From: [redacted]
Date 19 October 2011
Programme: Strategy Directorate
Location: [redacted]
Tel: [redacted]

12(3) k13(2)(a)(i)

To: Gregory Barker

ENERGY AND CLIMATE CHANGE COMMITTEE INQUIRY INTO CONSUMPTION EMISSIONS
Submission of evidence

ISSUE

1. The Commons Select Committee on Energy and Climate Change (ECC) has launched an inquiry to investigate the case for consumption-based greenhouse gas emissions reporting in the UK.

TIMING

2. **Urgent.** The deadline for submission to the ECC is 25 October.

RECOMMENDATION

3. That you agree to the submission of the attached statement of evidence, providing a response to the Select Committee Inquiry on behalf of DEFRA, BIS and DECC.

RATIONALE

Background

4. The ECC inquiry focuses on so-called 'consumption' emissions, sometimes also referred to as 'embedded' emissions, an aspect of the UK's environmental impact which is growing in magnitude, yet poorly understood and not captured by our domestic carbon accounting methodology, which is based on territorial emissions as agreed under the UNFCCC and Kyoto Protocol.

5. The Committee has invited responses addressing the following questions:
   - How do assessments of the UK's greenhouse gas emissions differ when measured on a consumption rather than a production basis?
   - Is it possible to develop a robust methodology for measuring emissions on a consumption rather than production basis and what are the challenges that need to be overcome to deliver this?
   - What are the benefits and disadvantages associated with taking a consumption-based rather than production-based approach to greenhouse gas emissions accounting?
   - Is there any evidence of industry relocating from the UK to other countries as a result of UK climate change policy?
   - Would it be (a) desirable and (b) practicable for the UK to adopt emissions reduction targets on a consumption rather than production basis?
   - What are the potential implications at the international level of the UK adopting a consumption- rather than production-based approach to greenhouse gas emissions accounting?
   - Are there any other issues relating to consumption-based emissions reporting that you think the Committee should be aware of?

Options

6. We have prepared a joint response with input from officials at Defra, DECC and BIS, resulting in the attached draft (Annex A), agreed between these three departments.

7. The proposed submission makes the following key points:
   - The UK's consumption emissions rose by nearly 20% between 1990 and 2008, in contrast to the downward trend in our territorial emissions
   - 55% of the total emissions associated with goods and services purchased by UK households in 2004 occurred overseas
   - Estimates of consumption emissions are useful to indicate their scale and how they are split between sectors and countries, but are not robust enough for target setting.
   - Evidence on consumption emissions has significant value in helping to target policies to change UK consumption patterns and may also help target overseas sources of imported emissions
   - Consumption-based emissions reporting cannot replace the territorial approach to reporting, which is fundamental to global governance of climate change, but provides a useful complementary viewpoint.

Considerations

8. [redacted] 12(4)(e)

9. [redacted]

10. [redacted]

11. [redacted]

12. [redacted]

NEXT STEPS

13. If you are content to issue the evidence, we will submit Tuesday Morning (25 October) in time for meeting the ECC deadline.

[redacted]

[redacted]

12(3) & 13(2)(a)(i)

Annex A

Response to the Energy and Climate Change Committee inquiry on consumption-based emissions reporting

Summary

- The UK's consumption emissions rose by nearly 20% between 1990 and 2008, in contrast to the downward trend in our territorial emissions.
- 55% of the total emissions associated with goods and services purchased by UK households in 2004 occurred overseas.
- Estimates of consumption emissions are useful to indicate their scale and how they are split between sectors and countries, but are not robust enough for target setting.
- Evidence on consumption emissions has significant value in helping to target policies to change UK consumption patterns and may also help target overseas sources of imported emissions.
- Consumption-based emissions reporting cannot replace the territorial approach to reporting, which is fundamental to global governance of climate change, but provides a useful complementary viewpoint.

Response to ECC Questions

1. How do assessments of the UK's greenhouse gas emissions differ when measured on a consumption rather than a production basis?

1.1 The UK uses three different approaches to measure greenhouse gas emissions, and the Government publishes figures based on each approach:

- *Territorial basis*: Emissions based on the UK greenhouse gas inventory, published by DECC – this is used as the basis for our reporting to the EC and UNFCCC, and forms the basis for reporting on progress towards our domestic and international emissions reduction targets. The inventory measures emissions on a territorial basis, so only includes emissions which occur within the UK's borders. We have used *'territorial'* throughout this report to make comparisons between the existing reporting regime and the consumption approach referred to in the Committee's questions.

- *Production or Residents basis*: Emissions as measured by the UK Environmental Accounts, published by the Office for National Statistics (ONS) - these measure greenhouse gas emissions on what is referred to as a "residents" basis, which means that the figures represent emissions produced by UK residents and industry whether in the UK or abroad, but exclude emissions within the UK which can be attributed to overseas residents and businesses.

- *Consumption basis*: Defra publishes research data that measures the emissions associated with goods and services the UK consumes and thus takes account of the emissions embedded within the manufactured goods and services which the UK imports and exports.

1.2 International emissions data, targets and action to mitigate climate change have focussed on territorial greenhouse gas emissions. However, it is now possible to make an estimate

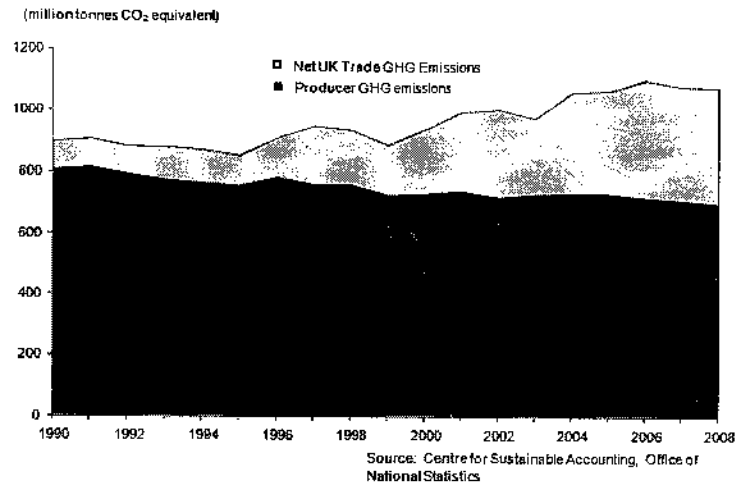
of consumption emissions as more evidence is now becoming available. The Government is monitoring total carbon dioxide emissions associated with UK consumption on an annual basis.

1.3 *Estimated total greenhouse gas emissions:* In 2008, UK territorial greenhouse gas emissions were 620 Mt CO2e but from a consumption approach they were significantly larger – 1,071Mt. Total consumer emissions were therefore 75% higher than total territorial emissions.[1]

1.4 *Trends:* UK territorial emissions have declined steadily since 1990, at around 1% per year (14% in total between 1990 and 2008). At the same time, emissions associated with UK consumption have been increasing as we consume more products from overseas. Taking a consumption emissions approach the UK's greenhouse gas emissions have risen by nearly 1% a year (almost 20% in total between 1990 and 2008). If these trends continue, greenhouse gas emissions embedded in imports to the UK could be greater than UK territorial emissions by 2018.[2]

Figure 1:

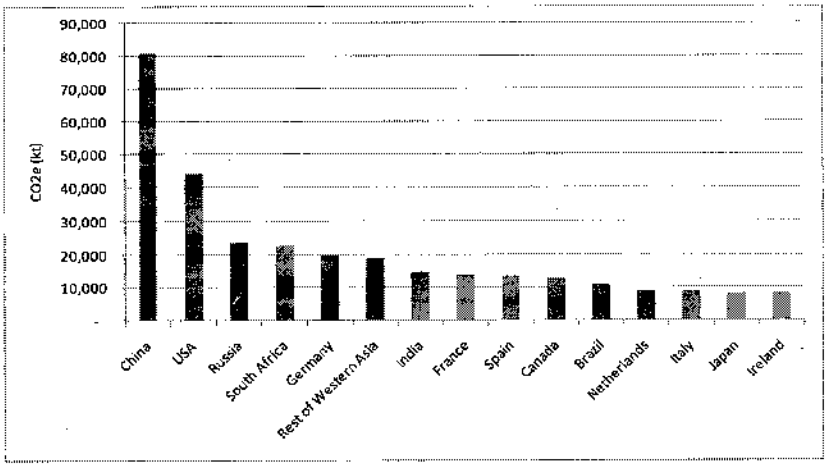
GHG emissions relating to UK consumption, 1990 to 2008



1.5 Geographical distribution of consumption impacts: According to an analysis of consumption emissions, 55% of the total emissions associated with goods and services purchased by UK households in 2004 occurred overseas.[3] Over three quarters of overseas emissions occurred outside the European Union, 36% came from Asia and 12% from North America. The country with the highest level of emissions to satisfy UK consumption was China, by a significant margin. The next three were USA, Russia and South Africa (see Figure 2 below).

Figure 2: Top 15 overseas contributors to 2004 UK consumption emissions total [3]

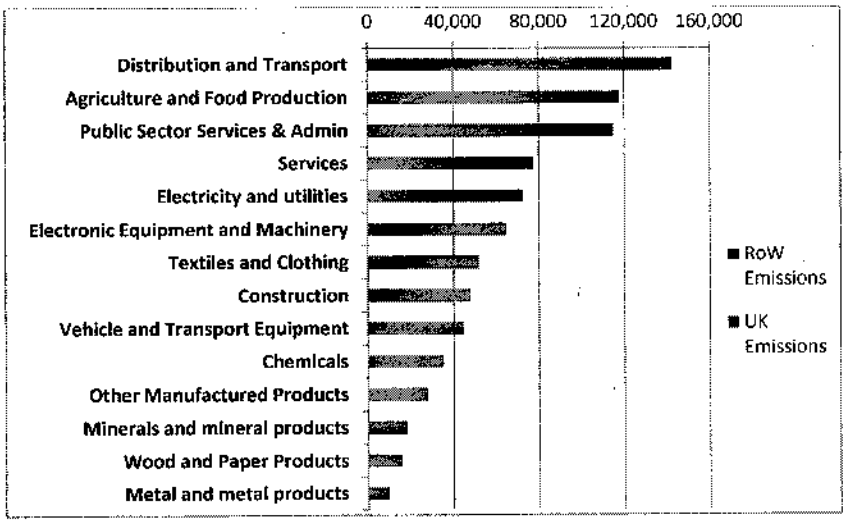
NB: Due to the nature of the modelling and the international trade data available, all figures should be treated as estimates and used with caution.



1.6 *Distribution by sector:* The latest research data also indicates which products and sectors had the highest proportion of embedded carbon emissions in 2004. For products such as electronic equipment and clothing, which are mainly produced overseas, over 80% of the associated greenhouse gas emissions occurred outside the UK.

Figure 3 Total UK Greenhouse Gas Consumption Emissions (2004 data in kilotons CO2e), split by sector and by UK / Rest of World (RoW) [3]

NB: Due to the nature of the modelling and the international trade data available, all figures should be treated as estimates and used with caution.



2. *Is it possible to develop a robust methodology for measuring emissions on a consumption rather than production basis and what are the challenges that need to be overcome to deliver this?*

2.1 This is a relatively new research area with a limited number of active researchers and little international experience. Recent work has focussed on development of a multi-regional input-output model and use of Global Trade Analysis Project (GTAP) data.[4,5,6] As the accuracy and timeliness of research outputs in this area depends heavily on the raw data that is available, a wider acceptance within the international community will be needed in order to improve future data sources and methodologies.

2.2 A 2008 Defra research report 'Development of an Embedded Carbon Emissions Indicator' developed an initial model for the assessment of greenhouse gas impacts associated with UK trade flows.[7] This provides an indication of the scale of the impact and the growth trend. The resulting estimates have been published as part of the UK Government Sustainable Development indicators, as a contextual indicator alongside the reported territorial emissions.[8] Ongoing research work will provide a high level analysis of the UK national carbon dioxide footprint, covering 131 product groups and all final demand categories on annual basis from 2011 – 2016.[9] A 2009 total is expected to be available in late 2011.

2.3 The current modelling methodology has been developed and scrutinised by leading academics. It reflects the state-of-the-art in the field, but currently cannot be considered to be sufficiently reliable for setting targets, and has only limited use in policy evaluation. This is due to the assumptions required to estimate the emissions, and to data availability constraints which mean that the latest detailed estimates of consumption emissions by country of origin are for 2004 and by product are for 2008. The limitations are described below:

Comment [RC1]: Edited for clarity & consistency with agreed lines in 5.1 and 5.4

2.4 *Constraints on data availability and timeliness:*

- Ideally, up-to-date data for all trading partners covering more detailed information on emissions by sector as well as up-to-date consistent and detailed annual input-output analytical tables for all those countries would be required. Although the UN is making progress in setting standards for greenhouse gas emissions accounts, availability of this data will always be limited by the capacity and will of trading partners to provide it.

2.5 *Methodological assumptions:*

- Emissions are attributed pro rata to spend. For example, a cheap flight is allocated a fraction of the emissions of a costly business class flight. Analysis of physical data in key sectors could improve this but would require laborious, sector specific analysis.
- It is assumed that products within a product group, or sub-sectors within a sector, are homogeneous i.e. that all dairy products, or all electronic goods, have the same

emissions intensity. The only way round this would be to have ever more detailed input-output tables.

2.6 In comparison, territorial emissions are easier to measure robustly, allowing statistics to be published for more recent years. The UK's international reporting requirements for territorial emissions require more recent data (the UK's last annual report to the UNFCCC was in April 2011 with data up to 2009). DECC published provisional 2010 territorial emissions in March 2011.

3. *What are the benefits and disadvantages associated with taking a consumption-based rather than production-based approach to greenhouse gas emissions accounting?*

3.1 There are merits to both consumption and territorial based accounting and the two should be seen as complementary approaches rather than alternatives. Consumption-based accounting allows government to identify abatement associated with changing consumption patterns, while territorial based accounting enables scrutiny of policy that targets production processes. The Government believes that a territorial basis for accounting is the most appropriate basis for emissions to be measured under international reporting guidelines. Other key benefits and disadvantages of a consumption-based approach are outlined below.

3.2 *Benefits of a consumption-based approach:*

a. Although the data is more uncertain in nature, looking at consumption emissions alongside producer emissions gives a more complete picture of the carbon emissions associated with the activities of UK citizens and businesses. The scale of consumption emissions relative to territorial emissions give a measure of the risk that reductions in UK territorial emissions could be counteracted or substituted by increases in embedded emissions in imports. Consumption emissions accounts can identify the largest sources of these overseas emissions, providing a good starting point for considering what scope there is for the UK to address them.

b. In a world of increasing global trade, it could be argued that since both consumers and producers benefit from production the responsibility for these emissions does not necessarily reside solely with the producer. While this has not been a priority issue for developing countries, who often worry that a change in approach could lead to protectionist anti-trade policies, it could also be argued that developing countries should not be entirely responsible for emissions associated with producing goods and services that are mainly consumed in the developed world. As noted above, a consumption approach can help identify where changes in how UK citizens consume could lead to overseas emission reductions that would be invisible in UK territorial accounts, but significant for global climate outcomes. This information can then be taken into account in UK and EU policy measures (e.g. under the Ecodesign Directive, or in sustainable procurement and voluntary sustainability labels).

c. Analysis of the distribution of consumption emissions within sectors can contribute to assessment of the scale and nature of the risk of 'carbon leakage' which could

potentially be caused by relocation of industry from areas inside the UK/EU to jurisdictions which do not place a limit on greenhouse gas emissions.

d. It is in line with the life-cycle approach that leading businesses are using to track the full supply chain impacts of their products and identify action areas.

3.3 Disadvantages of a consumption-based approach:

a. Beyond changing domestic consumption patterns and action through business supply chains, countries have very limited ability to influence the carbon intensity of international supply chains, as they lack the sovereignty to determine policy in other countries. In contrast countries do have sovereignty over emissions in their own territory meaning that they can design effective policies to address them.

b. Consumption-based emissions models are limited by the availability of international trade data, and rely on quite a number of assumptions (explained in Question 2 above). All figures should be treated as estimates and used with caution.

4. Is there any evidence of industry relocating from the UK to other countries as a result of UK climate change policy?

4.1 There is little evidence on the extent to which firm relocation has actually occurred and can be directly attributed to UK or EU climate change policy, although some industry representatives (e.g. Intellect) have stated that they view UK climate change policy as a disincentive to investment in the UK and Tata Steel have cited it as a contributing factor to one plant closure decision. There are however a number of ex-ante studies of the likely impact on carbon leakage (movement of production from areas that place a limit on emissions to jurisdictions that do not have such a limit) from climate change policies (notably the EU Emissions Trading System). There are also a number of intermediate indicators (notably cost pass through rates) that may also indicate whether relocation due to climate change policy is likely to occur.

4.2 A number of studies have shown that the risk of carbon leakage is likely to be limited to a small number of sectors. These sectors are those that are relatively carbon intensive (i.e. high carbon content per value of production) **and** high trade intensity (high levels of imports and exports per unit of production).

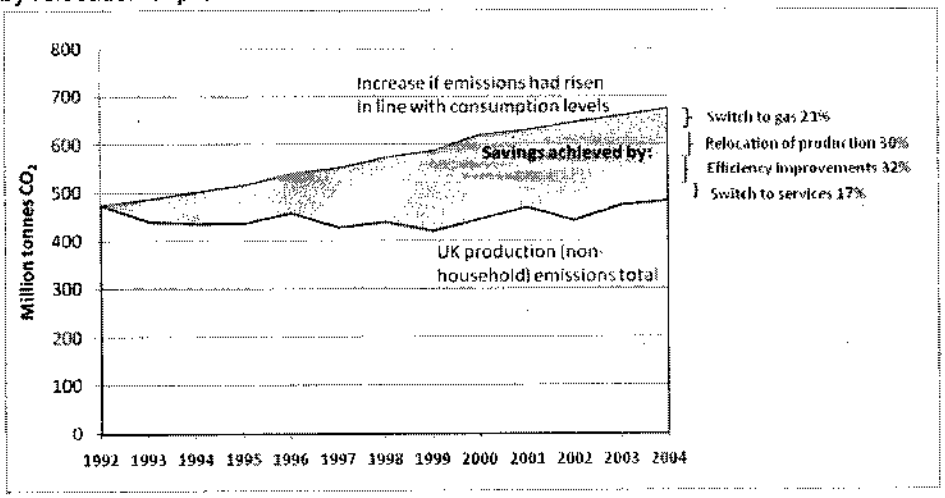
4.3 In the context of the EU ETS, the evidence (e.g. Climate Strategies[10,11], Oko Institute[12]) points to a limited number of sectors being at significant risk of carbon leakage; those that appear consistently are iron & steel, cement, lime, fertilisers, refineries, aluminium and chlor alkali. This is based on research into the production impacts of the ETS and the impacts of non-EU trade intensity. Further work to supplement this has looked at cost pass through, the implications of full auctioning and the impact of a 30% emissions reduction target for the EU[13]. Studies also show that provisions for the free allocation of emission allowances go a long way to managing the risk of carbon leakage.

4.4. Concerns around carbon leakage arise as industries that are subject to international competition may not be able to fully pass on the costs of carbon to consumers, thus making them unviable. Empirical analysis[14] has suggested that the majority of industrial sectors, including those with high trade intensities such as iron and steel, have been able to pass on a significant proportion of the carbon price into the final consumer price, thus mitigating the risk of leakage.

4.5 The Government has announced that by the end of 2011 it will announce a package of measures for energy intensive businesses whose international competitiveness is most affected by our energy and climate change policies in order to reduce the impact of government policy on the cost of electricity for these businesses.

4.6 A structural decomposition analysis of the UK 1992-2004 carbon emissions trends has examined the drivers for emissions reductions. 30% of the production or residents' emissions savings over this period could be attributed to relocation of production (with the remainder due to efficiency, shift to services, and switch to gas).[15] This does not demonstrate any causal link between business decisions to relocate and climate policy, as business decisions reflect a diverse range of structural and cyclical economic factors. Wider economic trends that have driven globalisation include removal of trade barriers and improvements in the investment conditions in developing countries that have meant that their resources (natural and a relatively low-cost labour force) are making an increasing contribution to the global economy. The EU's Emission Trading Scheme was not introduced until 2005 so this and the majority of the current climate policy framework could not have been influencing the trend prior to this point.

Figure 4: Savings in UK non-household CO2 production emissions 1992 to 2004, achieved by relocation of production and other factors [15]



5. ***Would it be (a) desirable and (b) practicable for the UK to adopt emissions reduction targets on a consumption rather than production basis?***

5.1 Adopting consumption emission targets in the place of production emission targets would be a breach of the UK's international obligations under the UNFCCC and Kyoto Protocol. However, consumption and production approaches to emissions accounting are not mutually exclusive. It is desirable for the UK to understand, measure and be open about the overseas impacts associated with consumption of imported goods and services. The relative significance of these impacts could increase when we successfully decrease territorial emissions. Data on total consumption emissions and on the breakdown between geographical areas and types of products could be used to help target action on consumption by UK households and businesses, and to inform UK engagement with overseas partners (e.g. through bilateral agreements and trade and development policy).

5.2 It would not be desirable to undermine the current territorial accounting methodology, which is fundamental to the UK's approach to carbon budgets and international commitments and negotiations. The territorial approach has been agreed internationally and seeking to unpick this would require difficult negotiations that may well not succeed and would provide a distraction from other crucial areas of the negotiations. Switching to a consumption based approach would be a mistake. The territorial approach was chosen for good reason, because countries have a much greater ability to influence production activities in their own territory than to influence emissions from goods which are consumed in their country but produced overseas. Some commentators have suggested we could consider introducing carbon standards for imported goods as a solution to this problem, but trade measures could risk a negative retaliatory response.

5.3 This means that the preferred route to reduce global emissions is for legal domestic commitments to address territorial emissions, and to reach a broad international agreement with ambitious commitments for developed and developing countries to reduce emissions according to their capabilities. This is the basis for the UK's approach to carbon budgets and the global climate change negotiations.

5.4 Even if consumption based greenhouse gas accounting were a desirable approach for managing global emissions it is not currently practicable. As described in Question 2 above, the current consumption emissions measurement methodology is not sufficiently reliable for use in or setting targets.

6. ***What are the potential implications at the international level of the UK adopting a consumption- rather than production-based approach to greenhouse gas emissions accounting?***

6.1 The UK currently has international reporting requirements under the UN Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the EU Monitoring Mechanism. To meet our reporting requirements under the UNFCCC and Kyoto Protocol we prepare an annual Greenhouse Gas inventory reporting on all UK green house gas

emissions in a given year and historically back to 1990. Given the challenges in gathering emissions data, each inventory reports on the annual emissions from two years previously. Every four years, we prepare a National Communication which, as well as annual emissions data, includes detail on the national policies we are putting in place to deliver our international emissions reduction targets to enable an assessment of whether we are on target to deliver our commitments. To meet our additional reporting requirements under the EU Monitoring Mechanism we submit, every two years, a report on projected future UK emissions.

6.2 As set out in our response to Question 5 above, our international reporting is based on territorial accounting. We have negotiated this with other countries and committed to it internationally. If the UK switched to reporting its emissions exclusively on a consumption basis, we would be breaching our obligations under the UNFCCC and Kyoto Protocol. In addition, the UK would be undermining the very process of ensuring that there was a robust global approach to monitoring, reporting and verifying emission levels and mitigation action that we are trying to build. It would have a major impact on the UK and EU's reputation and influence in the international negotiations.

6.3 Although consumption emissions data can provide insights into how to decarbonise economies, the current lack of data and understanding on developing country emissions would make it extremely difficult to undertake global emissions accounting on this basis - consumption emissions, because they are difficult to calculate accurately, are uncertain and not easily verified. As discussed in Question 3 above, there are relatively few policies to target emissions embedded in imports, due to the lack of sovereignty over imported emissions. It is therefore likely that a universal change to setting targets on a consumption basis would lead countries to reduce their ambition.

6.4 It would be probably be impossible to negotiate a global emissions reduction treaty based on consumption emissions with other countries. We are not aware of any interest in this approach from other countries and discussion of consumption emissions in the negotiations inevitably leads to discussion of trade sanctions against carbon intensive production. This is a particularly sensitive issue with the potential to derail the international negotiations and set us back decades in reaching an effective global solution to climate change.

6.5 The UK has started to collect information on consumption emissions and we could consider ways in which we could join up the presentation of our information to show a more complete picture. Introducing fuller accounts of consumption emissions alongside the UK's territorial accounts could help target current and future policies to reduce consumption impacts. The Swiss and Swedish governments have also invested in evidence work to identify their consumption emissions,[16,17] and as other countries begin to account systematically for the impacts of their consumption there may be potential to work collectively and with producer countries to focus domestic policy to address common sources of high impact.

7. ***Are there any other issues relating to consumption-based emissions reporting that you think the Committee should be aware of?***

   na

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What do consumption emissions tell us?

- **UK territorial emissions have declined steadily**
  21% between 1990 and 2008
  Around 1% per year

- **We will meet and over achieve** our first three carbon budgets to 2022 according to projections
  - by 96, 132 and 87 million tonnes respectively

- Consumption emissions approach – UK GHG emissions have **risen by nearly 1% a year** to almost 20% in total (between 1990 and 2008)

- Consumption approach **does not contradict the success of reducing our territorial emissions**

- Looks at a different aspect of UK's environmental impact: **more of our purchases in recent years have been globally traded goods** – impact occurs before import to the UK

Latest emissions statistics:

Emissions	2008	2009	2010 provisional data
Excluding the effects EU ETS trading	-21%	-28.%	-25.3%
Including the effects EU ETS trading	- 23.8%	- 26.5%	- 25 .2%
On a consumption basis (2008 is the latest year for which we have data	+ 20%		

What is the Government's view on consumption based emissions reporting?

- Data should be seen as **complementary to the territorial emissions approach**
  – territorial will continue to be the best basis for emissions to be measured under **international reporting guidelines**

- **Consumption emissions data is already published**
  Defra Sustainable Development Indicators

- Existing policies do address consumption emissions to some extent

For example:

- DECC's international climate work **already targets some of the countries which the consumption approach identifies as major exporters of carbon to UK consumers**
  (inc China, South Africa and India)
  E.g. wide range of low carbon cooperation work and knowledge-sharing with China ongoing;

- Defra's work includes increasing the transparency of products which are lower carbon in manufacture and use
  - mandatory EU standards
  - voluntary labels
  - procurement specifications

- Defra also supports work on carbon foot printing methodologies, business reporting of supply chain impacts, and voluntary agreements with industry.

Are other countries analysing their consumption emissions patterns?

- **Swiss** and **Swedish** governments invested in evidence work to identify their consumption emissions

- **Netherlands have included these emissions in their Green Growth Indicators**

- **Germany publishes some estimates of consumption emissions**

- As other countries begin to account systematically for the impacts of their consumption there may be potential to work collectively and with producer countries to focus domestic policy to address common sources of high impact

Does 'good news story' of territorial emissions reduction hide the fact that the UK has simply moved its industry off shore?

Defra analysis of the drivers for UK carbon emissions trends 1992-2004 (prior to the EU Emissions Trading System launch)

Showed there were **four major drivers**:

- **Relocation** – 30%
- **Efficiency** – 32%
- Shift to **services** – 17%
- Switch to **gas** – 21%

- So **the "good news story" is real.**
  70% of improvement in territorial emissions over period resulted from improved efficiency, shift to services, switch to gas

- Savings attributed to relocation do not demonstrate any causal link between business decisions to relocate and climate policy

- Business decisions reflect a diverse range of structural and cyclical economic factors
  - labour markets, commodity sources etc

- Little evidence on relocation that can be directly attributed to UK or EU climate change policy

- Number of studies have shown that the risk of carbon leakage is likely to be limited to a small number of sectors

- Government announced a **package of support** for EIIs

What is the Government doing about 'carbon leakage'?

Announced by the Chancellor in the Autumn Statement, the Coalition will implement a package of measures to reduce the transitional impacts of policy on the costs of electricity for the most electricity-intensive industries.

Beginning in 2013 – **worth around £250 million** over the Spending Review period.

Package includes:

- **compensation** from the costs of the carbon price floor and the EU Emissions Trading System for key electricity-intensive businesses, subject to Commission approval, and

- **an increase in the rate of relief** for electricity from the climate change levy for Climate Change Agreement participants from the current level of 65 per cent to 90 per cent.

The Coalition will also **explore options for reducing the impacts of electricity costs arising as a result of Electricity Market Reform** policies on electricity-intensive industries where this has a significant impact on their competitiveness.

We are also:

- Gathering evidence on the electricity-intensity of industry in order to consult on our approach to threshold criteria. BIS will be announcing next steps in due course.

- EU ETS Directive provides for 100% of allowances to be allocated for free to sectors that are deemed to be significantly exposed to the risk of carbon leakage.

Does Government have a role with regards to supply chains, procurement and labelling? Does Government have a view on mandatory reporting of scope 3 emissions as a way to identify "hotspots" ?

- Yes, the Government is involved in supporting businesses to tackle emissions throughout their supply chains

- We specify products which are lower carbon in manufacture and use, through mandatory EU standards, voluntary labels, and procurement specifications. These create a market pull for green products

- Defra encourages companies to measure and report on their direct and indirect emissions, including those in the supply chain.

- Government publish guidance and emission factors for companies which help calculate emissions for all scopes if they wish to do so.

- We do encourage Scope 3 reporting (i.e. reporting supply chain emissions) but are not in favour of mandating it. It would be difficult to regulate for something that by definition is out of a company's direct control.

ANNEX C

Briefing pack

Key lines to take

1. **Data on consumption-based emissions should be seen as complementary to the territorial emissions approach**, which will continue to be the best basis for emissions to be measured under international reporting guidelines. Taken together, these indicators provide a more complete picture of the carbon emissions associated with the activities of UK citizens and businesses.

2. **Consumption emissions data is already published by Defra** as part of the Sustainable Development Indicators and we will continue to do this, in line with a commitment in the Carbon Plan.

3. **Existing policies do address consumption emissions to some extent.** Analysis of the available evidence is important in order to ensure measures are targeted on the right products and regions:

   - We specify products which are lower carbon in manufacture and use, through mandatory EU standards, voluntary labels, and procurement specifications. (Defra-led)
   - We work with businesses, who increasingly have a good grip on their own supply chain impacts. WRAP's (the Waste & Resources Action Programme) Product Research Forum is developing and making public evidence and data on impact hotspots, and Defra has supported carbon footprinting methodologies, business reporting of supply chain impacts, and voluntary agreements with industry. We can also support business to encourage consumer behaviour change. (Defra-led)
   - DECC's international climate work already targets some of the countries which the consumption approach identifies as major exporters of carbon to UK consumers (including China, South Africa and India). For example, a wide range of low carbon cooperation work and knowledge-sharing with China is already ongoing. (DECC led)

4. **Defra and DECC views and policies are aligned** *(Committee members may seek to identify conflict between Defra and DECC positions and challenge DECC to broaden their perspective regarding consumption emissions.)*

   - Defra wants to address impacts of UK consumption patterns as part of a strong and sustainable green economy and is responsible for a range of policies which contribute to this by targeting products across the supply chain.
   - DECC targets major global emitters through their overarching goal to achieve a global deal on climate change and through bilateral engagement via the International Climate Fund and other measures.
   - Defra and DECC are both in favour of transparent publication of consumption emissions and using the data to target policy interventions

ANNEX D

Summary of Government response to the questions in ECC Terms of Reference

NB Full responses to these questions are provided in the joint written evidence statement submitted by DECC, Defra and BIS in October 2011.

Q and A

1. **How do assessments of the UK's greenhouse gas emissions differ when measured on a consumption rather than a production basis?**

   UK territorial emissions have declined steadily since 1990, at around 1% per year (**21% in total between 1990 and 2008**). At the same time, emissions associated with UK consumption have been increasing as we consume more products from overseas. Taking a consumption emissions approach the UK's greenhouse gas emissions have risen by nearly 1% a year (**almost 20% in total between 1990 and 2008**).

2. **Is it possible to develop a robust methodology for measuring emissions on a consumption rather than production basis and what are the challenges that need to be overcome to deliver this?**

   Defra has invested in evidence gathering on this topic over the past 5 years. The methodology has been developed and scrutinised by leading academics. It reflects the state-of-the-art in the field, but currently cannot be considered to be sufficiently reliable for setting targets. This is due to the assumptions required to estimate the emissions, and to data availability constraints.

3. **What are the benefits and disadvantages associated with taking a consumption-based rather than production-based approach to greenhouse gas emissions accounting?**

   There are merits to both consumption and territorial based accounting and the two should be seen as complementary approaches rather than alternatives. Consumption-based accounting allows government to identify abatement associated with changing consumption patterns, while territorial based accounting enables scrutiny of policy that targets production processes.

4. **Is there any evidence of industry relocating from the UK to other countries as a result of UK climate change policy? (DECC lead)**

   There is little evidence on firm relocation that can be directly attributed to UK or EU climate change policy. A number of studies have shown that the risk of carbon

leakage is likely to be limited to a small number of sectors, and the Government has announced a package of support for those affected (see Q21).

5. **Would it be (a) desirable and (b) practicable for the UK to adopt emissions reduction targets on a consumption rather than production basis?**

Adopting consumption emission targets in the place of production emission targets would be a breach of the UK's international obligations under the UNFCCC and Kyoto Protocol. Data on consumption-based emissions should be seen as complementary to the territorial emissions approach, which will continue to be the best basis for emissions to be measured under international reporting guidelines.

Even if consumption based greenhouse gas accounting were a desirable approach for managing global emissions it is not currently practicable. The current consumption emissions measurement methodology is not sufficiently reliable for use in or setting targets.

6. **What are the potential implications at the international level of the UK adopting a consumption- rather than production-based approach to greenhouse gas emissions accounting?**

Adopting consumption emission targets in the place of production emission targets would be a breach of the UK's international obligations under the UNFCCC and Kyoto Protocol. We need to continue to use the established approach for accounting for our domestic emissions and for international negotiations, but also to be transparent about the information we have on our global impacts.

The Swiss, Swedish and Dutch governments have also invested in evidence work to identify their consumption emissions, and as other countries begin to account systematically for the impacts of their consumption there may be potential to work collectively and with producer countries to focus domestic policy to address common sources of high impact.

ANNEX E

Likely Committee questions and further Q&A

1. What do consumption emissions tell us?

Emissions associated with UK consumption have been increasing as we consume more products from overseas. Taking a consumption emissions approach the UK's greenhouse gas emissions have risen by nearly 1% a year (almost 20% in total between 1990 and 2008). UK territorial emissions have declined steadily over the same period, at around 1% per year (21% in total between 1990 and 2008).

2. How accurate is it for DECC to claim that UK emissions have actually fallen since 1990?

It is accurate. The positive trend in territorial emissions is real and based on figures calculated to globally agreed protocols. This is a genuine achievement which we need to continue to build on. The consumption approach does not contradict this success but looks at a different aspect of UK's environmental impact, recognising that more of our purchases in recent years have been globally traded goods which have an impact that occurs before they are imported to the UK.

Latest emissions statistics:

Emissions	2008	2009	2010 provisional data
Excluding the effects EU ETS trading	-21%	-28.%	-25.3%
Including the effects EU ETS trading	- 23.8%	- 26.5%	- 25 .2%

3. Are Defra and DECC are taking different stances on how this issue should be approached and on the extent to which emissions may be falling or not falling?

We agree closely on this, as our written evidence shows. Our departments share a desire to build a Green Economy and to mitigate global climate change. Defra has taken a lead on evidence on consumption emissions as part of our focus on Sustainable Consumption and Production, and also holds many of the relevant demand-side and product policy measures. DECC leads on international climate change, including bilateral engagement work aiming to support developing countries through knowledge sharing and other measures. All these policies, and others led by other Departments, have a role to play in addressing overseas emissions.

4. **The graphs appear to show the increase in consumption emissions effectively cancelling out the progress made on territorial emissions. Does the 'good news story' hide the fact that the UK has simply moved its industry off shore?**

Defra commissioned an analysis of the drivers for the UK 1992-2004 carbon emissions trends (the period prior to the EU ETS launch). This showed there were four major drivers: 30% of the emissions savings over this period could be attributed to relocation with the remainder due to efficiency – 32%, shift to services – 17%, and switch to gas – 21%.

So the "good news story" is real. 70% of the improvement in territorial emissions over that period resulted from improved efficiency, shift to services and switch to gas.

30% of the savings in that period were attributed to relocation, but this does not demonstrate any causal link between business decisions to relocate and climate policy, as business decisions reflect a diverse range of structural and cyclical economic factors (labour markets, commodity sources etc).

5. **If measured by consumption, emissions in the UK have gone up significantly in the last 20 years. Doesn't that imply that the UK policy has been one that is contributing to an increase in global emissions?**

This is a major shift reflecting continuing globalisation of trade and cannot be attributed to UK policy. We are simply buying more, and a wider variety of products, and we have increasingly imported relatively carbon-intensive goods. Removal of trade barriers and improvements in the investment conditions in developing countries have contributed to the wider trend.

6. **Discussion of the concept of 'carbon leakage' (Evidence from Public Interest Research Centre (PIRC) and others suggested that the issue is not 'strong' carbon leakage driven by climate policy but 'weak' carbon leakage caused by wider economic factors. (DECC lead)**

There is little evidence on firm relocation that can be directly attributed to UK or EU climate change policy. A number of studies have shown that the risk of carbon leakage is likely to be limited to a small number of sectors, and the Government has announced a package of support for those affected (see Q21).

7. **Do border tariff adjustments have a role in ensuring UK and EU industry is not disadvantaged by ambitious climate policy? (DECC lead)**

Border Adjustment Mechanisms (BAMs) are levies imposed on imports based on the carbon emitted during the production of those goods and the price of carbon faced by comparable goods in the importing country. This could in theory help level the playing field, for example by pricing aluminium from outside the EU so that it

competes fairly with goods produced within the carbon trading regime. The Carbon Trust, BIS and others have done work in this area. However, designing these measures to have the desired effects would be very complex. It is not clear that BAMs could be made WTO-compliant, and developing countries including India and China have already signalled their opposition and their readiness to take retaliatory action.

8. Is the DECC assertion (in the written memo) regarding sovereignty over emissions overseas absolute? Can't we do anything beyond our territory to reduce emissions?

Emissions in the countries that manufacture goods for the UK market are outside our sovereignty but can still be affected to some extent by UK policy. Consumption emissions can be addressed at several levels, from the micro (product) to the macro (international government) level.

At the product level, existing mechanisms allow us to specify products which are lower carbon in manufacture and use, through mandatory EU standards, voluntary labels, and procurement specifications. These create a market pull for green products. Defra leads on this area.

At a sectoral level, we can work with businesses and organisations, who are increasingly have a good grip on their own supply chain impacts. WRAP's Product Research Forum is developing open source guidance on sectoral data and hotspots, and Defra has supported carbon footprinting methodologies and voluntary agreements with industry. We can also support business to encourage consumer behaviour change. Tools are available for regional authorities to look at their own emissions from a consumption perspective.

At the governmental level, DECC's international climate work already targets some of the countries which the consumption approach identifies as major exporters of carbon to UK consumers (including China, South Africa and India). For example, a wide range of low carbon cooperation work and knowledge-sharing with China is already ongoing, as shown in the Government's response to this Committee's inquiry on that topic.

9. Do you consider these policies sufficient to tackle consumption emissions?

It is clear that more could be done. The policies discussed may have more potential to address consumption emissions, and this is where the data is so important to target them further (for example, ensuring that new EU Ecodesign measures take into account production emissions where they are significant, and helping businesses target the most effective points in their supply chain).

10. What is the UK doing internationally to help reduce emissions?

Countries accounting for around 80% of global emissions have already pledged mitigation commitments or actions to 2020, and research by GLOBE International has found that every major economy has now enacted climate or energy legislation

The UK works with other countries in a number of ways to support and encourage them to reduce their emissions, including: sharing UK / EU best practise; providing financial support for developing countries; and by negotiating a new legally binding climate change deal.

- In recent months, DECC Ministers have met with legislators from China, Mexico, the Republic of Korea, and South Africa to share our experience of passing the Climate Change Act on a bipartisan basis, operating within the European Emissions Trading System and policy on the Green Deal.

- The UK has set up the £2.9bn International Climate Fund (ICF) to help developing countries adapt to the impacts of climate change and move onto a low carbon growth path.

- At the UN climate change conference in Durban in November last year, we reached agreement to negotiate a new legally binding deal (with emissions reduction targets for all but the very poorest countries) by 2015 at the latest, with entry into force by 2020.

UK's International Climate Fund and Fast Start finance

- The ICF will provide £2.9 billion from April 2011 to March 2015, thereby committing UK climate finance for two years beyond the Fast Start period.

- We are on track to meet our Fast Start pledge to deliver £1.5 billion international climate finance by the end of 2012. A total of £1,056 million has so far been approved for, or spent on, specific multilateral and bilateral programmes – over two-thirds of our Fast Start pledge.

- But we need to start thinking beyond the Fast Start period and ensure there is no gap in climate finance at the end of this period. That is why the UK has set up the ICF and we think it is crucial that other countries to come forward with commitments beyond 2012.

Background

- At the UN Climate Change Conference in Copenhagen in 2009, developed countries pledged to provide approaching $30 billion of Fast Start Finance between 2010-12. The UK pledge is £1.5bn.The Copenhagen Accord and Cancun Agreements also set a long-term goal of $100 billion per year by 2020 for climate finance

- The UK is contributing £2.9 billion of international climate finance (International Climate Fund) over the Spending Review to help developing countries tackle and adapt to climate change. DECC is responsible for spending £1 billion of the ICF.

- ICF will be Official Development Assistance (ODA) and will be spent in line with OECD Development Assistance Committee (DAC) guidelines.

FCO Prosperity Fund

- The FCO prosperity fund replaces the Low Carbon High Growth Strategic Programme Fund, focuses on opening global markets, promoting sustainable global growth and ensuring access to energy resources in 15 priority emerging nations and regions.

- Creating the political conditions to tackle climate change in countries where future emissions are growing most quickly is the single biggest theme of the projects supported. At least 56% of the £18m (agreed amount for 2012/13) fund will continue to be devoted to this next year. In addition the fund must spend £14million on ODA-eligible activities.

Global Carbon Markets

- The UK is keen to share its experience on carbon markets to support developing countries to develop their own carbon market mechanisms.We are piloting different carbon market approaches in three key ways (countries targeted represent emission equivalent to 2.5 times EU27 emissions[1]):

  - The UK-China low carbon memorandum of understanding has agreed co-operation on three themes, including building capacity to implement pilot ETSs as announced in the 12th 5-year plan.

  - India launched its energy efficiency trading scheme ('PAT' scheme – Perform Achieve and Trade) with continuing UK assistance through a joint DECC-FCO-DfID effort.

  - The World Bank's new Partnership for Market Readiness (PMR) - The UK has pledged £7m which makes us the fund's top contributor.2 It aims at building capacity for market-based instruments including cap-and-trade in 10-15 middle income developing countries.

11. Does consumer labelling work / what is the role for labels in driving down consumption emissions?

[1] Based on CAIT 2005 emissions

[2] Other donors are: Australia ($10m), the European Commission ($7m), Germany ($7m), Japan ($7m), Switzerland ($6m), Norway ($5m), Spain ($5m), Netherlands ($5m), and the United States ($5m).

The EU Energy Labelling Directive has brought about mandatory labelling of the energy efficiency in use of an increasing range of electrical products – most recently TVs have been brought in to the labelling regime.. This is the dominant consumer energy label in the UK and, in combination with minimum, energy performance standards which cut out the worst performers (in terms of energy consumption), has produced a considerable reduction in direct emissions. Labels that indicate the consumption/supply chain emissions at present have a much lower profile. It is clear that there are great benefits to business in the process of calculating consumption emissions, as this requires a good understanding of their supply chain and will expose the most important emission sources to target. However it is not clear that consumers will buy a product just because less carbon was emitted in its production so labelling for consumers may not have a significant role.

Consumption emissions are also included in broader green label schemes for consumers. The EU Ecolabel, for example, takes a life cycle approach and covers all relevant environmental impacts. It gives the consumer a high degree of assurance that the product is a sustainability leader as it avoids the perverse effects that can result from looking at just one impact.

Commercial procurement decisions are made more systematically through a tender processes, and in this context product certification and labelling has a clear role. The UK Government Buying Standards link to the EU Ecolabel standards and other existing certification schemes where possible, and this connection helps procurers identify compliant products while increasing the incentive for producers to seek certification to the label.

12. Evidence at the local and regional level suggests that there is much that can be done - what are views on how/ whether this could translate to the national level? Or is this sort of work not at an advanced enough stage?

The regional examples show how much can be done with consumption emissions data notwithstanding the data limitations. The value of the data is to highlight sectors, areas, or products where changes to how we consume can make the most difference to global emissions.

Many local authorities are enthusiastic about playing their part in meeting our carbon mitigation targets and have already set in place stretching ambitions and policies for emissions reductions in their areas. Local authorities that wish to self-impose their own targets (or "budgets") are free to do so. Under the Memorandum of Understanding (MoU) signed between DECC and the Local Government Association in March 2011, local authorities are encouraged to set themselves targets for emissions reductions under a new Nottingham Declaration. The aim is for the new Declaration and a new Declaration Board to be launched by the spring.

The Government has asked the Committee on Climate Change to provide a report by the end of April 2012 on what local authorities can do to reduce carbon emissions in their areas.

There are a number of other initiatives to encourage local authorities to take action to tackle carbon emission in their areas. These include work by the Department for Communities and Local Government on 'permissive guidance' outlining the tools local authorities can use to reduce carbon and Local Carbon Frameworks pilot – a £2.5m programme in 2010/11 involving 30 local authorities. The aim of the LCF pilot programme was to a) **integrate** measures to combat climate change into the core business of local authorities as stewards for community action on carbon (at business, commercial; and neighbourhood levels), b) **align** carbon reduction to the growth of the green economy and public sector efficiency and c) **optimise** local authority to the national carbon budget and secure local accountability in line with the government's localism agenda.

13. **Supply chains, procurement and labelling (Carbon Trust work re labelling). Does Government have a role here? Does Government have a view on mandatory reporting of scope 3 emissions as a way to identify "hotspots" ?**

Yes, the Government is involved in supporting businesses to tackle emissions throughout their supply chains. We specify products which are lower carbon in manufacture and use, through mandatory EU standards, voluntary labels, and procurement specifications. These create a market pull for green products.

Defra encourages companies to measure and report on their direct and indirect emissions, including those in the supply chain. We publish guidance and emission factors for companies which help calculate emissions for all scopes if they wish to do so.

We definitely encourage Scope 3 reporting (i.e. reporting supply chain emissions) but are not in favour of mandating it. It would be difficult to regulate for something that by definition is out of a company's direct control.

14. **Do consumption emissions, and more transparency and policies directed at addressing consumption emissions, have a role to play in changing behaviour? The Committee believes that there might be too many carrots i.e. incentives and possibly not enough sticks – what is the Government's view?**

Behaviour change is an important aspect of sustainable consumption. Defra has published the 'Sustainable Lifestyles Framework', a tool that identifies the elements needed for a sustainable lifestyle, offers insights on why some people act in certain ways, and identifies ways to influence behaviour.

Businesses, especially retailers, are uniquely placed to help consumers understand how their actions, behaviours and attitudes can make a real difference and support change. The On-pack Recycling Label, the WRAP's Love Food Hate Waste initiative, and the EU Ecolabel and Energy Label schemes are some examples of where retailers have used their influence to help consumers make better environmental choices.

Behaviour change doesn't have to be direct messages and labelling. We are also exploring the potential to adjust business models to use fewer environmental resources while retaining profitability and customer service – for example through moving into product leasing.

[On carrots and sticks- we are not sure what incentives the Commitee is referring to – could they explain?]

15. Conclusions and what will Government be doing going forward.

Defra is continuing to commission the latest consumption data from the best available source. The next update on consumption emissions will be 8th March, when 2009 data will become available. We will also be working to ensure that we exploit any opportunities for our policies on sustainable products and supply chains to take into account consumption impacts.

16. Are other countries analysing their consumption emissions patterns?

The Swiss and Swedish governments have also invested in evidence work to identify their consumption emissions. The Netherlands have included these emissions in their Green Growth Indicators and Germany also publishes some estimates of consumption emissions.

As other countries begin to account systematically for the impacts of their consumption there may be potential to work collectively and with producer countries to focus domestic policy to address common sources of high impact.

17. Should the UK propose the consumption emissions as part of the UNFCCC reporting protocol and international negotiations? Is there any appetite internationally for this?

No, we should not. We should continue to support the current territorial accounting methodology, which is fundamental to the UK's approach to carbon budgets and international commitments and negotiations. The territorial approach has been agreed internationally and seeking to unpick this would require difficult negotiations that may well not succeed and would provide a distraction from other crucial areas of the negotiations.

The issue of consumption based reporting did not arise in the formal UN negotiations at Durban. We would be wary about potentially introducing a new complexity which could unpick the progress we have made to date in terms of improving reporting from developing countries (who have only just agreed to report more recent inventory data). Discussion of consumption emissions in the negotiations inevitably leads to discussion of trade sanctions against carbon intensive production. This is a particularly sensitive issue with the potential to compromise the international negotiations.

Rather than proposing it as a formal part of the international climate negotiations, the real value of the consumption emissions data is to help policy makers and others to understand trends and patterns, to ensure that the UK is identifying and using all available avenues to influence global emissions.

18. There is a lot of agreement that it is desirable to measure and publish consumption-based emissions alongside production, but is it feasible to have a consumption-based emissions target?

No, the data is not robust enough for this. As you have heard from the academic witnesses, the methodology used is state-of-the-art, but there are limitations due to the raw data availability and timeliness, and because of the economic and homogeneity assumptions made at sub-sector level. The data is good enough to show the scale of consumption emissions and how they are split between sectors and countries, but it currently cannot be considered to be sufficiently reliable for setting targets.

19. Even if we did not have an actual target, could we commit to try and achieve a reduction in consumption-based emissions?

Yes, the UK should understand, measure and be open about the overseas impacts associated with consumption of imported goods and services. This will provide a basis to look at what is already being achieved by existing policy and what opportunities there could be to use UK and EU influence to target overseas emissions sources. This is one way that the UK, already a leader in global climate change, might continue to punch above its weight.

20. What is the role of business in reducing consumption emissions?

Defra's experience is that business understand the consumption perspective very well, as it reflects closely the supply chain approach. For them it is good business to know their exposure to risks throughout their operations. Industry witnesses to this inquiry have demonstrated that leading businesses have an excellent grip on where their most significant impacts are, and this is the first step in being able to reduce them. At the business / consumer interface, business (particularly the retail sector) also has a role to play in influencing consumer demand. Government can support

business in reducing consumption emissions by developing agreed tools and methodologies, helping with voluntary agreements and supporting SMEs in particular to identify supply chain hotspots without extensive technical analysis.

21. What is the Government doing to assist the Energy Intensive Industries (DECC lead)?

The Government is committed to ensuring that manufacturing is able to remain competitive during the shift to a low carbon economy and to minimising 'carbon leakage'. As announced by the Chancellor in the Autumn Statement, the Government will implement a package of measures to reduce the transitional impacts of policy on the costs of electricity for the most electricity-intensive industries, beginning in 2013 and worth around £250 million over the Spending Review period. This will include:

- compensation from the costs of the carbon price floor and the EU Emissions Trading System for key electricity-intensive businesses, subject to Commission approval, and
- an increase in the rate of relief for electricity from the climate change levy for Climate Change Agreement participants from the current level of 65 per cent to 90 per cent.

The Government will also explore options for reducing the impacts of electricity costs arising as a result of Electricity Market Reform policies on electricity-intensive industries where this has a significant impact on their competitiveness.

The Government will be gathering evidence on the electricity-intensity of industry in order to consult on our approach to threshold criteria. This will help inform our approach to compensation.

The Government (BIS) will be announcing next steps on implementing the Autumn Statement measures shortly.

<u>The EII package was announced on 29 November as part of the Chancellor's autumn statement :</u>

- This package of **measures will reduce the transitional impacts of energy and climate change policies on the costs of electricity for those energy intensive industries whose international competitiveness is most affected by these policies**.
- **It is worth £250 million** over the spending review, excluding the support available for energy efficiency through the Green Investment Bank.
- For a business (e.g. a steel producer) covered by measures, this **could reduce their electricity costs by around 5-10 %** - perhaps halving the costs to them of Government policy.
- The package **reduces the impact of energy and climate change policies on the cost of electricity in the short to medium term** for those energy intensive industries whose international competitiveness is most affected by these policies.

- This package is intended to support these industries **whilst the UK decarbonises** and transitions to a low carbon economy.

- Overall, we are **providing incentives for greater industrial energy efficiency** – not removing them.

- The continued success of energy intensive industries is part of the Government's **commitment to rebalancing the economy** away from a narrow range of economic sectors to ensure long term, balanced and sustainable growth.

- **Many proposals have state aid implications**, in particular compensation for the indirect carbon price floor cost, and are thus subject to Commission approval.

- Depending on the proposal, **approval could be expected to take at least 9 - 12 months or 18 months or more** if the Commission opens a formal investigation procedure. Government will start to inform and notify the Commission as soon as possible.

22. **What about addressing potential carbon leakage in the EU ETS ?**

- A strong manufacturing sector is core to an effective transition to a low carbon economy and in rebalancing the economy. We want to make sure that our energy intensive industry remains in the UK where it can become more energy and carbon efficient and where it can be part of the green economy – providing steel for Offshore wind farms, for example, or providing the chemicals which will lower the carbon intensity of consumer products.

- The best way to address carbon leakage would be a robust international climate agreement, creating a level playing field for industry and therefore mitigating the risk.

- The EU ETS Directive provides for 100% of allowances to be allocated for free to sectors that are deemed to be significantly exposed to the risk of carbon leakage. We support this, in the absence of an international climate agreement. Proportionate free allocation of allowances gives relief to sectors most at risk of carbon leakage, without raising barriers to international trade.

- We consider that there is a risk of carbon leakage for a small number of sectors. Our view on the low number of sectors likely to be at significant risk is supported by research from both the UK and the EU. We continue to believe that Border Adjustment Mechanisms (BAMs) are an unhelpful way to address carbon leakage because they risk having protectionist undertones. BAMs are also very complex to administer, with costs for government, business and consumers. Where exports originate from a country using less carbon intensive technology, such countries may seek 'tax credits', creating even more complications to global trade.

Compensation for carbon leakage as a result of the indirect costs of the EU ETS

- The UK fully supports the work of the Commission to develop State Aid guidelines for the provision under the Directive to award compensation to electro-intensive industries in the EU that are exposed to competition by third countries as a result of ETS indirect costs.

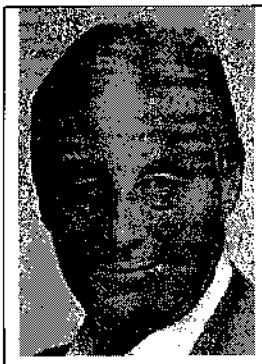
- In November, the Government announced that £110m had been made available for this purpose available over the SR period. This announcement formed a key component of the package of measures to alleviate the cumulative impacts of climate policies on UK electro-intensive industries.

- We are working to support the Commission's development of State Aid guidelines for the provision of compensation which will set the framework for awarding compensation to exposed industries in the UK.

- So far we have been broadly supportive of the Commission's approach which recognises that the number of sectors significantly exposed to leakage as a result of indirect ETS costs is small and that not all MS are able to pay. The Commission has therefore sought to limit the risk of intra-EU competitive distortion if some MS compensate their sectors while others do not.

ANNEX F

Energy and Climate Change Select Committee membership



Tim Yeo (Chair)

Conservative

South Suffolk

Electoral history

Contested Bedwelty February 1974 general election. Member for South Suffolk 1983-2010, for South Suffolk (revised boundary) since 6 May 2010 general election

Parliamentary career

PPS to Douglas Hurd: as Home Secretary 1988-89, as Foreign and Commonwealth Secretary 1989-90; Joint Parliamentary Under-Secretary of State: Department of the Environment 1990-92, Department of Health 1992-93; Minister of State, Department of the Environment 1993-94; Opposition Spokesperson for Environment, Transport and the Regions 1997-98; Shadow Minister of Agriculture, Fisheries and Food 1998-2001; Shadow Secretary of State for: Culture, Media and Sport 2001-02, Trade and Industry 2002-03, Public Services, Health and Education 2003-04, Environment and Transport 2004-05

Select committees

Member: Treasury 1996-97, Culture, Media and Sport 2005-06; Chair: Environmental Audit 2005-10; Member: Liaison 2006-, Joint Committee on the Draft Climate Change Bill 2007; Chair: Energy and Climate Change 2010-; Member: Liaison (National Policy Statements Sub-committee) 2010-, Joint Committee on National Security Strategy 2010

Political interests

Health, economic policy, environment, charity reform, rural affairs.

Dan Byles
Conservative
North Warwickshire

Electoral history

Member for North Warwickshire since 6 May 2010 general election

Party groups

Vice-chair, Knighton Branch, South Leicester Conservatives 2006

Select committees

Member: Energy and Climate Change 2010-

Political interests

Defence, economic policy, energy security, healthcare

Barry Gardiner

Labour

Brent North

Electoral history

Member for Brent North 1997-2010, for Brent North (revised boundary) since 6 May 2010 general election

Parliamentary career

PPS to Beverley Hughes as Minister of State, Home Office 2002-04; Parliamentary Under-Secretary of State: Northern Ireland Office 2004-05, Department of Trade and Industry 2005-06, Minister for Biodiversity, Landscape and Rural Affairs, Department for Environment, Food and Rural Affairs 2006-07; Prime Minister's Special Envoy for Forestry 2007-08; PPS to Lord Mandelson as Secretary of State for Business, Enterprise and Regulatory Reform/Business, Innovation and Skills 2009-10; Leader of the Opposition's Special Envoy for Climate Change and the Environment 2011-

Party groups

Member, Labour Finance and Industry Group; Vice-chair, Labour Friends of Israel; Chair, Labour Friends of India 1999-2002, 2008-09

Select committees

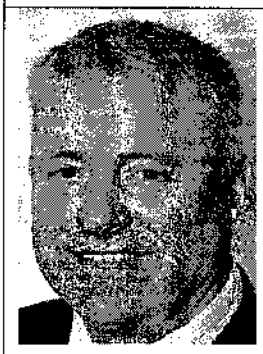
Member: Procedure 1997-2001, Broadcasting 1998-2001, Public Accounts 1999-2002, Joint Committee on Consolidation of Bills Etc 2001-10, Energy and Climate Change 2010-, Environment, Food and Rural Affairs 2011-

Councils, public bodies

Cambridge City Council: Councillor 1988-94, Chair of Finance, Mayor 1992-93

Political interests

Economic policy, trade and industry, education, foreign affairs, environment, climate change, India-UK relations



Ian Lavery

Labour

Wansbeck

Electoral history

Member for Wansbeck since 6 May 2010 general election

Parliamentary career

PPS to Harriet Harman: as Deputy Leader and Chair, Labour Party; Deputy Leader of the Opposition; Shadow Secretary of State for International Development 2010-11, as Shadow Deputy Prime Minister, Chair, Labour Party, and Shadow Secretary of State for Culture, Media and Sport 2011-

Party groups

Member, Ashington Town branch, Labour Party; Executive committee member, Wansbeck CLP

elect committees

Member: Northern Ireland Affairs 2010-11, Regulatory Reform 2010-, Energy and Climate Change 2010-

Councils, public bodies

Former councillor, Wansbeck District Council

International bodies

International Energy Miners Organisation

Political interests

Local regeneration, employment, energy, climate change, poverty, internationalism, sport

Dr Phillip Lee

Conservative

Bracknell

Electoral history

Contested Blaenau Gwent 2005 general election. Member for Bracknell since 6 May 2010 general election

Parliamentary career

Board member, Parliamentary Office of Science and Technology (POST)

Party groups

Executive member, Conservative Friends of Bangladesh; Vice-chair, Conservative Middle East Council

Select committees

Member: Energy and Climate Change 2010-, Administration 2010-

Councils, public bodies

Councillor, Beaconsfield Town Council 2001-02

Political interests

Science, energy security policy, space industry

Albert Owen

Labour

Ynys Môn

Electoral history

Member for Ynys Môn since 7 June 2001 general election

Party groups

Constituency Labour Party: Treasurer 1991-92, Vice-chair 1992-96; Press officer 1996-2000

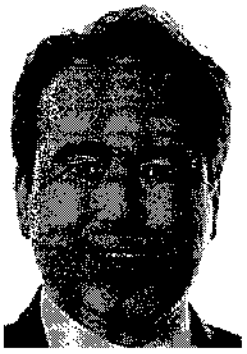
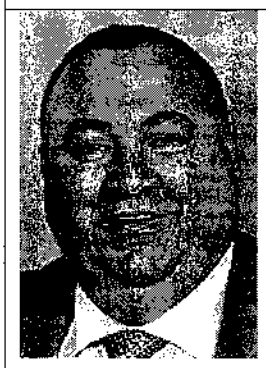
Select committees

Member: Welsh Affairs 2001-05, 2006-10, Accommodation and Works 2001-05, Energy and Climate Change 2010-, Chairmen's Panel/Panel of Chairs 2010-

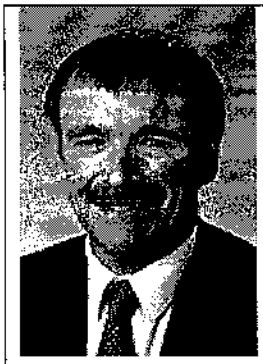
Councils, public bodies

Councillor Holyhead Town Council 1997-99

Political interests

	Welsh affairs, welfare, economic development
 **Christopher Pincher** Conservative Tamworth	**Electoral history** Contested Warley 1997 and Tamworth 2005 general elections. Member for Tamworth since 6 May 2010 general election **Party groups** Member, Conservative Party 1987- **Select committees** Member: Energy and Climate Change 2010-, Armed Forces Bill 2011, Standing Orders 2011- **Political interests** Home affairs, defence, education, energy
 **John Robertson** Labour Glasgow North West	**Electoral history** Member for Glasgow Anniesland 23 November 2000 by-election to 2005, for Glasgow North West since 5 May 2005 general election **Parliamentary career** PPS: to Kim Howells as Minister of State, Foreign and Commonwealth Office 2005-08, to Yvette Cooper: as Chief Secretary to the Treasury 2008-09, as Secretary of State for Work and Pensions 2009-10, as Shadow Home Secretary 2010- **Party groups** Election agent to Donald Dewar MP, MSP 1993-2000; Chair, Anniesland constituency Labour party 1995-2000; Secretary: Glasgow Group of MPs 2001-06, Scottish Parliamentary Labour Party 2004- **Select committees** Member: Scottish Affairs 2001-05, European Scrutiny 2003-05, Energy and Climate Change 2009-, Chairmen's Panel/Panel of Chairs 2010- **International bodies** Member: Commonwealth Parliamentary Association 2000-, Executive Committee, Inter-Parliamentary Union, British Group 2000-, British-American

	Parliamentary Group 2000-, NATO Parliamentary Assembly, British-Irish Parliamentary Assembly, **Political interests** International development, defence, work and pensions, Scottish affairs, communications, foreign affairs, music, nuclear energ
 **Laura Sandys** Conservative South Thanet	**Electoral history** Member for South Thanet since 6 May 2010 general election **Parliamentary career** Member Speaker's Committee for the Independent Parliamentary Standards Authority 2010- **Party groups** Member: Quality of Life Taskforce, Conservative Party, Democracy Taskforce, Conservative Party; Patron, Tory Reform Group **Select committees** Member: Energy and Climate Change 2010-, Joint Committee on the Draft House of Lords Reform Bill 2011- **Political interests** Small businesses, care of the elderly, education, defence policy
 **Sir Robert Smith** Liberal Democrat West Aberdeenshire and Kincardine	**Electoral history** Contested (SDP/Liberal Alliance) Aberdeen North 1987 general election. Member for West Aberdeenshire and Kincardine 1997-2005, for West Aberdeenshire and Kincardine (revised boundary) since 5 May 2005 general election **Parliamentary career** Liberal Democrat: Whip 1999-2001, Spokesperson for: Scotland 1999-2001, Trade and Industry 2005-06, Energy 2005-06, Deputy Chief Whip 2001-06, Deputy Shadow Leader of the House 2007-10; Whip 2008-10 **Select committees** Member: Scottish Affairs 1999-2001, European Standing Committee A 2000-01, Procedure 2001-10, Trade and Industry 2001-05, Unopposed Bills (Panel) 2001-10, Standing Orders 2001-10, Accommodation and Works 2003-05, International Development 2007-09, Energy and Climate Change 2009-, Joint Committee on Consolidation, Etc, Bills 2010- **Councils, public bodies** Councillor, Aberdeenshire Council 1995-97; JP 1997 **Political interests** Electoral reform, offshore oil and gas industry, rural affairs



Dr Alan Whitehead

Labour

Southampton Test

Electoral history

Contested Southampton Test 1983, 1987 and 1992 general elections. Member for Southampton Test 1997-2010, for Southampton Test (revised boundary) since 6 May 2010 general election

Parliamentary career

Joint PPS to David Blunkett as Secretary of State for Education and Employment 1999-2000; PPS to Baroness Blackstone as Minister for Education and Employment 1999-2001; Parliamentary Under-Secretary of State, Department for Transport, Local Government and the Regions 2001-02

Party groups

Member Labour Party National Policy Forum 1999-2001; Chair Manifesto Group Local Government 2007-

Select committees

Member: Environment, Transport and Regional Affairs 1997-99, Environment, Transport and Regional Affairs (Environment Sub-Committee) 1997-99, Constitutional Affairs/Justice 2003-10, Standards and Privileges 2005-, Joint Committee on the Draft Climate Change Bill 2007, Energy and Climate Change 2009-, Environmental Audit 2010-

Councils, public bodies

Southampton City Council: Councillor 1980-92, Leader 1984-92

Political interests

Environment, local and regional government, higher education, education, constitution, transport, energy

RESTRICTED

From: [redacted]
Team: Carbon Budgets, Strategy Directorate
Telephone: [redacted]
Date: 5 March 2012

12(5) & 13(2)(a)(i)

To: Secretary of State

Outside scope of request

Response to [redacted] on Consumption Emissions and the Green Deal

ISSUE

Outside scope of request

1. The [redacted] has written to you (letter at Annex A) regarding Consumption Emissions and the Green Deal. You asked for an explanatory note on the issue of measuring Consumption Emissions which is also attached at Annex C.

TIMING

2. Routine.

RECOMMENDATION

Outside scope of request.

3. That you agree to respond to [redacted] as attached at **Annex B** (which covers the issues they raise on the Green Deal as well as the issues around consumption based emissions set out in this note).

4. That you **note** the attached information on Consumption Emissions and the position to date at **Annex C**.

BACKGROUND

5. The issue of consumption emissions has recently gained more attention. Indeed the Environmental Audit Committee have addressed this issue as part of their inquiries into carbon budgets, and more recently the Energy and Climate Change Committee has picked it up. Evidence on consumption emissions could have value in helping to target policies to change UK consumption patterns. Defra, in particular, is willing to do some more work on exploring that.

6. Our position to date has been that we regard consumption based emissions as a useful complement to territorial data, and might well be useful to inform policy, but that a territorial approach is the right way for us to monitor and regulate our emissions. This is for a number of reasons:

   - Territorial emissions are the basis for international reporting and the UN led process on climate change negotiations. [redacted]

12(5) & 13(2)(a)(i)

[redacted]

- Data for measuring consumption emissions is currently not reliable. Even the state-of-the-art methodology in the field cannot currently be considered as sufficiently reliable for anything other than limited use in evaluating the effects of policies.

- We do not have levers to influence the manufacturing process in other countries which lead to embedded emissions short of either taxing or regulating the import of higher carbon goods (as the [redacted] are proposing). Doing this would be fraught with difficulties, not least because, in the first place we do not have the authority to regulate the production processes in other countries. But also, any measures on imported goods need to stand the test of the WTO rules. [redacted]

7. For those reasons, we recommend that you write back to [redacted] expressing support for the usefulness of consumption based emissions reporting to complement a territorial approach, but confirming the policy position set out by Chris Huhne in his previous reply, that our primary approach must remain a territorial basis for considering emissions reduction.

CLEARANCE

[redacted]

Annex C

Consumption Based Emissions

Key Messages

- The UK's consumption emissions rose by nearly 20% between 1990 and 2008, in contrast to the downward trend in our territorial emissions.
- 55% of the total emissions associated with goods and services purchased by UK households in 2004 occurred overseas.
- Estimates of consumption emissions are useful to indicate their scale and how they are split between sectors and countries, but are not robust enough for target setting.
- Evidence on consumption emissions has significant value in helping to target policies to change UK consumption patterns and may also help target overseas sources of imported emissions.
- Consumption-based emissions reporting cannot replace the territorial approach to reporting, which is fundamental to global governance of climate change, but provides a useful complementary viewpoint.

How do assessments of the UK's greenhouse gas emissions differ when measured on a consumption rather than a production basis?

1.1 The UK uses three different approaches to measure greenhouse gas emissions, and the Government publishes figures based on each approach:

- *Territorial basis*: Emissions based on the UK greenhouse gas inventory, published by DECC – this is used as the basis for our reporting to the EC and UNFCCC, and forms the basis for reporting on progress towards our domestic and international emissions reduction targets. The inventory measures emissions on a territorial basis, so only includes emissions which occur within the UK's borders.

- *Production or Residents basis*: Emissions as measured by the UK Environmental Accounts, published by the Office for National Statistics (ONS) - these measure greenhouse gas emissions on what is referred to as a "residents" basis, which means that the figures represent emissions produced by UK residents and industry whether in the UK or abroad, but exclude emissions within the UK which can be attributed to overseas residents and businesses.

- *Consumption basis*: Defra publishes research data that measures the emissions associated with goods and services the UK consumes and thus takes account of the emissions embedded within the manufactured goods and services which the UK imports and exports.

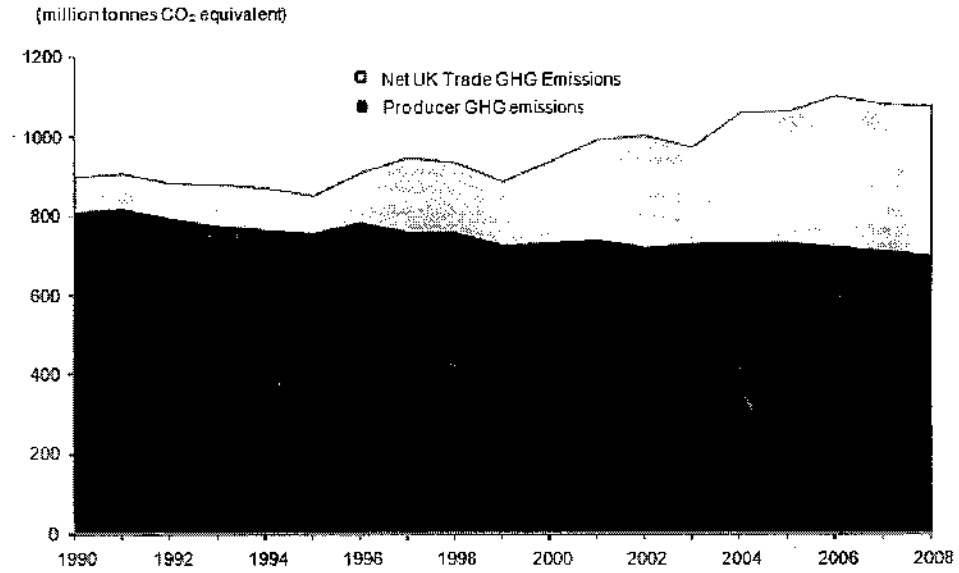
1.2 International emissions data, targets and action to mitigate climate change have focussed on territorial greenhouse gas emissions. However, it is now possible to make an estimate of consumption emissions as more evidence is now becoming available. The Government is monitoring total carbon dioxide emissions associated with UK consumption on an annual basis.

1.3 *Estimated total greenhouse gas emissions:* In 2008, UK territorial greenhouse gas emissions were 620 Mt CO2e but from a consumption approach they were significantly larger – 1,071Mt. Total consumer emissions were therefore 75% higher than total territorial emissions.

1.4 *Trends:* UK territorial emissions have declined steadily since 1990, at around 1% per year (21% in total between 1990 and 2008). At the same time, emissions associated with UK consumption have been increasing as we consume more products from overseas. Taking a consumption emissions approach the UK's greenhouse gas emissions have risen by nearly 1% a year (almost 20% in total between 1990 and 2008). If these trends continue, greenhouse gas emissions embedded in imports to the UK could be greater than UK territorial emissions by 2018.

Figure 1:

GHG emissions relating to UK consumption, 1990 to 2008



Source: Centre for Sustainable Accounting, Office of National Statistics

Is it possible to develop a robust methodology for measuring emissions on a consumption rather than production basis and what are the challenges that need to be overcome to deliver this?

2.1 This is a relatively new research area with a limited number of active researchers and little international experience. Recent work has focussed on development of a multi-regional input-output model and use of Global Trade Analysis Project (GTAP) data. As the accuracy and timeliness of research outputs in this area depends heavily on the raw data that is available, a wider acceptance within the international community will be needed in order to improve future data sources and methodologies.

2.2 A 2008 Defra research report 'Development of an Embedded Carbon Emissions Indicator' developed an initial model for the assessment of greenhouse gas impacts associated with UK trade flows. This provides an indication of the scale of the impact

and the growth trend. The resulting estimates have been published as part of the UK Government Sustainable Development indicators, as a contextual indicator alongside the reported territorial emissions. Ongoing research work will provide a high level analysis of the UK national carbon dioxide footprint, covering 131 product groups and all final demand categories on annual basis from 2011 – 2016. A 2009 total is expected to be available soon.

2.3 The current modelling methodology has been developed and scrutinised by leading academics. It reflects the state-of-the-art in the field, but currently cannot be considered to be sufficiently reliable for setting targets, and has only limited use in policy evaluation. This is due to the assumptions required to estimate the emissions, and to data availability constraints which mean that the latest detailed estimates of consumption emissions by country of origin are for 2004 and by product are for 2008. The limitations are described below:

2.4 *Constraints on data availability and timeliness:*

- Ideally, up-to-date data for all trading partners covering more detailed information on emissions by sector as well as up-to-date consistent and detailed annual input-output analytical tables for all those countries would be required. Although the UN is making progress in setting standards for greenhouse gas emissions accounts, availability of this data will always be limited by the capacity and will of trading partners to provide it.

2.5 *Methodological assumptions:*

- Emissions are attributed pro rata to spend. For example, a cheap flight is allocated a fraction of the emissions of a costly business class flight. Analysis of physical data in key sectors could improve this but would require laborious, sector specific analysis.
- It is assumed that products within a product group, or sub-sectors within a sector, are homogeneous i.e. that all dairy products, or all electronic goods, have the same emissions intensity. The only way round this would be to have ever more detailed input-output tables.

2.6 In comparison, territorial emissions are easier to measure robustly, allowing statistics to be published for more recent years. The UK's international reporting requirements for territorial emissions require more recent data (the UK's last annual report to the UNFCCC was in April 2011 with data up to 2009). DECC published provisional 2010 territorial emissions in March 2011.

What are the benefits and disadvantages associated with taking a consumption-based rather than production-based approach to greenhouse gas emissions accounting?

3.1 There are merits to both consumption and territorial based accounting and the two should be seen as complementary approaches rather than alternatives. Consumption-based accounting allows government to identify abatement associated with changing consumption patterns, while territorial based accounting enables scrutiny of policy that targets production processes. The Government believes that a territorial basis for accounting is the most appropriate basis for emissions to be measured under

international reporting guidelines. Other key benefits and disadvantages of a consumption-based approach are outlined below.

3.2 Benefits of a consumption-based approach:

a. Although the data is more uncertain in nature, looking at consumption emissions alongside producer emissions gives a more complete picture of the carbon emissions associated with the activities of UK citizens and businesses. The scale of consumption emissions relative to territorial emissions give a measure of the risk that reductions in UK territorial emissions could be counteracted or substituted by increases in embedded emissions in imports. Consumption emissions accounts can identify the largest sources of these overseas emissions, providing a good starting point for considering what scope there is for the UK to address them.

b. In a world of increasing global trade, it could be argued that since both consumers and producers benefit from production the responsibility for these emissions does not necessarily reside solely with the producer. While this has not been a priority issue for developing countries, who often worry that a change in approach could lead to protectionist anti-trade policies, it could also be argued that developing countries should not be entirely responsible for emissions associated with producing goods and services that are mainly consumed in the developed world. As noted above, a consumption approach can help identify where changes in how UK citizens consume could lead to overseas emission reductions that would be invisible in UK territorial accounts, but significant for global climate outcomes. This information can then be taken into account in UK and EU policy measures (e.g. under the Ecodesign Directive, or in sustainable procurement and voluntary sustainability labels).

c. Analysis of the distribution of consumption emissions within sectors can contribute to assessment of the scale and nature of the risk of 'carbon leakage' which could potentially be caused by relocation of industry from areas inside the UK/EU to jurisdictions which do not place a limit on greenhouse gas emissions.

d. It is in line with the life-cycle approach that leading businesses are using to track the full supply chain impacts of their products and identify action areas.

3.3 Disadvantages of a consumption-based approach:

a. Beyond changing domestic consumption patterns and action through business supply chains, countries have very limited ability to influence the carbon intensity of international supply chains, as they lack the sovereignty to determine policy in other countries. In contrast countries do have sovereignty over emissions in their own territory meaning that they can design effective policies to address them.

b. Consumption-based emissions models are limited by the availability of international trade data, and rely on quite a number of assumptions (explained above). All figures should be treated as estimates and used with caution.

Department for Environment Food and Rural Affairs

Department for Environment, Food and Rural Affairs

STATISTICAL RELEASE **8 March 2012**

UK's Carbon Footprint 1990 - 2009

UK's carbon dioxide (CO_2) footprint has fallen again according to data released to today.

- Between 2008 and 2009, the UK's carbon dioxide footprint fell by 9 per cent. This follows a steady rise of 35 per cent between 1995 and 2005, leaving the footprint in 2009 some 20 per cent higher than it was in 1990
- Over the whole period, carbon dioxide emissions relating to imports doubled and emissions relating to the consumption of goods and services produced in the UK decreased by 10 per cent
- The findings released today also indicate that the UK's total carbon footprint, including other greenhouse gases (GHG), increased by 12 per cent between 1990 and 2009

The carbon footprints reported in this release relate primarily to carbon dioxide emissions, although more experimental estimates of the total greenhouse gas (GHG) emissions are also presented. In this release a carbon footprint refers to emissions that are associated with the spending of UK residents on goods and services, wherever in the world these emissions arise, and those which are directly generated by UK households through private motoring etc. These emissions are often referred to as 'consumption emissions' to distinguish them from estimates relating to the emissions 'produced' within a country's territory or economic sphere.

To find out what effect UK consumption has on carbon emissions we need to take into account where the goods we buy come from. Since 1990, the UK economy has continued to move from a manufacturing base towards the services sector. As a result, more of the goods and services we buy and use are now produced overseas.

Inherently the emissions relating to overseas production of imports to the UK are not as easily measured as emissions generated within the UK borders. There are general conventions on how to do this, using shares of production based on financial data, but the results cannot be viewed as being as robust as the estimates of carbon emissions generated domestically.

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Lead Statistician: rocky.harris@defra.gsi.gov.uk

Website: www.defra.gov.uk/statistics/environment/

Carbon dioxide emissions associated with UK consumption

The UK's carbon dioxide (CO_2) footprint can be separated into two components: those emissions relating to goods and services produced by UK business and consumed by UK residents, and those emissions relating to imported goods, often referred to as emissions that are 'embedded' in imports.

Figure 1 CO_2 emissions associated with UK consumption 1990 to 2009

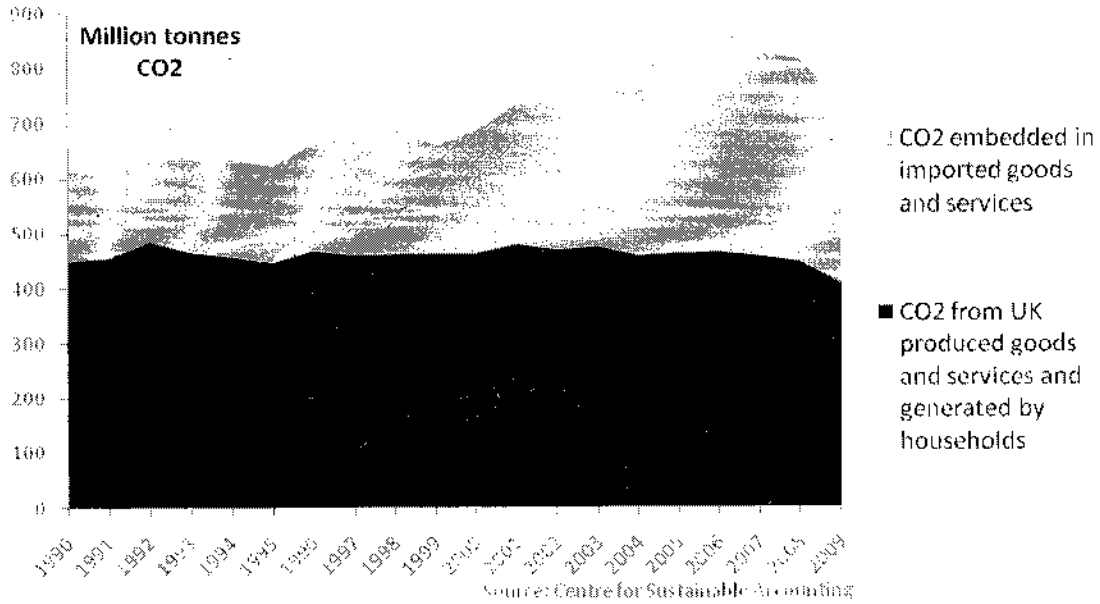
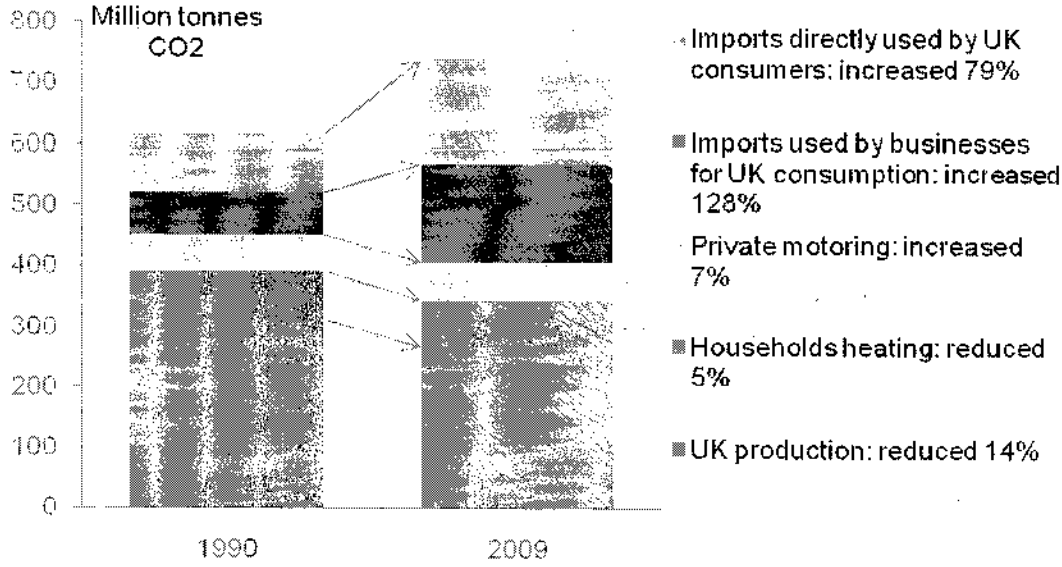


Figure 1 shows that CO_2 emissions associated with imported goods and services accounted for around a quarter of the carbon dioxide footprint in 1990 (166 million tonnes (mt) CO_2, 27 per cent); by 2009 their share had increased to just under half (331 mt CO_2, 45 per cent).

CO_2 emissions from our consumption of UK produced goods and services (excluding exports) and from households' direct emissions from car use and heating (excluding electricity) are relatively constant across the time series: the main change has been the fall of 10 per cent between 2008 and 2009. This fall can be attributed to a number of factors: there was a significant reduction in emissions from power stations, largely due to a fall in demand but also in part due to an increase in the use of nuclear power for electricity generation. There was also a large reduction in emissions from heavy goods vehicles, and a noticeable fall in emissions from the construction activity.

Figure 2 Comparison: consumption based CO_2 emissions in 1990 and 2009



Source: Centre for Sustainable Accounting

Table 1 Description of consumption emissions from the main activities in Figure 2

Activity	Description
UK production	UK production emissions attributable to UK final consumption, including manufacturing and transport, international aviation and shipping provided by UK operators,
Imports used by businesses for UK consumption	Emissions associated with the production of imports which are used by UK industry and attributable to UK final consumption
Imports directly used by UK consumers	Emissions associated with the production of imports which are used by UK final consumers
Households	UK emissions generated directly by households, split between those e.g. for heating and those for private motoring

As well as an overall increase in emissions over the last 20 years, the composition of the carbon dioxide footprint has changed. Figure 2 sets out the changes in each of the five main activities that make up the total carbon dioxide footprint. The increase in emissions embedded in goods and services between 1990 and 2009 is related to increased spending, offset by improvements in the carbon efficiency of production and a switch to less carbon intensive products[1].

Emissions associated with UK production, excluding those directly generated by households, decreased by 14 per cent between 1990 and 2009. UK produced goods and services accounted for 36 per cent of the total CO_2 footprint in 2009, compared with 50 per cent in 1990.

[1] See report for a more detailed explanation of the causes of these changes.

Emissions associated with imports, both those directly used by consumers and those used by businesses, account for the increase in the UK's carbon footprint over the period. Emissions embedded in imports used by businesses for UK consumption more than doubled, and emissions associated with the production of imports used directly by UK consumers increased by nearly 80 per cent. This reflects how we are increasingly importing relatively carbon intensive goods. We are also buying more, and a wider variety of products.

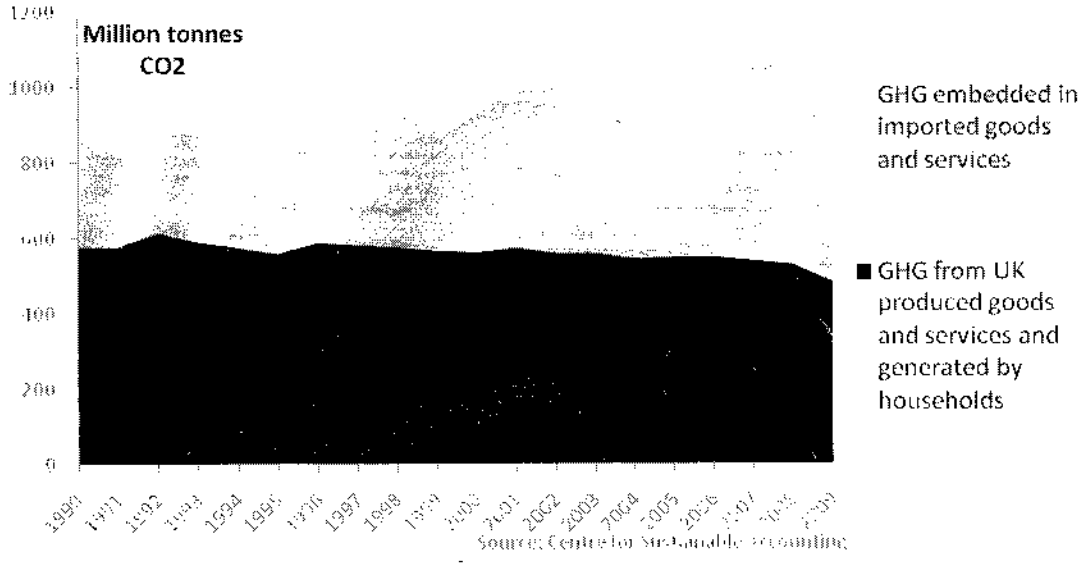
The absolute amount of **emissions generated directly by households** has remained relatively constant at 139 mt CO_2 in 1990 and 140 mt CO_2 in 2009. Within the category, emissions from heating decreased whilst emissions from private motoring increased. The decline in heating emissions can be attributed to more efficient central heating systems and increased insulation in modern homes, coupled with milder winters. The increase in private motoring emissions can be related to the increase in travel by car which has been partly offset by the introduction of more fuel -efficient vehicles.

Over the same period, household final consumption expenditure (HHFCE)[2], which measures total spending by households, when adjusted for the effects of price inflation, increased by 50 per cent whereas total CO_2 emissions increased by 20 per cent. Between 2008 and 2009 HHFCE decreased by 2 per cent, while the carbon dioxide footprint declined by 9 per cent.

Greenhouse Gas emissions associated with UK consumption

CO_2 is the main greenhouse gas, accounting for about 77 per cent of total UK consumption greenhouse gas emissions in 2009. The new research indicates that UK's total carbon footprint, including the other greenhouse gases[3] has increased by about 12 per cent between 1990 and 2009. These estimates are less robust than estimates for CO_2 only, largely because of inherent uncertainties in the estimation of non-CO_2 emissions.

Figure 3 Greenhouse gas emissions associated with UK consumption 1990 to 2009



[2] Household final consumption expenditure :Domestic concept.

[3] Methane, nitrous oxide, and three fluorinated compounds - hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

Figure 3 shows how the proportion of total GHG emissions that arose from the production of imports increased from a third in 1990 to a half of total GHG emissions in 2009. In 2009 GHG emissions associated with imported goods were estimated at 477 million tonnes CO_2 equivalent[4].

Background to the research

The Centre for Sustainability Accounting (CenSA) has been contracted for five years to undertake the work on behalf of Defra. The project updates previous work carried out by the Stockholm Environment Institute (SEI) published by Defra in 2008. It uses a multi-region input-output (MRIO) model, which the SEI has developed, to link the flows of goods and services described in monetary terms, with the emissions generated in the process of production. In brief, this is a sophisticated computer model that can assimilate data on emissions and product flows from different countries and years in different classifications and valuations, dealing with the data gaps and reconciling inconsistencies.

The methods and data sources used in this research remain consistent with those used in the previously published results that are documented in Wiedmann et al (2008). However, due to a change in the Standard Industrial Classification (SIC) used in some of the source data, additional effort has been needed to re-allocate estimates from the more recent classification covering 110 sectors to the previous coverage of 123 sectors. A conversion of recent time series data to the later format based on SIC 2007 is planned for when sufficient source data becomes available.

Revisions to the data since first release

Since the first research was published in 2008, the model has been further refined by CenSA. The data has been expanded, from solely covering CO_2 to covering all greenhouse gases, and now encompasses a longer time series, from 1990 to 2009. For most years the result of these refinements has made little difference to the totals – increasing or decreasing them by less than 1 per cent. The overall trend remains the same.

Greenhouse gas emissions uncertainty

Defra published research on the uncertainty in the estimates as part of the previous report on consumption-based CO_2 emissions between 1992 and 2004. The research showed that the relative standard error for total CO_2 consumption emissions in any one year lies within the range of 3.3 per cent for 1994 and 5.5 per cent for 2004. It was therefore possible to conclude that the estimated increase in total consumption-based emissions over the period was statistically significant. Since then there have been a number of improvements in the model, with more up-to-date and reliable financial data, which should have reduced the range of errors for the more recent years. However, the uncertainty relating to the changes in the UK's greenhouse gas footprint has not yet been researched and the estimates must therefore be treated with greater caution.

Relationship with other measures of GHG emissions

The UK's carbon footprint is measured in different ways for different purposes. Each basis of measurement is published by the government. The different bases should be viewed as complementary ways of accounting for carbon emissions.

[4] Emissions are converted to an equivalent weight of CO_2 emissions

Territorial basis
Emission estimates are based on the UK greenhouse gas inventory and published by the Department for Energy and Climate Change (DECC) – this is used as the basis for our reporting to the EC and United Nations Framework Convention on Climate Change (UNFCCC), and forms the basis for reporting on progress towards our domestic and international emissions reduction targets. The inventory measures emissions on a territorial basis, so only includes emissions which occur within the UK's borders. GHG emissions emitted in international territory, i.e. international aviation and shipping, are reported as memorandum items.

Production or Residents basis
Emissions estimates as reported in the UK Environmental Accounts, published by the Office for National Statistics (ONS) - these measure GHG emissions on what is referred to as a "residents" basis, which means that the figures represent emissions produced by UK residents and industry whether in the UK or abroad, but exclude emissions within the UK which can be attributed to overseas residents and businesses. International aviation and shipping emissions are allocated to countries based on the operator of the vessel.

Next scheduled release
March 2013 to include 2010 data.

References
Csv dataset

The current research project is ET0101

Wiedmann, T., Wood, R., Lenzen, M., Minx, J., Guan, D. and Barrett, J. (2008) *Development of an Embedded Carbon Emissions Indicator – Producing a Time Series of Input-Output Tables and Embedded Carbon Dioxide Emissions for the UK by Using a MRIO Data Optimisation System*, Report to the UK Department for Environment, Food and Rural Affairs by Stockholm Environment Institute at the University of York and Centre for Integrated Sustainability Analysis at the University of Sydney, June 2008. Defra, London, UK

Wiedmann, T., Lenzen, M. and Wood, R. (2008) *Uncertainty Analysis of the UK-MRIO Model – Results from a Monte-Carlo Analysis of the UK Multi- Region Input-Output Model (Embedded Emissions Indicator);* Report to the UK Department for Environment, Food and Rural Affairs by Stockholm Environment Institute at the University of York and Centre for Integrated Sustainability Analysis at the University of Sydney. Defra, London, UK.

Office for National Statistics Environmental Accounts

DECC UK greenhouse gas inventory

Notes
Whilst the research has not been subject to National Statistics assessment standards, in other respects the analysis has been conducted in line with the National Statistics Code of Practice.

Briefing: Defra publication of 2009 "UK Carbon Footprint" on Thursday 8th March

Background

The UK, for specific reasons, uses three different approaches to report greenhouse gas (GhG) emissions, and the UK Government publishes figures based on each approach. These approaches are:

- Emissions based on the UK greenhouse gas inventory, published by DECC – this is used as the basis for our reporting to the EC and UNFCCC, and forms the basis for reporting on progress towards our domestic and international emissions reduction targets. The inventory measures emissions on a territorial, or "production" basis, so only includes emissions which occur within the UK's borders.

- Emissions as measured by the UK Environmental Accounts, published by the Office for National Statistics (ONS) - these measure GhG emissions on what is referred to as a "residents" basis, which means that the figures represent emissions caused by UK residents and industry whether in the UK or abroad, but exclude emissions within the UK which can be attributed to overseas residents and businesses.

- "Embedded emissions", published by Defra – this measures emissions on a "consumption" basis, and takes account of the emissions embedded within the manufactured goods and services which the UK imports and exports.

The first two of these are prepared in accordance with an establish annual timetable, and are published in the UK as National Statistics. Both approaches use a methodology which estimates and reports greenhouse gas emissions based on a territorial approach, and both measure emissions on a "production" basis, in accordance with international guidance. In the case of the UNFCCC inventory approach, this looks at where the emissions are produced, and in the case of the ONS Environmental Accounts approach, this looks at who the emissions are produced by. This is in accordance with the rules agreed internationally for reporting to the UNFCCC, the Kyoto Protocol and the EU. All countries reporting emissions under these agreements do so in this way.

The third approach, however, also takes account of the emissions embedded within the manufactured goods and services which the UK imports and exports. The calculation of emissions on a "consumption" basis, reporting on emissions embedded in goods and services across international borders, and often referred to as "embedded emissions", involves many uncertainties. This approach would certainly not conform to the reporting requirements of the UNFCCC and the Kyoto Protocol, and would not provide a robust, internationally agreed basis for reporting.

The UK Government does undertake research into embedded emissions. Defra, who provide the lead in this area, have published a number of reports in recent years, and now have a plan in place to update this work on a more regular basis. They will be preparing estimates on an annual basis from now on, to be published as Official Statistics. The first of these publications will be on Thursday 8th March 2012.

As stated, these estimates do not conform to the reporting requirements of the UNFCCC, or provide an appropriate internationally agreeable basis for reporting.

Update to embedded emissions estimates

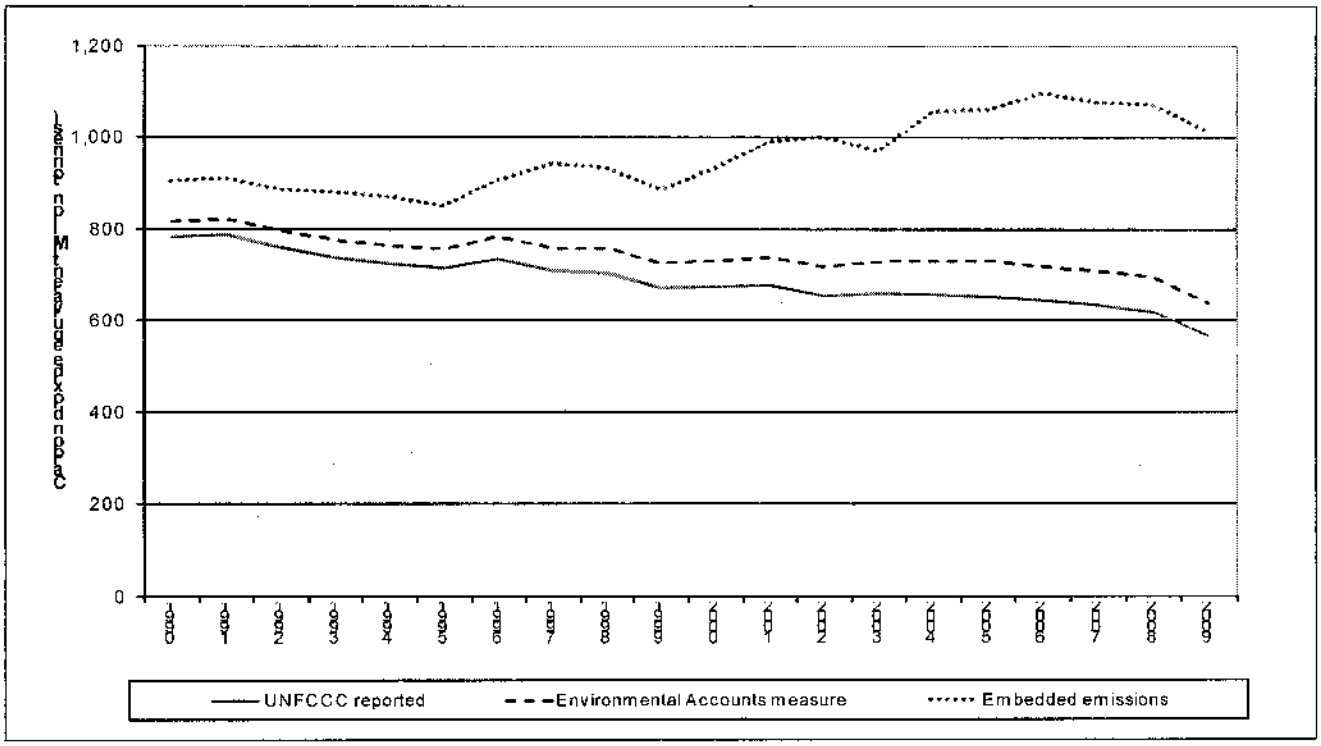
On Thursday 8th March 2012, Defra will be publishing 2009 embedded emissions estimates for both carbon dioxide and all greenhouse gases, although the latter will be labelled as "experimental", which indicates a greater level of uncertainty.

The headline results are:

- Between 2008 and 2009, embedded emissions of carbon dioxide fell by 9 per cent. Measured on this basis, emissions were 20 per cent higher in 2009 than in 1990.
- Over the period from 1990 to 2009, carbon dioxide emissions relating to imports doubled and emissions relating to the consumption of goods and services produced in the UK decreased by 10 per cent.
- Including non-CO_2 greenhouse gases, embedded emissions increased by 12 per cent between 1990 and 2009.

The chart below shows that for both the EA and the UNFCCC series there has been a steady decrease in total GhG Emissions since 1990, with the EA measure being higher than the UNFCCC measure for all years. Conversely, the embedded emissions measure has steadily increased over the period 1990 to 2009, by around 1% a year on average; this compares with a decrease of around 1.3% a year on average in the UNFCCC measure.

Comparison of UK total GHG Emission reporting: UNFCCC, Environmental Accounts and Embedded emissions,1990-2009



[redacted] 12(3) & 13(2)(a)(i).
UK Greenhouse Gas Statistics and Inventory team
DECC
7th March 2012