House of Commons

Energy and Climate Change Committee

Consumption-Based Emissions Reporting

Twelfth Report of Session 2010–12

Volume I

Volume I: Report, together with formal minutes, oral and written evidence

Additional written evidence is contained in Volume II, available on the Committee website at www.parliament.uk/ecc

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The Energy and Climate Change Committee

The Energy and Climate Change Committee is appointed by the House of Commons to examine the expenditure, administration, and policy of the Department of Energy and Climate Change and associated public bodies.

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The Reports and evidence of the Committee are published by The Stationery Office by Order of the House. All publications of the Committee (including press notices) are on the internet at www.parliament.uk/ecc. A list of Reports of the Committee in the present Parliament is at the back of this volume.

The Report of the Committee, the formal minutes relating to that report, oral evidence taken and some or all written evidence are available in a printed volume. Additional written evidence may be published on the internet only.

Committee staff

The current staff of the Committee are Sarah Hartwell-Naguib (Clerk), Dr Richard Benwell (Second Clerk), Dr Michael H. O'Brien (Committee Specialist), Jenny Bird (Committee Specialist), Katie Phelan (Senior Committee Assistant), Jonathan Olivier Wright (Committee Assistant), Julie Evans (Committee Support Assistant) and Nick Davies (Media Officer).

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Report

Terms of reference

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

- Is it possible to develop a robust methodology for measuring emissions on a consumption rather than territorial 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 territorial-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 territorial basis?
- What are the potential implications at the international level of the UK adopting a consumption- rather than territorial-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?

Summary

Greenhouse gas emissions can be accounted for in different ways. The UK's territorial emissions account for those that are physically emitted from chimneys and exhausts in the UK. Driving down the UK's territorial emissions has been a main policy driver for the Department of Energy and Climate Change (DECC).

The UK's consumption-based emissions take into account the emissions generated in another country during the manufacture of goods (or services) that are then exported and "consumed" in the UK. Data on the UK's consumption-based emissions is gathered by the Department for Environment, Food and Rural Affairs (Defra).

There is a clear divergence between the UK's territorial emissions and its consumption-based emissions. The UK's territorial emissions have been going down, while the UK's consumption-based emissions, overall, have been going up. The rate at which the UK's consumption-based emissions have increased have far offset any emissions savings from the decrease in territorial emissions. This means that the UK is contributing to a net increase in global emissions.

We conclude that there are two main reasons for the fall in the UK's territorial emissions, neither of which were a result of the Government's climate policy: the switch from coal to gas-fired electricity generation in the 1990s, which was driven by privatisation of the electricity sector; and the shift in manufacturing industries away from the UK in response to the pressures of globalised markets. The latter led to an increase in consumption-emissions as the UK imported goods it previously manufactured domestically. However, the rate at which the UK's consumption-based emissions are increasing is also indicative of increasing levels of consumption.

Local authorities around the UK have used assessments of their consumption-based emissions to explain to residents how their behaviour—in terms of what they "consume", whether that be an imported tomato or computer, or a flight—is connected to emissions of greenhouse gases. Consideration of consumption-based emissions has allowed these local authorities to generate new policy options targeting consumption behaviour.

DECC should explore the options for incorporating consumption-based emissions data into their policy making process, alongside data on territorial emissions. Considering both sets of data together will give a more complete picture of the UK's impact on the climate, and can be used to inform people of the impacts of their own behaviour on global emissions. The Government's independent climate adviser, the Committee on Climate Change, has told us that it would welcome the opportunity to explore the implications that consumption-based emissions accounting might have for the UK's carbon budgets. The Government should take them up on this offer.

If the Government wishes the UK to continue its lead on climate policy it must recognise the growth in the UK's consumption-based emissions. The Committee is not proposing that consumption-based emissions become the primary driver of policy at DECC. Neither is the Committee suggesting that consumption-based emissions should replace territorial

emissions as the basis for negotiations under the United Nations Framework Convention on Climate Change (UNFCCC). However, an acknowledgement that the UK's consumption is driving up emissions in other countries could increase the Government's leverage over those emissions. The UK has to address its consumption if it is to make an effective contribution to a global reduction of greenhouse gas emissions.

1 Introduction

1. The responsibility for greenhouse gas emissions associated with the manufacture of goods and services can be attributed in a number of different ways: according to the territory in which they were physically emitted; according to where the good or service produced was consumed; or according to the emissions a country is responsible for historically. This inquiry explored the difference between the emissions physically produced in the UK (territorial emissions), and those emissions embedded in the goods we have consumed (consumption emissions).

2. The main distinction between territorial-based and consumption-based measures is the treatment of emissions embodied in trade flows.[1] Consumption-based emissions reporting excludes emissions embodied in exports, but includes emissions embodied in imports.[2] Consumption emissions in the UK are published by Defra[3], while DECC base policy on—and report emissions performance on—a territorial basis.[4]

3. DECC's 2011 statistics stated that GHG emissions calculated on a territorial basis fell almost 28% between 1990–2009,[5] and declined at around 1% per year between 1990 and 2008.[6] The Committee acknowledges the Government's achievements in this area, and commends DECC for its commitment to ambitious carbon budgets and targets. However, these emission reductions and targets were based upon emissions that have occurred within the UK's borders, and did not take into account the emissions embedded in goods that were consumed in the UK but produced elsewhere.

1 Ev w27

2 Ev w27

3 Defra, *UK's Carbon Footprint—Carbon dioxide emissions relating to UK consumption*, www.defra.gov.uk/statistics/environment/green-economy/scptb01-ems/

4 DECC, *UK Greenhouse Gas Emissions*, www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/gg_emissions.aspx

5 DECC,*UK Climate Change Sustainable Development Indicator*, 31 March 2011, p 10

6 Ev 46

Different ways of calculating emissions

The UK Government uses three different approaches to the measurement of GHG emissions: territorial basis, production (or residents) basis, and consumption basis.

- **Territorial basis**: this inventory only measures emissions that occur within the UK's borders, and constitutes DECC's "existing [emissions] reporting regime".[1] They are used as the basis for the UK's reporting on emissions reduction targets to Europe and the UNFCCC.

- **Production or Residents basis**: these approaches measure emissions produced by UK residents and industry whether in the UK or abroad, but exclude emissions within the UK that can be attributed to overseas residents and businesses.[1] Emissions are measured in this way by UK Environmental Accounts and published by the Office for National Statistics. These will not be considered in this report.

- **Consumption basis**: this approach measures the emissions associated with goods and services consumed in the UK, taking account of the emissions embedded in UK imports and exports.[1] Defra regularly publishes data in this format.

This inquiry focused on the difference between territorial and consumption emissions

4. DECC's exclusive focus on UK territorial emissions drove the Committee to explore what conclusions could be drawn about energy and climate change if emissions calculated on a consumption basis were also taken into account. The Committee sought to explore the contribution that a consideration of consumption emissions could make to a more holistic understanding of the greenhouse gas emissions the UK was responsible for. This included inquiry into an increased role for data on consumption-based emissions in policy, and the merits of setting targets for consumption emissions alongside the UK's existing territorial carbon budgets. The Committee was not seeking to change the territorial basis on which international negotiations on a climate change agreement, and EU emissions targets, were made. However, we noted that Scottish climate change legislation already requires Scottish Ministers to lay before the Scottish Parliament a report that must "set out the emission of greenhouse gases (whether in Scotland or elsewhere) which are produced by or otherwise associated with the consumption and use of goods and services in Scotland during that year".[7]

5. As this report details, the evidence suggests that consideration of consumption-based emissions is complementary to the territorial approach. There is also evidence that the Government, or more specifically DECC, may be complacent about what it needs to do if it is basing energy and climate change policy on an incomplete picture of the UK's emissions. As the University of Leeds Professor John Barrett explained to us, the UK "measure[s] [emissions] from a territorial perspective so the emission has to have actually occurred [in the UK], and the thing we know about climate change is it doesn't actually matter where the tonne occurs".[8] The Committee agrees with WWF-UK's Dr Keith Allot who added, "I think we have a huge responsibility in the UK to show leadership, however you measure the metrics of the UK's footprint".[9]

7 SP Act Climate Change (Scotland) 2009

8 Q 6

9 Q 61

2 Considering consumption-based emissions

6. The Committee received evidence that DECC's position of relying solely on one method of calculating emissions—the territorial approach—had severe shortcomings in terms of UK energy and climate change policy. WWF-UK's Head of Climate Change, Dr Keith Allott, argued that consideration of consumption-based emissions alongside the established territorial approach "gives additional insights, guards against perverse consequences, and can help to improve policy formulation".[10] Academics from the universities of Leeds, Manchester and York all agreed that there was a case for publishing consumption and territorial emissions together.[11]

7. This view was shared amongst representatives of energy-intensive industries and businesses. The Director of UK Steel, Ian Rodgers, told us that "[the territorial approach alone] gives a false view of the UK's total contribution to climate change". [12] Jeremy Nicholson—Director of the Energy Intensive Users Group (EIUG), Fergus McReynolds—Senior Climate and Policy Adviser at EEF (the manufacturers' organisation), and Dr Richard Leese of the Minerals Products Association all agreed that relying solely on territorial emissions provided an "incomplete picture".[13] The EIUG's Jeremy Nicholson added that this picture was "an inaccurate one, which is unhelpful for policy makers and indeed for the industry".[14]

8. The Carbon Trust had undertaken detailed analysis of the UK's consumption-based greenhouse gas emissions. Their Associate Director, Eric Lounsbury, explained to the Committee the problem with DECC's reliance on territorial emissions as an indicator of the success of the UK's climate policies:

> If we have tackled one half of the problem, which is producing the stuff that we produce here more carbon-efficiently, that is a huge part of the battle, but we should not forget about the other piece of it [that we are also consuming more goods and services causing emission outside the UK].[15]

9. The UK's consumption-based emissions are published by Defra, and take into account the emissions embedded in the UK's imports and exports.[16] Defra's Parliamentary Under-Secretary of State—Lord Taylor of Holbeach CBE—told us that, "Taken together, territorial and consumption emissions provide a more complete picture of the carbon emissions associated with the activities of UK citizens and businesses." [17]

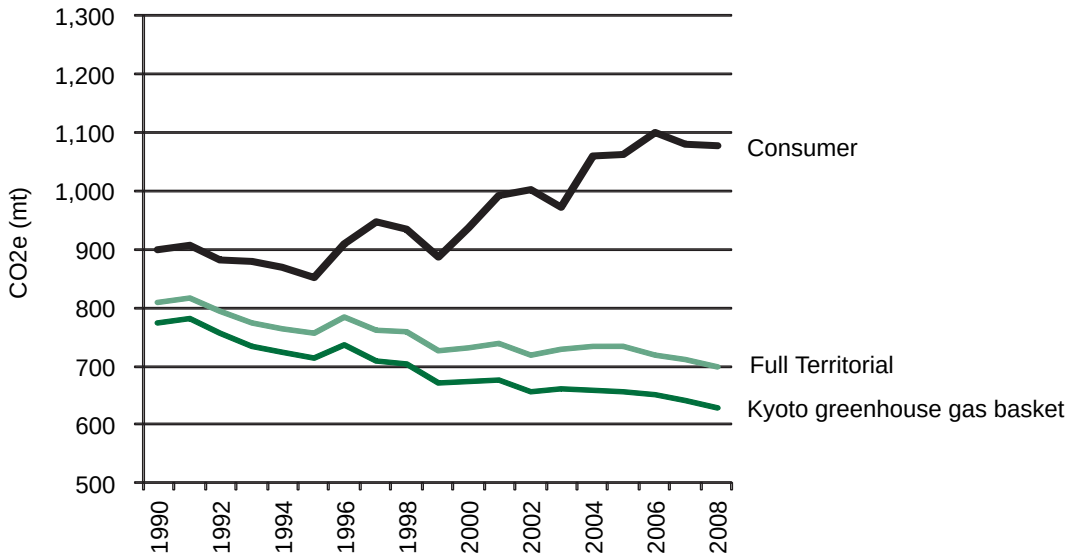
10 Q 74
11 Q 3
12 Q35
13 Q 36
14 Q 36
15 Q 76
16 Ev 46
17 Q 127

Emissions trends

10. Analysis by the Sustainable Consumption Institute has shown that UK greenhouse gas emissions measured on a consumption basis are consistently higher than those on a territorial basis, and the gap is widening as shown in Figure 1.[18] This research was funded by Defra, and is being continued on at Leeds University for years 2009–2014. The UK Energy Research Centre (UKERC) stated that while territorial-based emissions showed a 19% reduction between 1990 and 2008, consumption based emissions showed a 20% increase.[19]

11. Analysis by the Carbon Trust has shown that in 2004 the UK's consumption emissions were 34% greater than the "usually reported" territorial emissions, as shown in Figure 2.[20] Given this disparity, WWF-UK thought that it was not "credible for the UK to claim progress towards a sustainable, green economy" unless the impacts of both UK territorial and consumption emissions were addressed together.[21]

Figure 1—Comparison of UK consumption-based GHG emissions with territorial emissions[22]



Source: UK Energy Research Centre (UKERC)

12. Oxford University's Professor of Energy Policy, Dieter Helm, and others examined the UK's climate record up to 2007, in the report, "Too Good to be true?".[23] They determined that one of the main reasons for the UK's territorial emissions falling was the "dash-for-gas" since 1990.[24] Helm's report noted that these emissions savings were "real" in that they

18 Ev 81

19 Ev w30

20 Ev 70

21 Ev 63

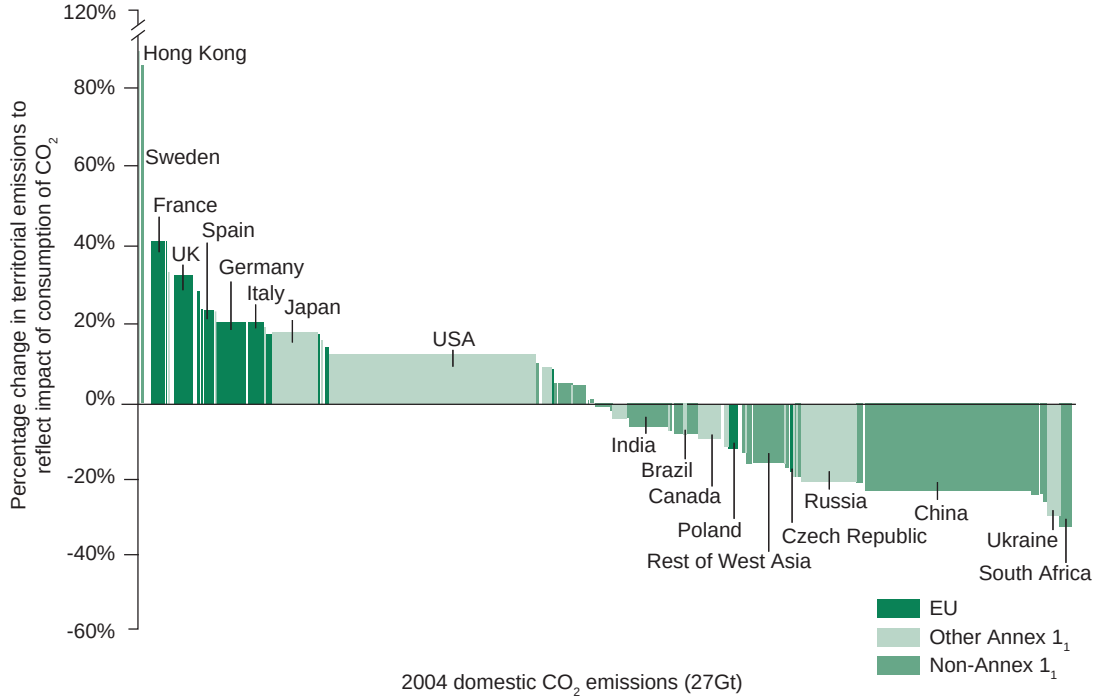
22 Ev w30

23 Helm, D.R, et al.,Too Good To be True? The UK's Climate Change Record, December 2007

24 The dash-for-gas refers to the significant shift away from coal by the newly privatised electricity companies in the UK towards lower-carbon gas-fired electricity generation during the 1990s

were a genuine GHG reduction caused by the displacement of coal-fired electricity generation by gas.[25] WWF-UK's Dr Keith Allot agreed that the UK's move from coal to increasing amounts of power generated by gas had played a part in driving down the UK's territorial emissions, but noted that this transition "was not really driven by climate change policy".[26]

Figure 2—the impact of a consumption-based view on emissions by country.[27]



1 Annex 1 to UNFCC.
Note 1: Includes CO_2 emissions from production, process, transport and household sources only (27Gt in 2004): excludes non-CO_2 emissions due to land-use-change.
Note 2: Based on an MRIO (multi-region input/output) model allocating emissions to regions of consumption.
Source: Carbon Trust Analysis; CICERO/SEI/CMU GTAP7 MRIO Model (2004).

Source: The Carbon Trust

13. The UK Energy Research Centre (UKERC) observed that the difference in the UK between the rate at which consumption-based emissions rose and the rate at which territorial emissions fell was the largest amongst the top ten emitters in the world—a 23% difference in 2008 compared to 1990, compared to only 8% for the US (see Figure 3).[28] Figure 3 shows that consumption emissions in the USA and UK since 1990 have grown faster than their territorial emissions have fallen. This is because the UK and USA, and by 2006 Canada, were increasingly consuming more emissions embedded in imports than they were reducing their territorial emissions. Meanwhile, China and India were increasingly exporting more of their emissions to be consumed in other countries.

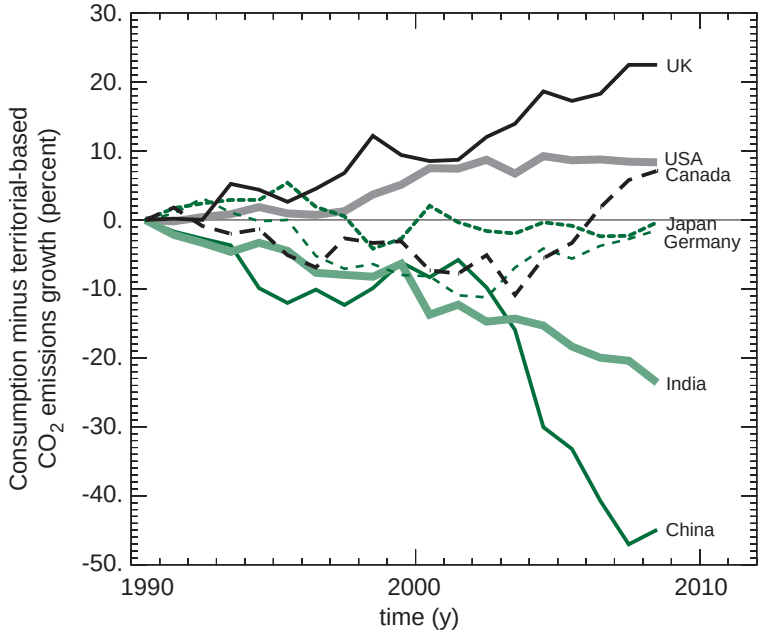
25 Helm, D.R, et al.,Too Good To be True? The UK's Climate Change Record, December 2007, p 11

26 Q 90

27 Ev 70

28 Ev w30

Figure 3—Growth difference between consumption-based and territorial-based CO2 emissions from 1990 for China, India, and industrial nationals in the top ten emitters.[29]



Source: UK Energy Research Centre (UKERC)

14. When we raised this with Ministers, the DECC Minister Greg Barker told us, "If we were to see a divergence [between territorial and consumption emissions] obviously we want to take that into account" [30]

15. **There is a clear divergence between the UK's territorial emissions and its consumption-based emissions. Furthermore, the rate at which the UK's territorial emissions have fallen has been outpaced by the growth in its consumption-emissions. We are concerned that the UK could be meeting its domestic carbon budgets at the expense of the global carbon budget.**

Carbon Leakage

16. As the UK's industrial emissions fell, the growth in the UK's consumption emissions indicated either that industry (and therefore the associated emissions) was leaving the UK, or that the UK was consuming more and more (or a combination of the two). The term carbon leakage is used to refer to the relocation of an industry to avoid the costs of cutting greenhouse gas emissions that have been imposed in a particular region (for example, the EU-Emissions Trading System). In the new region, the industry continues to emit greenhouse gases without any penalty, and exports their products back into the original region to be "consumed". Carbon is said to be "embedded" in these products. Carbon leakage can also refer to the associated "investment leakage", where companies do not invest in a country in the first place owing to the carbon costs that are imposed.

29 Ev w30

30 Q 185

17. Ultimately, carbon leakage leads to an increase in the amount of greenhouse gases that are emitted to the atmosphere, despite efforts to reduce them. UKERC defined two distinct categories of carbon leakage: weak and strong:

- strong carbon leakage refers to an increase in global emissions owing specifically to climate policies; while
- weak carbon leakage refers to an increase in global emissions owing to increased consumption, rather than any specific government policy.[31]

18. However, there can be many reasons why a business may choose to relocate to another country, or invest money in one region over another. The Aldersgate Group (a coalition of environment agencies, NGOs, think tanks and industry) noted that "there is no evidence of industry relocating from the UK solely as a result of climate change policy", in other words, no evidence of what UKERC described as "strong carbon leakage".[32] The Public Interest Research Centre's Guy Shrubsole told us that the disparity between UK consumption and territorial emissions "is almost entirely down, so far, to weak carbon leakage—that is increasing consumption". [33]

19. The Aldersgate Group explained that, while carbon costs could be significant for a limited number of industries, "often they are exaggerated and the potential economic benefits [of reducing emissions] ignored".[32] UKERC argued that the current carbon price is too low to be a factor in a company's decision on where it manufactures its goods.[34]WWF-UK believed claims that business is being driven overseas by carbon regulation (including by the EU-ETS) had been shown to be "greatly exaggerated or even groundless" although it was sometimes cited by industry as the reason for their relocation.[35] For example, Rio Tinto blamed the closure of their Alcan aluminium smelter in Northumberland on "energy costs [that] are increasing significantly, due largely to emerging [climate] legislation".[36] In contrast, WWF-UK believed that the "dynamics of globalisation" were the main driver of where companies located their manufacturing facilities, rather than "environmental, climate or social policies implemented in the UK".[37]

20. Professor Dieter Helm explained that the "de-industrialisation" (a move away from manufacturing industries) that the UK has experienced since 1990—which would have contributed to a fall in territorial emissions—"may have not delivered a real saving at the global level" as it led to increased emissions from countries with greater greenhouse gas intensities in their manufacturing sectors.[38] The University of Leeds' Professor Barrett argued that greater emphasis on a system of consumption-based accounting could have the

31 Ev w30

32 Ev 95

33 Q 91

34 Ev w30

35 Ev 63

36 "Energy costs blamed as Rio axes smelter", *Financial Times*, 16 November 2011

37 Ev 63

38 Helm, D.R, et al.,Too Good To be True? The UK's Climate Change Record, December 2007, p 11

positive effect of highlighting the efficiency of UK industry in terms of lower emissions intensity.[39]

21. The Director of UK Steel, Ian Rodgers, explained that the drive to decarbonise the power-generating sector had led to higher electricity prices in Europe.[40] However, Mr Rodgers added that the steel sector had "free [emissions] allowances under the EU-ETS. So it would be implausible to argue that current policies […] resulted in [strong] carbon leakage".[41] The Minerals Products Association's Dr Richard Lease added that the UK's climate policy was not the main concern when a company made investment decisions, but it was "certainly an influencing factor".[42] The Energy Intensive Users' Group's Director, Jeremy Nicholson, believed the UK's climate policies placed a large cumulative burden on energy intensive industries, but noted that, "If the rest of the world will sign up to this [emissions reduction] agenda there would be no competitiveness issue arising from this".[43]

22. **We conclude that the fall in the UK's territorial emissions was not entirely or even mostly a consequence of the Government's climate policy. Rather, it was mainly a result of the switch from coal to gas-fired electricity generation that began in the early 1990s, and the shift in manufacturing industries away from the UK in response to the pressures of globalised markets. At the same time, the emissions embedded in the UK's imported goods have increased. To complement the UK's existing territorial carbon budgets, we recommend that DECC explore the options for setting emissions targets on a consumption-basis at the national level, and to set out the steps it will take to do this when responding to the Committee's report.**

Compensation for energy intensive companies

23. In his November 2011 Autumn Statement, the Chancellor announced measures intended to "reduce the impact of policy on the costs of electricity for the most electricity-intensive industries".[44] The Treasury's aim was to minimise the "carbon leakage which might happen if investment relocated abroad".[44] Beginning in 2013, the Government plans to introduce compensation measures for electricity-intensive industries that will be worth around £250 million over the Spending Review period 2011–12 to 2014–15. This was despite the fact that we had been told earlier that day that it would be "implausible" to argue that the UK's policies had resulted in carbon leakage.[45]

24. WWF-UK's Dr Keith Allot told us that if companies were receiving compensation for the impacts of the UK's climate policies:

> [...] there should be something in return—some clear commitments—from the sectors benefiting [...] in terms of increased environmental benefits from energy

39 Q 23

40 Q 36

41 Q 37

42 Q 37

43 Q 40

44 HMT, *Autumn Statement 2011*, Cm 8231, November 2011, p 36

45 Q 36

> efficiency improvement […] Otherwise, we are in danger of giving something for nothing for generalised industry lobbying. […] The reason why Europe is struggling to show the [climate] leadership that we need […] is substantially because of lobbying by the heavy manufacturing industry.[46]

25. We asked the Minister whether the companies benefiting from this compensation would be obliged to make commitments to increased energy efficiency, to which he responded "I expect so".[47]

26. **We received no evidence that electricity-intensive industry investment decisions were being driven by the Government's climate policy, and therefore no evidence that the compensation for electricity-intensive industries announced by the Chancellor in his 2011 Autumn Statement is necessary. If electricity-intensive industries are to be "compensated" for increases in the cost of electricity—which are being driven primarily by volatility in the fossil fuel market, not climate policy—we recommend that the Government requires the beneficiaries to make clear commitments to increased energy efficiency. In its response to our Report, the Government must set out clearly what these commitments will be.**

46 Qq 92–93

47 Q 138

3 Policy applications

27. DECC stated that owing to the assumptions required to estimate consumption-based emissions, they have "only limited use in policy evaluation".[48] In order to explore the utility of consumption-based emissions reporting, we took evidence from three regional authorities and organisations which had assessed their emissions on a consumptions basis, and subsequently adopted consumption-based emission targets and policies: the Lake District National Park Authority, West Sussex County Council, and Manchester City Council. These three regional authorities commissioned Small World Consulting to undertake the assessment of their consumption emissions.

West Sussex County Council

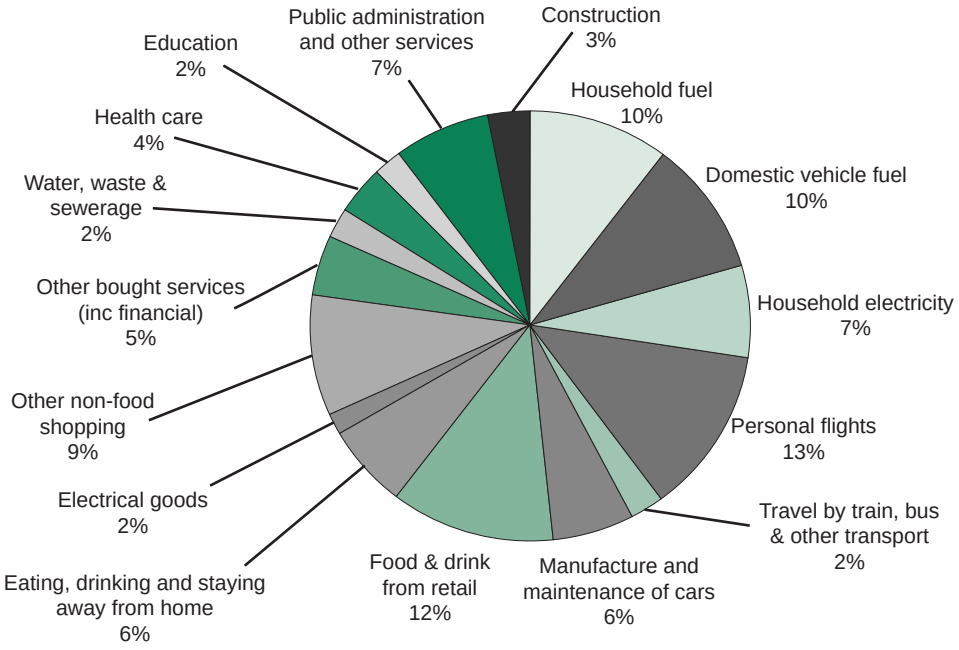
28. West Sussex County Council believed that consumption-based emissions reporting was appropriate for "place-based approaches" to cutting emissions that focused on an individual's carbon impact, and so could enable communities to "understand and take responsibility" for reducing their emissions through changes to their lifestyles and consumption.[49] The Council believed that using consumption data provided a "clearer indication of the behaviour changes that will be required" to drive down emissions. [50]

29. Figure 4 shows the consumption-based carbon footprint for West Sussex residents broken down into sixteen specific segments. In comparison, information at the county-level provided by DECC was far coarser and less informative, being broken down into road transport (32%), domestic (34%), and industrial and commercial (34%).[51] West Sussex argued that the consumption-based approach was easier to understand because it provides a "much richer and more action-orientated breakdown [of emissions]" for local governments than territorial metrics can [52] West Sussex County Council added that a consumption approach provided a more "comprehensive representation of the source of emissions" and was therefore better for informing policies to limit climate change.[53]

30. By linking peoples' carbon footprint to their behaviours, the West Sussex County Council found consumption-based emissions reporting metrics "useful for policy assessment and evaluation". [54] The Council's Principal Adviser, Dr Wendy Benson, told us that people "really do find [a consumption-based carbon footprint] very simple and easy to understand".[55]

48 Ev 46
49 Ev 58
50 Ev 58
51 Ev 58
52 Ev 58
53 Ev 58
54 Ev 58
55 Q 111

Figure 4—Breakdown of the carbon footprint of West Sussex residents by source[56]



Source: West Sussex County Council

Lake District

31. The Lake District National Park Authority (LDNPA) manages the Lake District in partnership with a mixture of public, private, and voluntary-sector groups (including district and borough councils, business associations, the Environment Agency, and Government Office Northwest).[57]

32. The LDNPA found that consumption-based emissions reporting led to a comprehensive "picture of emissions" as it included emissions from imports and the supply chain.[58] The LDNPA believed that a "carbon budget framework" based on consumption information could be explained in a similar way to a financial budget, as it could give an indication of how much carbon could be "spent" and what it could be spent on.[59] It added that such an approach was particularly useful for local government as they have more responsibility for—and opportunity to influence—"indirect emissions [from] behaviours and lifestyles" than they do large sources of direct emissions such as power plants and large industry.[60] However, the LDNPA acknowledged that consumption measures were more complex and had greater uncertainties.[57]

56 Ev 58

57 Ev 55

58 Ev 55

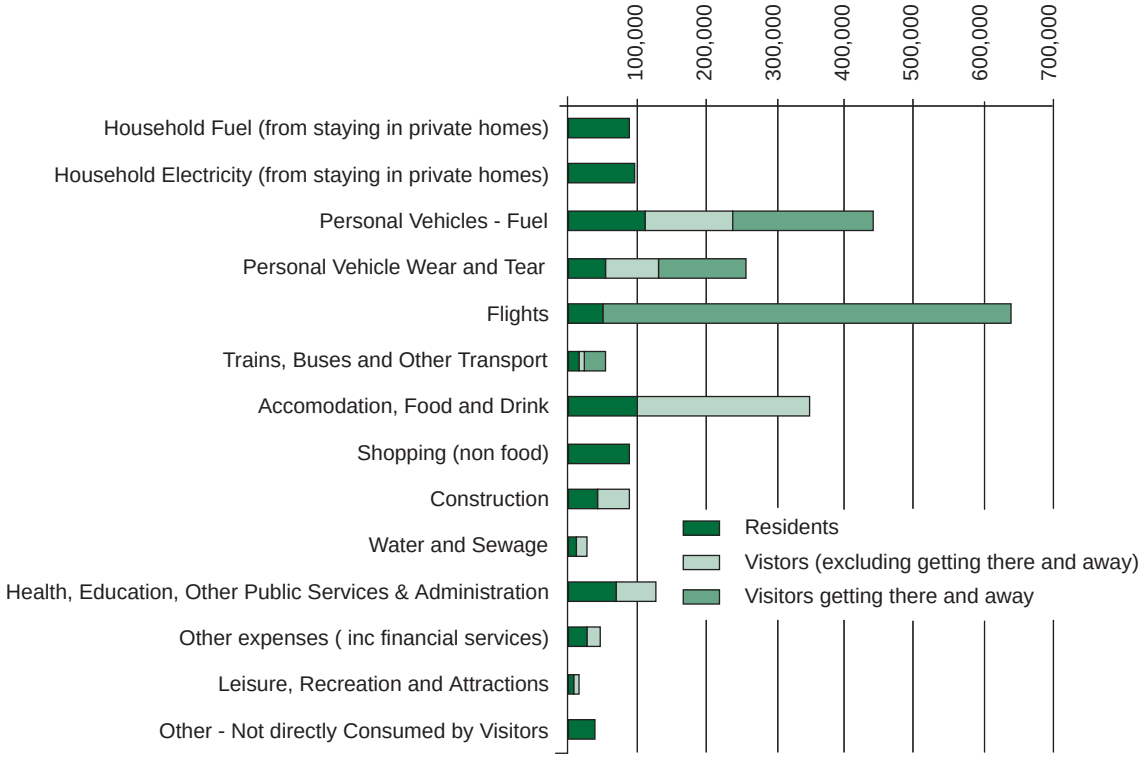
59 Ev 55

60 Ev 55

33. The LDNPA believed that the consumption-based information in Figure 5 provided better guidance for mitigation strategies than a territorial based analysis. For example:

- the top two bars show that household energy use was not a major source of emissions (which, the LDNPA believed, would not be the case if measured using a territorial-based approach);
- transport, particularly aviation (mainly visitors getting there and away), has a very significant impact. The LDNPA believed that this implied there should be more efforts to encourage UK holidaymakers to holiday at home; and
- the significance of food and drink led to the promotion of locally sourced, seasonal food.[61]

Figure 5—the carbon footprint of the Lake District National Park measure on a consumption basis (tonnes of CO2)[62]



Source: Lake District National Park Authority

34. Richard Leafe, Chief Executive of the Lake District National Park Authority, told us that he was "surprised to find the proportion [of emissions on a consumption-basis] from foreign flights by visitors to the Lake District was […] a third of the total budget—yet of our 16 million visitors a year, only 10% come from abroad". [63] Mr Leafe observed that, with aviation taken out, "transport and accommodation of the visitors in the Lake District […] become very significant […] we have used those figures to support a bid that we made

61 Ev 55

62 Ev 55

63 Q 100

successfully to the Department for Transport's sustainable transport fund for £5 million of investment in sustainable transport".[64]

Manchester

35. Manchester City Council commissioned a consumption-based assessment of the emissions in the ten local authority areas of Great Manchester. Emissions associated with aviation can be challenging to categorise, as they could be assigned to the departure or destination country, an airline's home country, or the passenger. If emissions were attributed to a UK departure airport, that would lead to an increase in the UK's territorial emissions. If the emissions were attributed to a destination airport outside of the UK, that would not affect the UK's territorial emissions, but would increase the territorial emissions of the destination country. If the aviation emissions were attributed to the passenger, that would increase the consumption-emissions of the passenger's native country. Manchester City Council explained that their consumption-based assessment enabled emissions from aviation to be assigned to consumers purchasing that activity, instead of the emissions associated with airports being assigned to local authorities in which they reside.[65] They believed that this was a "fairer" way of assigning aviation emissions that serve a much larger region than that in which they are situated.[66]

36. Greater Manchester's consumption-based emissions study found that a large proportion of its carbon footprint comes from food and waste, with "up to a third of food purchased by households being sent to landfill".[67] The City Council believed that through "policy intervention and education" they could help reduce waste (and hence emissions) as well as "help the poorest in society".[68] Richard Sharland, the Council's Head of Environment Strategy, told us that emissions associated with food were virtually negligible in a territorial assessment, but "Consumption figures turn that on its head. So we are setting up a panel, and they are going to look at how we—that is not just local authorities, but also the NHS, universities and others—start to take that forward".[69]

Regional to national

37. West Sussex County Council thought that consumption-based metrics highlighted the need for changes in consumption patterns and lifestyle, and argued that the case would be more powerful still if it were part of a "nation-wide approach".[70] The LDNPA also suggested that it would be useful to have "national-level consumption-based emissions accounting" as well as "clear protocols" that would enable comparisons.[71] Manchester City Council believed that it was feasible to create consumption-based emissions targets on a

64 Q 105
65 Ev 73
66 Ev 73
67 Ev 73
68 Ev 73
69 Q 107
70 Ev 58
71 Ev 55

national level, adding that it could "help focus policy intervention in a number of areas" and that it could "give a much clearer indication of the UK's impact on world-wide emissions".[72] Professor Barrett suggested "if organisations are starting to think in [consumption] terms [at the regional level], then we need to be thinking about that at a national level as well".[73]

38. We asked the Minister whether he thought that the experiences of the local authorities showed that consumption-based emission reporting was capable of generating new policy options at the national level that would not have been evident if only territorial emissions were considered. He responded: "Yes, I am sure […] the more information you have and the more localised and more specific it is to the people who are affected, the more helpful it is."[74]

39. **It is evident that the consideration of consumption-based emissions encourages the development of new policy options, as revealed by the experiences of regional authorities that have adopted a consumption-based approach to emissions accounting. We recommend that DECC explore the options for incorporating consumption-based emissions data into the policy making process, and set out the steps it will take when responding to the Committee's report.**

Defra's latest consumption emissions data

40. On 8 March 2012 Defra published a statistical release on the "UK's Carbon Footprint 1990–2009".[75] These figures showed that while the UK's carbon dioxide footprint (consumption emissions) fell 9 % between 2008 and 2009, this was against the backdrop of a steady rise of 35% between 1995 and 2005, leaving the footprint in 2009 "some 20 per cent higher than it was in 1990".[76] Defra's analysis revealed that between 1990 and 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.[77]

41. Defra's findings also indicated that the UK's "total carbon footprint", which included greenhouse gases other than carbon dioxide, had increased by 12% between 1990 and 2009.[78]

42. We asked Defra's Parliamentary Under-Secretary of State, Lord Taylor of Holbeach CBE, about these latest figures prior to their publication. Although he had not seen them, he expected the new data to show a reduction in the UK's consumption-based emissions over the period 2008-09.[79] We inquired whether this fall in consumption-based emissions

72 Ev 73

73 Q 23

74 Q 206

75 Defra, UK's Carbon Footprint 1990–2009, Statistical Release, 8 March 2012

76 Defra, UK's Carbon Footprint 1990–2009, Statistical Release, 8 March 2012, p 1

77 Defra, UK's Carbon Footprint 1990–2009, Statistical Release, 8 March 2012, p 1

78 Defra, UK's Carbon Footprint 1990–2009, Statistical Release, 8 March 2012, p 1

79 Q 167

was more likely to be a result of the recession rather than the UK's climate policies. Lord Taylor did not dissent from this assertion.[80]

43. **The 9% fall in the UK's consumption-based emissions between 2008 and 2009 was primarily a result of the economic downturn, rather than of the UK's policies to reduce greenhouse gas emissions. Discounting the effects of the recession, the UK's consumption-based emissions have been on an upward trend since 1990.**

Data availability and robustness

44. DECC noted that due to the lack of robustness and transparency in data on international trade, all consumption figures should be "treated as estimates and used with caution".[81] This was because of the difficulty in accounting for all the emissions embedded in the supply chain of a particular product, including its manufacture and the emissions embedded in its constituent components. UKERC explained that consumption-based estimates of emissions will have a larger degree of uncertainty due to the incorporation of more input data compared to territorial estimates.[82] However, the Sustainable Consumption Institute (SCI) believed that these uncertainties were "inherent" to the consumption-based emissions approach, and should not be thought of as a "challenge to overcome".[83] Professor Barrett of the University of Leeds argued that while manufacturing sectors can "show considerable uncertainty […] we have considerable certainty with the overall [consumption-based emissions] figures". [84] The uncertainties inherent in consumption emissions data are not as severe as claimed; they do not undermine the usefulness of this approach when making policy.

45. Lord Taylor described consumption-based emissions reporting as "better than nothing but [...] not perfect".[85] However, Michael Berners-Lee—of Small World Consulting, who developed consumption-based emission reports for regional authorities around the UK—thought that although "there is a lot [of uncertainty] you can still create a good enough model that allows you […] to get a much better handle on the impacts and issues you should be managing". [86]

46. The University of Surrey believed the UK should be "ambitious" in helping to develop international datasets for use in consumption accounting.[87] UKERC believed that a "process of harmonisation" in emissions reporting practices could greatly reduce the need for data manipulation and, therefore, uncertainties.[88] We put this to the Minister, and he told us that he "would very much welcome an improvement in the reporting of

80 Qq 149, 167

81 Ev 46

82 Ev w30

83 Ev 81

84 Q 7

85 Q 165

86 Q 98

87 Ev w21

88 Ev w30

consumption-based emissions and greater transparency and greater up to date [data]".[89] Tata Steel suggested that one solution to the lack of data may be to start with a default, possibly worst-case, assumption, which could be improved at a later point.[90] This would encourage companies to develop more robust and transparent datasets. UK Steel's Director Ian Rodgers told us that:

47. […] the sort of data that is [currently] going down the supply chain […] is not really driving purchasing decisions as to which source of steel to buy [based on its embedded emissions] but might be driving purchasing decisions or design decisions in terms of which material to use in a product […] You would need a lot more data on an individual company's carbon efficiency to identify carbon hotspots in the supply chain [than is currently available].[91]

48. **DECC's argument that there is insufficient, robust data on embedded emissions to make policy, overlooks the extent to which consumption-based emissions can be used to connect an individual's consumption to their impact on the climate. We are not convinced that consumption based emissions data are too complex or time consuming to gather, as Defra's work in this area shows. The experiences of regional authorities has demonstrated that there is sufficiently robust data available to encourage the development of new policy options and identify carbon-intensive behaviours that are overlooked by concentrating on territorial emissions alone. We recommend that in this case, the Government does not make the perfect the enemy of the good. In its response to the Committee's report, the Government should avoid using the uncertainties inherent to consumption-based emissions data as an excuse for inaction.**

Challenges and perverse consequences

49. The Minister told us that: "There are a whole number of challenges that don't lend themselves to simplistic analysis by one single data set".[92] Many witnesses agreed, and thought that DECC should consider consumption and territorial approaches in parallel when making policy on energy and climate change. The University of Surrey explained that consumption accounting enabled an assessment of the emissions attributable to UK lifestyles and that by considering the consumption data in parallel with territorial emissions the UK would be adopting "a more equitable form of sharing responsibility for GHG emissions".[93] Manchester City Council believed that this parallel approach would also "give a much clearer indication of the UK's impact on world-wide emissions".[94] UKERC thought that consideration of consumption alongside territorial emissions data could lead to policies that encouraged the reduction of emissions at least cost.[95] The Sustainable Consumption Institute thought that an increased focus by DECC on consumption-based emissions could "increase the share of global emissions over which the

89 Q 186

90 Ev w6

91 Qq 57,59

92 Q 185

93 Ev w21

94 Ev 73

95 Ev w30

UK has influence, and therefore broaden its reach".[96] Dr Alice Bows of the University of Manchester noted, "if you take a systems view then one indicator is only going to give you half the picture".[97]

50. The Minister told us that while he thought "consumption-based carbon emissions are interesting […] they are also potentially a huge distraction […] they could have perverse consequences" such as undermining the international climate negotiations, which are based on territorial emissions.[98] In contrast, many witnesses highlighted the perverse consequences caused by a lack of emphasis on consumption-based emissions. Small World Consulting, developers of consumption-based greenhouse gas metrics, argued under-emphasis on consumption emissions led to a "seriously distorted perspective" and was a "perverse incentive for harmful policy measures".[99] They added that—used solely—territorial-based metrics could lead to policies that provided "an increasingly perverse" incentive to off-shore our emissions".[100] The Construction Products Association also believed that the UK's current emphasis on territorial-based emissions reporting could "perversely result in efficient low carbon manufacturing in the UK being forced overseas".[101]

51. The Universities of Stirling, Strathclyde, and Cardiff stressed that a focus solely on either territorial or consumption-based accounting could result in perverse incentives.[102] For example, while territorial-based measures may encourage "importing of 'dirty' goods and services", consumption-based accounting may "reduce incentives to 'clean up' domestic technology" where manufacture primarily serves export demands.[102]

52. We drew the Ministers' attention to the evidence presented to us. DECC's Minister told us that "if there was a big counter-story emerging from [what territorial emissions reveal] we would worry about it, but [consumption-based emissions are] not the primary driver of policy at DECC, which remains territorial emissions".[103] He added that, overall, he believed territorial emissions were a better indicator of the UK's performance on reducing global emissions.[104]

53. **We conclude that that the UK's energy and climate change policy challenges do not lend themselves to simplistic analysis by a single data set. The growth in the UK's consumption-emissions does provide a counter-story to the one suggested by territorial emissions and we recommend that the Minister give more detailed consideration to the evidence gathered in our inquiry and presented here. We recommend that DECC no longer rely exclusively on territorial emissions as their primary policy driver. DECC's belief that territorial emissions are a better indicator of the UK's impact on the global**

96 Ev 81

97 Q 5

98 Q 125

99 Ev 52

100 Ev 52

101 Ev w48

102 Ev w27

103 Q 130

104 Q 129

climate is shortsighted and neglects the global impact of our consumption. Basing policy decisions on a single method of accounting for emissions is likely to have unintended consequences. In order to avoid perverse incentives, we recommend that DECC increase the extent to which they consider consumption-based emissions when making policy.

Committee on Climate Change

54. The Committee on Climate Change (CCC) was established as an independent body under the Climate Change Act 2008 to advise the Government and devolved administrations on emissions targets, and to report to Parliament on progress made in reducing greenhouse gas emissions. Lord Adair Turner, Chair of the Committee, wrote to us that calculating emissions solely on a territorial basis "carries the risk that emissions for which a country is responsible are underestimated".[105] Lord Turner said that it was important for the CCC to:

> […] establish through evidence and analysis any implications that a consumption based approach to emissions accounting […] might have for the design of carbon budgets and supporting policies.[106]

55. The Committee on Climate Change stated that it would therefore "welcome a commission from the Government to undertake a review of consumption emissions" and indicated that this was a project they could undertake after publishing their fourth progress report on the carbon budget in June this year.[107]

56. **The Committee on Climate Change has stated that it would welcome the opportunity to explore the implications that consumption-based emissions accounting may have for the UK's carbon budgets, and that they could undertake such work after they publish their fourth progress report on the carbon budget in June 2012. We recommend that the Government commission the Committee on Climate Change to undertake this work.**

105 Ev w62

106 Ev w62

107 Ev w62

4 The Government's Position

57. DECC have tended to emphasise, and base policy on, emissions calculated on a territorial basis. As discussed in Chapter 2, while such territorial emissions have been falling since 1990, the rate at which the UK's consumption has increased has outstripped any benefit in terms of global emissions. Defra are responsible for gathering and publishing the UK's data on consumption-based emissions. Defra's Parliamentary Under-Secretary, Lord Taylor of Holbeach CBE, told us that:

> Total consumption emissions in 2008 were over 1,000 million tonnes of CO_2, while territorial emissions amounted to 620 million tonnes of CO_2. Consumption emissions, therefore, added an extra 75% impact to the territorial emissions level. While territorial emissions have fallen by 20% since 1990, consumption emissions have risen by the same level.[108]

58. Professor Barrett of the University of Leeds observed that "DECC have resisted showing these [consumption] emissions [while] Defra have been quite progressive in acknowledging that these emissions exist".[109] The Director of the Public Interest Research Centre added that "There is a large number of people in DEFRA looking [at green consumption] Unfortunately, I do not think there is sufficient joined-up government between DEFRA and DECC on this as yet".[110] Even though Defra publishes consumption-based emissions data, DECC has stated that it believed the consumption-based approach to managing emissions is "not currently practicable".[111]

59. DECC ministers have often stated that the UK is only responsible for 2% of global emissions.[112] We asked the Minister whether he thought this statement was true, to which he responded: "Based on territorial emissions it is".[113] However, this caveat is not routinely made by DECC in public pronouncements. Professor Barrett told us that while the 2% statement is "is accurate from a territorial perspective […] it does not take into account the fact that we have other emissions associated outside the UK to satisfy UK consumption".[114] In a 2006 report the Sustainable Development Commission (up until April 2011, the Government's independent adviser on sustainable development) noted, "if everyone in the world consumed at the average rate we do in the UK, we would need three planets".[115] The University of Manchester's Dr Alice Bows thought the claim that the UK was only responsible for only 2% of global emissions was "irresponsible" when considering the problem of global climate change.[116]

108 Q 127

109 Q 2

110 Q 86

111 Ev 46

112 For example: DECC, *Green growth real and happening in the south east*, Press Notice: 11/087_SE, 26 October 2011

113 Q 201

114 Q 21

115 Sustainable Development Commission, *I will if you will—Towards Sustainable Consumption,* p 4

116 Q 20

60. **DECC's claim that the UK is only responsible for 2% of global emissions—without acknowledgement of the caveat that this is on a territorial basis and does not take account of the emissions embedded in the goods we import—is unhelpful in terms of understanding our impact on the global climate. We recommend that when the Government refers to the proportion of global emissions that the UK is responsible for it should always state on what basis that proportion has been determined: territorial or consumption.**

61. A joint submission to us from BIS, DECC and Defra argued that, since both consumers and producers benefit from a product, the responsibility for the emissions generated in the product's manufacture "does not necessarily reside solely with the producer", [117] and added that:

> [...] 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.[118]

62. Dr Rupert Read of the University of East Anglia stated that the coalition had a heavy responsibility to "be honest in reporting Britain's record on emissions, which in reality is one of growth, not of reductions".[119] The Centre for Alternative Technology thought that the Government had shown a lack of "transparency" and "openness in dealing with the issue of the UK's consumption emissions".[120]DECC admitted that they "could consider ways in which we could join up the presentation of our information to show a more complete picture".[121] Defra's Lord Taylor told us that the two departments were "perfectly capable of co-ordinating [their] efforts and there is no difficulty between [them]".[122]

63. **We recommend that Government departments work together to communicate the full picture of the UK's impact on the global climate. DECC is correct in stating that the UK's territorial emissions have been falling since 1990. Defra is also correct when it states that the UK's consumption emissions have been rising since 1990. It is only when these two perspectives are presented together that the full picture of the UK's impact on the climate is revealed.**

64. The DECC Minister's position on consumption-based emissions evolved during the inquiry. Initially, Greg Barker's told us:

> […] if it were anything more than being intellectually curious, if it was anything more than wanting to use it as a check and a contrast and a control exercise […] I think we would have severe problems with that".[123]

117 Ev 46

118 Ev 46

119 Ev w11

120 Ev w40

121 Ev 46

122 Q 155

123 Q 126

65. Defra's Parliamentary Under-Secretary of State, Lord Taylor, told us he thought "it is very important to emphasise that one of the key users of this data is not the Government itself but also business".[124] He added, "we make these consumption figures available because they do inform the debate and […] We think that that is a worthwhile exercise".[125] Eventually Greg Barker admitted that:

> "We don't overestimate how reliable it is nor do we underestimate the complexity of gathering it, but it is still a useful data-set and is useful to set alongside our territorial emissions."[126]

66. Finally, the DECC Minster said, "We very much see consumption-based and territorial-based emissions, whether that is locally or international, as complementary".[127]

67. **We were concerned at the start of our inquiry that DECC officially regard consumption-based emissions as nothing more than an intellectual curiosity. Since then, possibly in response to our inquiry, there have been signs of positive developments in its understanding and approach. This is encouraging. Consumption-based emissions reporting does more than inform debate: it is an invaluable tool that should be used alongside data on territorial emissions when making energy and climate change policy.**

124 Q 164

125 Q 165

126 Q 182

127 Q 206

5 Climate Change Negotiations

68. In their 2011 inquiry into *Carbon Budgets*, the House of Commons Environmental Audit Committee asked the Secretary of State for DECC about the general case for a consumption-based emissions approach, and was told:

> The reality is that if you were to tell most members of the United Nations that their territorial sovereignty would henceforth be suspended because we intended to take account of our imported embedded emissions, I think there would be an absolute firefight. The reality is that the territorial principle is very well established. We are responsible for our own territory, and while that remains the case, that is the bit that we can take responsibility for.[128]

69. The Environmental Audit Committee did not share the Secretary of State's reluctance to take consumption-based emissions into account when making policy, arguing rather that it would "facilitate a more rigorous approach to controlling our contribution to climate change".[128] We have explored whether an increased acknowledgement of the UK's consumption emissions—and hence a more complete acknowledgement of the UK's impact on the global climate—could facilitate negotiations on a global, legally binding agreement on greenhouse gas emissions reductions. We acknowledge DECC's point about a potential "firefight" at the United Nations climate negotiations, but we are not suggesting changes to the territorial accounting mechanisms that underpin the negotiations.

70. The UK Energy Research Centre (UKERC) observed that the UK is especially vulnerable to international criticism at the moment because "the leakage of its emissions is larger than that of all other industrial nations".[129] It was—in part—Britain's leadership on the issue of climate change in the early 1990s that eventually led to the signing of the Kyoto Protocol in 1997. Perhaps in the 2010s an admission of responsibility by the UK for the impacts of its consumption could lead the way for other net importers of emissions to do the same, and allow some of the barriers to a climate change agreement to be surmounted.

71. Reflecting the argument it made to the Environmental Audit Committee, DECC stated that the territorial approach to emissions reporting is used because countries have a much greater ability to "influence [manufacturing] activities in their own territory" than to influence "emissions from goods which are consumed in their country but [manufactured] overseas".[130] WWF-UK agreed with DECC, and acknowledged that the territorial-based approach to emissions accounting had considerable merit in that the "levers that address these emissions are clearly within the direct control and mandate of UK policy makers".[131] WWF-UK thought the UK should not promote a shift to an international policy framework based on consumption emissions, as it would have "very little support internationally and threaten the emergence of a new binding global deal".[132]

128 Environmental Audit Committee, *Carbon Budgets*, September 2011, HC 1080 p 17

129 Ev w30

130 Ev 46

131 Ev 63

132 Ev 63

72. We heard evidence that the UK could have some influence beyond the emissions that it has territorial sovereignty over. UKERC believed that that the "key issue" with regards to reducing emissions globally was the UK's ability to reduce overseas emissions, and that the UK should recognise the influence it has over emissions embodied in the goods it imports.[133] Policy Exchange observed that "the scale and rapid growth of carbon embedded in trade makes negotiation of an international agreement difficult and complex, including making it hard to specify realistic and fair targets for rapidly growing developing countries".[134] The Sustainable Consumption Institute thought that an increased emphasis on consumption-based emissions—in parallel to the territorial approach—would "increase the share of global emissions over which the UK has influence, and therefore broaden its reach".[135] By acknowledging that the UK has partial responsibility for emissions produced in another country, the UK could have more leverage in negotiations aimed at reducing those emissions. Professor Barrett from the University of Leeds told us that, while it may be argued that the UK does not have responsibility for the emissions produced in the manufacture of goods abroad which it then consumes, "we do have some influence over those emissions".[136]

73. In the paper "*Growth in emission transfers via international trade from 1990 to 2008*", Glen Peters, from the Norwegian Center for International Climate and Environmental Research in Oslo, and others argued that the consumption approach could inform negotiations on what international agreement takes shape after Kyoto's first commitment period expires.[137] The Kyoto Protocol as it stands was designed at a time when international flows of carbon were much smaller: emissions embedded in trade grew from 4.3 $GtCO_2$ in 1990 to 7.8 $GtCO_2$ in 2008.[138] This rise in the carbon emissions embedded in international trade flows shows the increased importance of a consumption-based approach to assessing the emissions a country is responsible for.

74. Professor Barrett told us that, at this point in the climate change negotiations, he would not argue for shifting the targets from away from the agreed territorial basis, but an increased acknowledgement of the UK's consumption emissions could:

> […] add further integrity to climate change debates; it helps give insights into responsibility […] it is about additional information to give us greater insight to widen our policy scope, not to try and totally redesign the whole international negotiations […] I think we are at a situation where we need to overcome the

133 Ev w30

134 Policy Exchange, *Carbon Omissions—Consumption-based accounting for international carbon emissions*, October 2011, p 2

135 Ev 81

136 Q 9

137 Author Affiliations: Center for International Climate and Environmental Research–Oslo, N-0318 Oslo, Norway; Department for Sustainable Engineering and the Department for the Economics of Climate Change, Technical University Berlin, Germany; Science and Technology Policy Institute, Washington, DC, USA; Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA, USA; and Potsdam Institute for Climate Impact Research, Germany.

138 Peters, G. et al., '*Growth in emission transfers via international trade from 1990 to 2008*', Proceedings of the National Academy of Sciences, vol. 108 no. 21, p 8903, March 2011

> barriers [to a global agreement], and so therefore new information to me can only be useful to do that.[139]

75. The University of Manchester's Dr Alice Bows added, "there will always be some emissions that we cannot necessarily have influence over and so it would be very tricky to set a target on [a consumption] basis".[140] On the other hand, Elena Dawkins of the University of York argued that "other countries might resist territorial emissions targets because they would impinge on their development goals. So maybe they will be more willing to accept that consumption approach".[141]

76. **The UK has been a leader on climate policy for many years. If the UK wishes to lead on low-carbon growth—and encourage emissions reductions in countries that manufacture and export goods to the UK—we recommend that the Government acknowledges the growth in the UK's consumption-based emissions. The Committee is not proposing that a legally binding agreement on emissions reductions should be based on consumption rather than territorial emissions. However, we do recommend that the Government acknowledge that the UK's consumption is driving up territorial emissions in other countries. This admission could increase the UK's leverage over those emissions. DECC should not dismiss out of hand the potential leverage of a more holistic assessment of the UK's emissions, and an acknowledgement that the UK's consumption drives up territorial emissions elsewhere.**

Developing countries

77. DECC were concerned that developing countries would be concerned that an emphasis on consumption-based accounting could lead to protectionist anti-trade policies. The Minister told us that he thought there was a danger "that it could be misinterpreted […] as a way of imposing tariff barriers and a new form of carbon duties on developing countries".[142] However, DECC also stated, "it could also be argued that developing countries should not be entirely responsible for emissions associated with goods and services that are mainly consumed in the developed world".[143]

78. Sustainability consultants Best Foot Forward noted that territorial emissions accounting typically led to a situation "where developed countries outsource their industries to developing countries and the latter have to bear costs of reducing GHG [greenhouse gas] emissions".[144] Dr. Glen Peters' study estimated the consumption-based carbon dioxide emissions for 113 world regions.[145] A key finding was that although many developed countries (including the UK) stabilised their territorial emissions, there was

139 Qq 9, 19

140 Q 24

141 Q 9

142 Q 187

143 Ev 46

144 Ev w42

145 Peters, G. et al., '*Growth in emission transfers via international trade from 1990 to 2008*', Proceedings of the National Academy of Sciences, vol. 108 no. 21, p 8903–8908, March 2011

often an associated increase in emissions in developing countries through manufacturing the imported goods and services.[146]

79. We put it to the Minister that it was very likely that developing economies would like to have an acknowledgment at the negotiating table of how low their consumption-based emission were on a per capita basis compared to ours, and he acknowledged that this would be "very helpful".[147]

80. **We accept that territorial emissions should remain the basis for international climate negotiations. However, the UK Government's emphasis on territorial emissions means that the responsibility for reducing emissions embedded in the products that we import lies with the—often, developing—countries where the goods are manufactured. We accept there is a risk that some exporters could have concerns that an increased emphasis on consumption-based emissions by the UK could be a precursor to anti-trade policies that penalised high-carbon products. On balance, however, we conclude that the potential benefits of an increased emphasis on consumption based emissions outweigh this risk. We recommend that the Government acknowledges the extent of our responsibility for these emissions in developing countries, in order to encourage a more equitable approach to reducing emissions globally.**

Border tariff adjustments

81. It has been suggested that the emissions embodied in imported goods could be accounted for in a form of carbon taxation, called a "border tariff adjustment", as a product passes through a border. UKERC noted that there were well-documented examples of taxation on consumption (consumption in general, not emissions), such as VAT.[148] As an example, UKERC explained that there had been resistance by the Unites States for the initial proposal for VAT, on the grounds that "a tax on [its] exports presented a trade barrier".[149] However, academic evidence has suggested that a "move from an origin to a destination basis for tax would have the effect of changing [the] price [...] and consequently offered no competitive advantage to Europe".[150] This argument—that consumption taxes do not act as a trade barrier—could then be extended to a border tariff adjustment, or tax, on the carbon content of products as they pass into a country.

82. EEF, the manufacturer's association noted that the UK has no powers to apply taxes at borders relating to a product's carbon content, as this is an EU prerogative.[151] Ian Rodgers, the Director of UK Steel, argued that, in the absence of a multilateral agreement where all the participants agree to suspend their rights in the World Trade Organisation, "border tax adjustments could lead to some serious trade disputes".[152] However, the University of Leeds' Professor Barrett made us aware of "Recent academic analysis or analysis by

146 Ev w30

147 Q 188

148 Ev w30

149 Ev w30

150 Ev w30

151 Ev 67

152 Q 54

lawyers, [that] would suggest that it is possible to introduce border carbon agreements […] there are environmental clauses [under WTO rules] where such a tax could potentially be bought into play".[153] Dr Richard Leese of the Minerals Products Association added that "consumption-based accounting would give you the information to judge whether border adjustment is possible. The possibility of border adjustment mechanisms then gives you the leverage to use in an international agreement".[154] Guy Shrubsole of the Public Interest Research Centre suggested to us, "the potential for integrating environmental standards into bilateral trade deals […] should be looked at in much more detail".[155]

83. **We recognise that the introduction of border tariff adjustments, to account for the carbon embedded in a product as it crosses into a country, is unlikely to be welcomed by exporting countries, particular those whose economies are developing. We recommend that the Government examine the challenges and opportunities that border tariff adjustments present when considering ways to limit consumption emissions and mitigate leakage risks. The Committee on Climate Change has declared its willingness and availability to undertake an investigation into consumption-based emissions, including an exploration of border tariff adjustments.**

153 Qq 23, 28

154 Q 55

155 Q 86

6 Changing behaviour

84. The Committee received a substantial amount of evidence that indicated consumption-based emissions reporting could be used to better communicate to individuals the impact of their consumption. WWF-UK's Dr Keith Allot told us that consumption-based emissions reporting "can be used to engage people, to change behaviour, and to have better decisions about how we consume".[156] Guy Shrubsole of the Public Interest Research Centre added that "consumption-based emissions reporting opens up a whole new scope of policy looking more comprehensively at demand-side measures […] this will engage the consumer far more".[157]

85. The Green Alliance's report on using behavioural insights to make green living energy policy work—*Bringing it home*—concluded that the Government was using "too many carrots" when trying to get people to consume more sustainably.[158] The Green Alliance explained that evidence from behavioural science suggested, "humans are loss averse and will put more effort into preventing a loss than securing a gain".[158] However, it added that most financial levers used by government are incentives rather than disincentives.

86. A report prepared for the Joseph Rowntree Foundation by the Fabian Society—*Climate Change and Sustainable Consumption: What do the public think is fair?*—concluded that "despite the strong support expressed for behaviour change and environmental policies [...] there was no great *desire* to change behaviour".[159] Through a series of focus groups, the Rowntree study found evidence that whereas government approaches to behaviour change attempted to appeal to a consumer's self-interest, the concept of "fairness" could also be an important factor in building support for action.[160] On the one hand, some participants in the Rowntree focus groups thought over-consumption was wrong as it increased the likelihood of dangerous climate change, whilst others thought it unfair as given a scarce resource—in this case the atmosphere's capacity to absorb CO_2—over-consumption by some would mean others would have to reduce their consumption even further.[161]

87. Chris Tuppen, Director of the Aldersgate Group (a coalition of environment agencies, NGOs, think tanks and industry) noted that consumption-based emission reporting can also influence the behaviour of government and business, as "procurement decisions can be influenced much more strongly by looking at a consumption-based reporting model".[162] However, the Minister told us that:

156 Q 67

157 Q 68

158 Green Alliance, *Bringing it home—Using behavioural insights to make green living energy policy work*, 2011, p 44

159 Joseph Rowntree Foundation, *Climate Change and Sustainable Consumption: What do the public think is fair?*—Summary, December 2011, p 4

160 Joseph Rowntree Foundation, *Climate Change and Sustainable Consumption: What do the public think is fair?*—Summary, December 2011, p 4

161 Joseph Rowntree Foundation, *Climate Change and Sustainable Consumption: What do the public think is fair?*—Summary, December 2011, p 3

162 Q 71

> The only way to affect consumption, fundamentally, is not to stop consumption but is for the countries that are exporting the goods to us to take greater measures to ensure that the products that they export to us have higher standards and a lower carbon footprint.[163]

88. **We disagree with DECC's claim that the only way to affect emissions associated with UK consumption is for countries that export the products we consume to lower their carbon intensities. Reducing the carbon intensity of exporting countries is helpful, but it fails to address that emissions are also rising because the UK is consuming more. The UK's consumption cannot rise indefinitely and we see a role for consumption-based emissions reporting in addressing this unsustainable behaviour and in encouraging UK-based consumers and businesses to pay more attention to the overall carbon footprint of the goods and services they purchase.**

89. As discussed in Chapter 2, the Lake District National Park Authority, Manchester City Council, and Wessex County each undertook an assessment of their emissions on a consumption-basis, and told us how it provided a useful narrative for encouraging individuals to reduce their consumption. Richard Leafe, Chief Executive of the Lake District National Park, told us that consumption-based emissions reporting had been "a very useful tool in working out which sectors we most need to engage with and talk to about their emissions".[164] West Sussex County Council's Principal Adviser, Dr Wendy Benson, described to us how her Council had "found that [the consumption-based approach] is a much clearer way of engaging with people".[165] Richard Sharland, Manchester City Council's Head of Environment Strategy added, "There is an opportunity for consumption-based metrics to create a quite different set of dialogues, particularly with consumers". [166] The Public Interest Research Group's Director Guy Shrubsole explained that consumption-based emissions reporting "opens up a whole new scope of policy looking more comprehensively at demand-side measures, and not simply supply-side measures".[167] The University of York's Elena Dawkins explained, "the consumption approach might appear more relevant to a householder if they are thinking about reducing their emissions as opposed to putting all the burden on an industry somewhere else". [168] Professor Barrett suggested that DECC may not recognise the full range of [policy] applications that consumption-based emissions reporting has to offer.[169]

90. We received evidence about the benefits of considering consumption-based emissions when making policy. The University of Manchester's Dr Alice Bows told us that "If you have a greater scope of policies that can tackle the demand side then that will actually mean that the UK is having greater influence over global emissions because it will be accounting for a greater share".[170] Professor Barrett added that the UK "may potentially ignore policies

163 Q 162

164 Q 97

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166 Q 97

167 Q 68

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169 Q 16

170 Q 9

that could have a greater reduction in emissions at least cost because we are ignoring a significant chunk of options on the demand side" through the Government's lack of emphasis on consumption-based emissions.[171].

91. We asked the Minister whether he thought that DECC and Defra should work together to disseminate data on the UK's consumption-based emissions, and work towards translating these into demand-focused policies. He said, "I totally agree", but stressed that a lot of this work was currently led by Defra.

92. **We conclude that consumption-based emissions reporting can be used to inform people of the impacts of their own behaviour on global emissions. This has been demonstrated by the experience of regional authorities, which have used consumption-based emissions metrics to engage with their citizens more effectively. We recommend that this is reflected in the forthcoming demand-side work of the recently opened Energy Efficiency Development Office in DECC.**

Carbon labelling

93. The Carbon Trust developed the "Carbon Reduction Label", which aimed to help consumers see "at a glance which products are working to reduce their carbon footprints".[172] Brands that are marked with the label are required to calculate the exact footprint of the product in question to the PAS 2050 standard, which was developed by the Carbon Trust in partnership with Defra and the BSI British Standards. The Carbon Trust's Eric Lounsbury told us, "as you do more and more specific product labelling, you can do it quite cost-effectively [...] There are no insurmountable problems to get to the next level of detail".[173] Once a brand has its carbon footprint measured and certified, the brand then has to commit to reducing the product's emissions—"every two years, the product must be reassessed and a reduction has to have been achieved and independently certified, or the label is removed".[174]

94. Defra's Lord Taylor explained to us, "the Government is trying to deal with [embedded carbon emissions] through eco-labelling and energy-labelling. These are areas where consumer behaviour is hopefully being influenced".[175] However, Professor Barrett and Dr Bows both thought that carbon labelling did not have any particular influence on the consumer.[176]Jeremy Nicholson, Director of the Energy Intensive Users Group observed, "There seems to be very little evidence that there is large consumer demand [yet] when you ask people to pay a premium for 'lower carbon' products."[177]

171 Q 15

172 Carbon Trust, *What is the Carbon Reduction Label,*

www.carbon-label.com/the-label/what-is-the-carbon-reduction-label

173 Q 77

174 Carbon Trust, *A guide to the Carbon Reduction Label,*

www.carbon-label.com/the-label/guide-to-the-carbon-reduction-label

175 Q 160

176 Q 11

177 Q 57

95. Consumers might be encouraged to buy lower carbon products (manufactured in other countries) if consumption based emission figures were more visible, and they could see the beneficial impact of their voluntary actions. But if UK policy makers only emphasise territorial measures of emissions, decisions made by the British consumer to procure lower carbon products from other countries—which will have a beneficial effect on global emissions—will not appear in the UK's emissions measurements at all.

96. **We acknowledge that progress has made on eco-labelling of products in order to encourage more sustainable consumption, but we conclude that more could be done to make use of the data that Defra collects on consumption-based emissions. Government should do more to make people aware of the consumption-based emissions data gathered by Defra. We recommend that DECC recognise the limitations of territorial emissions in trying to communicate to consumers how they can change their behaviour in order to reduce emissions globally. Even if an increased emphasis on consumption-based emissions has no impact on the UK's local territorial emissions, the UK has to address its consumption if it is to make an effective contribution to a global reduction in greenhouse gas emissions.**

7 Conclusions and recommendations

Considering consumption-based emissions

1. There is a clear divergence between the UK's territorial emissions and its consumption-based emissions. Furthermore, the rate at which the UK's territorial emissions have fallen has been outpaced by the growth in its consumption-emissions. We are concerned that the UK could be meeting its domestic carbon budgets at the expense of the global carbon budget. (Paragraph 15)

2. We conclude that the fall in the UK's territorial emissions was not entirely or even mostly a consequence of the Government's climate policy. Rather, it was mainly a result of the switch from coal to gas-fired electricity generation that began in the early 1990s, and the shift in manufacturing industries away from the UK in response to the pressures of globalised markets. At the same time, the emissions embedded in the UK's imported goods have increased. To complement the UK's existing territorial carbon budgets, we recommend that DECC explore the options for setting emissions targets on a consumption-basis at the national level, and to set out the steps it will take to do this when responding to the Committee's report. (Paragraph 22)

3. We received no evidence that electricity-intensive industry investment decisions were being driven by the Government's climate policy, and therefore no evidence that the compensation for electricity-intensive industries announced by the Chancellor in his 2011 Autumn Statement is necessary. If electricity-intensive industries are to be "compensated" for increases in the cost of electricity—which are being driven primarily by volatility in the fossil fuel market, not climate policy—we recommend that the Government requires the beneficiaries to make clear commitments to increased energy efficiency. In its response to our Report, the Government must set out clearly what these commitments will be. (Paragraph 26)

Policy applications

4. It is evident that the consideration of consumption-based emissions encourages the development of new policy options, as revealed by the experiences of regional authorities that have adopted a consumption-based approach to emissions accounting. We recommend that DECC explore the options for incorporating consumption-based emissions data into the policy making process, and set out the steps it will take when responding to the Committee's report. (Paragraph 39)

5. The 9% fall in the UK's consumption-based emissions between 2008 and 2009 was primarily a result of the economic downturn, rather than of the UK's policies to reduce greenhouse gas emissions. Discounting the effects of the recession, the UK's consumption-based emissions have been on an upward trend since 1990. (Paragraph 43)

6. DECC's argument that there is insufficient, robust data on embedded emissions to make policy, overlooks the extent to which consumption-based emissions can be

used to connect an individual's consumption to their impact on the climate. We are not convinced that consumption based emissions data are too complex or time consuming to gather, as Defra's work in this area shows. The experiences of regional authorities has demonstrated that there is sufficiently robust data available to encourage the development of new policy options and identify carbon-intensive behaviours that are overlooked by concentrating on territorial emissions alone. We recommend that in this case, the Government does not make the perfect the enemy of the good. In its response to the Committee's report, the Government should avoid using the uncertainties inherent to consumption-based emissions data as an excuse for inaction. (Paragraph 48)

7. We conclude that that the UK's energy and climate change policy challenges do not lend themselves to simplistic analysis by a single data set. The growth in the UK's consumption-emissions does provide a counter-story to the one suggested by territorial emissions and we recommend that the Minister give more detailed consideration to the evidence gathered in our inquiry and presented here. We recommend that DECC no longer rely exclusively on territorial emissions as their primary policy driver. DECC's belief that territorial emissions are a better indicator of the UK's impact on the global climate is shortsighted and neglects the global impact of our consumption. Basing policy decisions on a single method of accounting for emissions is likely to have unintended consequences. In order to avoid perverse incentives, we recommend that DECC increase the extent to which they consider consumption-based emissions when making policy. (Paragraph 53)

8. The Committee on Climate Change has stated that it would welcome the opportunity to explore the implications that consumption-based emissions accounting may have for the UK's carbon budgets, and that they could undertake such work after they publish their fourth progress report on the carbon budget in June 2012. We recommend that the Government commission the Committee on Climate Change to undertake this work. (Paragraph 56)

The Government's position

9. DECC's claim that the UK is only responsible for 2% of global emissions—without acknowledgement of the caveat that this is on a territorial basis and does not take account of the emissions embedded in the goods we import—is unhelpful in terms of understanding our impact on the global climate. We recommend that when the Government refers to the proportion of global emissions that the UK is responsible for it should always state on what basis that proportion has been determined: territorial or consumption. (Paragraph 60)

10. We recommend that Government departments work together to communicate the full picture of the UK's impact on the global climate. DECC is correct in stating that the UK's territorial emissions have been falling since 1990. Defra is also correct when it states that the UK's consumption emissions have been rising since 1990. It is only when these two perspectives are presented together that the full picture of the UK's impact on the climate is revealed. (Paragraph 63)

11. We were concerned at the start of our inquiry that DECC officially regard consumption-based emissions as nothing more than an intellectual curiosity. Since then, possibly in response to our inquiry, there have been signs of positive developments in its understanding and approach. This is encouraging. Consumption-based emissions reporting does more than inform debate: it is an invaluable tool that should be used alongside data on territorial emissions when making energy and climate change policy. (Paragraph 67)

Climate change negotiations

12. The UK has been a leader on climate policy for many years. If the UK wishes to lead on low-carbon growth—and encourage emissions reductions in countries that manufacture and export goods to the UK—we recommend that the Government acknowledges the growth in the UK's consumption-based emissions. The Committee is not proposing that a legally binding agreement on emissions reductions should be based on consumption rather than territorial emissions. However, we do recommend that the Government acknowledge that the UK's consumption is driving up territorial emissions in other countries. This admission could increase the UK's leverage over those emissions. DECC should not dismiss out of hand the potential leverage of a more holistic assessment of the UK's emissions, and an acknowledgement that the UK's consumption drives up territorial emissions elsewhere. (Paragraph 76)

13. We accept that territorial emissions should remain the basis for international climate negotiations. However, the UK Government's emphasis on territorial emissions means that the responsibility for reducing emissions embedded in the products that we import lies with the—often, developing—countries where the goods are manufactured. We accept there is a risk that some exporters could have concerns that an increased emphasis on consumption-based emissions by the UK could be a precursor to anti-trade policies that penalised high-carbon products. On balance, however, we conclude that the potential benefits of an increased emphasis on consumption based emissions outweigh this risk. We recommend that the Government acknowledges the extent of our responsibility for these emissions in developing countries, in order to encourage a more equitable approach to reducing emissions globally. (Paragraph 80)

14. We recognise that the introduction of border tariff adjustments, to account for the carbon embedded in a product as it crosses into a country, is unlikely to be welcomed by exporting countries, particular those whose economies are developing. We recommend that the Government examine the challenges and opportunities that border tariff adjustments present when considering ways to limit consumption emissions and mitigate leakage risks. The Committee on Climate Change has declared its willingness and availability to undertake an investigation into consumption-based emissions, including an exploration of border tariff adjustments. (Paragraph 83)

Changing behaviour

15. We disagree with DECC's claim that the only way to affect emissions associated with UK consumption is for countries that export the products we consume to lower their carbon intensities. Reducing the carbon intensity of exporting countries is helpful, but it fails to address that emissions are also rising because the UK is consuming more. The UK's consumption cannot rise indefinitely and we see a role for consumption-based emissions reporting in addressing this unsustainable behaviour and in encouraging UK-based consumers and businesses to pay more attention to the overall carbon footprint of the goods and services they purchase. (Paragraph 88)

16. We conclude that consumption-based emissions reporting can be used to inform people of the impacts of their own behaviour on global emissions. This has been demonstrated by the experience of regional authorities, which have used consumption-based emissions metrics to engage with their citizens more effectively. We recommend that this is reflected in the forthcoming demand-side work of the recently opened Energy Efficiency Development Office in DECC. (Paragraph 92)

17. We acknowledge that progress has made on eco-labelling of products in order to encourage more sustainable consumption, but we conclude that more could be done to make use of the data that Defra collects on consumption-based emissions. Government should do more to make people aware of the consumption-based emissions data gathered by Defra. We recommend that DECC recognise the limitations of territorial emissions in trying to communicate to consumers how they can change their behaviour in order to reduce emissions globally. Even if an increased emphasis on consumption-based emissions has no impact on the UK's local territorial emissions, the UK has to address its consumption if it is to make an effective contribution to a global reduction in greenhouse gas emissions. (Paragraph 96)

Formal Minutes

Tuesday 27 March 2012

Members present:

Mr Tim Yeo, in the Chair

Dan Byles
Barry Gardiner
Laura Sandys
Sir Robert Smith
Dr Alan Whitehead

The following declarations of interest relating to the inquiry was made:

Tuesday 29 November 2011

Sir Robert Smith declared the following interests: Shareholder in Shell Transport and Trading and energy-intensive users, RTZ

Tuesday 17 January 2012

Sir Robert Smith declared the following interests: Shareholder in Shell Transport and Trading and energy-intensive users, RTZ

Mr Tim Yeo declared an interest as Chairman of TMO Renewables Limited.

Tuesday 31 January 2012

Sir Robert Smith declared the following interests: Shareholder in Shell Transport and Trading and energy-intensive users, RTZ

Draft Report (*Consumption-Based Emissions Reporting*), proposed by the Chair, brought up and read.

Ordered, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 96 read and agreed to.

Summary agreed to.

Resolved, That the Report be the Twelfth Report of the Committee to the House.

Ordered, That the Chair make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

Written evidence was ordered to be reported to the House for printing with the Report (in addition to that ordered to be reported for publishing on 15 November 2011 and 6 March).

[Adjourned till Tuesday 17 April at 10.00 am

Witnesses

List of printed written evidence

List of additional written evidence

(published in Volume II on the Committee's website www.parliament.uk/ecc)

List of Reports from the Committee during the current Parliament

The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2010–12

First report	Emissions Performance Standards	HC 523 (807)
Second report	UK Deepwater Drilling–Implications of the Gulf of Mexico Oil Spill	HC 450 (882)
Third report	The revised draft National Policy Statements on energy	HC 648
Fourth report	Electricity Market Reform	HC 742 (1448)
Fifth report	Shale Gas	HC 795 (1449)
Sixth report	Ofgem's Retail Market Review	HC 1046 (1544)
Seventh report	A European Supergrid	HC 1040 (1684)
Eighth report	The UK's Energy Supply: Security or Independence?	HC 1065 (1813)
Ninth report	Solar Power Feed-In Tariffs	HC 1605 (1815)
Tenth report	The EU Emissions Trading System	HC 1476
First Special Report	Low carbon technologies in a green economy: Government Response to the Committee's Fourth Report of Session 2009-10	HC 455
Second Special Report	Fuel Poverty: Government Response to the Committee's Fifth Report of Session 2009-10	HC 541
Third Special Report	The future of Britain's electricity networks: Government Response to the Committee's Second Report of Session 2009–10	HC 629

Oral evidence

Taken before the Energy and Climate Change Committee

on Tuesday 29 November 2011

Members present:

Mr Tim Yeo (Chair)

Ian Lavery	Sir Robert Smith
Laura Sandys	Dr Alan Whitehead

Examination of Witnesses

Witnesses: **Dr Alice Bows**, Sustainable Consumption Institute, University of Manchester, **Elena Dawkins**, Stockholm Environment Institute, University of York, and **Professor John Barrett**, University of Leeds, gave evidence.

Q1 Chair: Good morning, and thank you for being here so punctually. We can start a few minutes early. Because of the importance of the business in the House later on, I am afraid we are very, very tight for time, so we need to wrap up our discussions with you by 11.00am because we have another panel coming on afterwards. But you are very welcome at this Committee. This is our first stab at doing some work in what I think is an exceptionally interesting area intellectually, and quite important for policy as well. I will skip any more formal introductions. We know who you are. We know what your backgrounds are and that is why we have asked you along.
Can I just start with a general question; how accurate do you think it is for DECC to claim that UK emissions have actually fallen since 1990?
Professor Barrett: Accurate as in they are undertaking or reporting on their emissions in the way that they are required to report under the UNFCCC, so I don't perceive them being dishonest in any way, although I would add that since 2006, when we undertook the first major study on this for Defra, we have known for some time that our imported emissions are significant. That has always been reported by Defra because it has been seen as a sustainable consumption issue, as opposed to more of a climate change issue. I would say that they are honest about this but there is an opportunity to be more transparent by also demonstrating that some emissions, or emissions related to imports, are extremely significant in their scale.
Dr Bows: Just to add to that, there is also the issue of international aviation and shipping emissions, which arguably, are part of the UK's responsibility as well, which have not been included in the past other than in a memo item, and those emissions, particularly up to about 2008, were increasing quite rapidly. They have plateaued somewhat but they are quite a significant portion of emissions.
There is lots of uncertainty around the shipping side; aviation is approximately around 7% of UK emissions and shipping is possibly about the same, maybe a little bit higher.

Q2 Chair: Is it true to say now that really 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?
Professor Barrett: I think it has been quite clear that DECC have resisted showing these emissions in the past. I think that has been fairly well known, and Defra have been quite progressive in acknowledging that these emissions exist, measuring them and committing to continue to measure them for the next five years. I would personally like to see less resistance and more transparency. I don't think there is a danger in declaring these emissions. Suggesting that they exist does not mean we are necessarily responsible for them; attribution and responsibility are very different things. So I think it is a time to bring it together into one coherent framework and document alongside each other.

Q3 Chair: Is there a case for saying we should really publish both sets of calculations, so each of them has validity but it is just a different way of looking at the problem?
Dr Bows: Yes, I would agree with that.
Professor Barrett: I very much agree with that.
Elena Dawkins: Yes. They are counting different things and as much evidence as you can gather is beneficial in all cases.

Q4 Chair: 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?
Professor Barrett: No, we see it as an unintentional consequence. We don't see it that UK policy has resulted in an increase in emissions occurring outside the UK. This links with the leakage question to some extent. We think it is extremely important to make a distinction between strong leakage, that is leakage that would relate directly to UK climate change policy, and weak leakage, which is the unintentional phenomena of the geographical separation between production and consumption.
One thing that is extremely important here is that all the analysis shows that it is income that is driving emissions, and that is hidden from the territorial perspective. So really, what the consumption

perspective does is tell us whether our economy is progressing in a low-carbon pathway, in many ways. The fact that emissions have decreased suggests that the decoupling between economy and environment has not occurred to the same level reported when we only look at territorial emissions.

Q5 Laura Sandys: If you were developing policy and you had to choose one indicator—and we are currently using production emissions as an international platform—would you use production or consumption?

Dr Bows: I do not think that we should just choose one indicator. This climate change problem is a systemic problem. You have to take a systems view, and if you take a systems view then one indicator is only going to give you half the picture. So I think we need many indicators, and I would personally advocate that we use both production and consumption.

Q6 Laura Sandys: So you think that by using just production now we are missing quite a bit of the so-called narrative and also the impact of the policies?

***Dr Bows*:** I think that is right. There are interesting examples. For instance, if you look at agriculture, production may be better in places like the UK under climate changes, so if the temperature rises wheat production might be better in the UK. You might want to have production in the UK because you have global demand for wheat, for instance. Under climate change constraints, the UK's emissions would rise because they are producing more food for the rest of the world. Under consumption-based they would not be rising because they would be emissions associated with export, and if you don't have both of the points of view then, first of all, you might not push the infrastructure for production enough, in terms of a low carbon approach. But also, you would not produce wheat in the places where it is most efficient to do so, so I think you need both perspectives.

Professor Barrett: I know at the moment we don't touch and measure from what we would call a "production perspective" because a production perspective would include aviation and shipping, and then that would be consistent with the way that we measure the economy; we measure from a territorial perspective so the emission has to have actually occurred, and the thing we know about climate change is it doesn't actually matter where the tonne occurs. So in that respect, if we want to measure how our economy is contributing to the global problem of climate change then we need to measure the full impact of that economy and then recognise policies from both sides. Some of those policies will affect territorial emissions more and others may affect our imported emissions.

Q7 Laura Sandys: When looking at consumption-based emissions, there are different ways of measuring it. I don't know what your views are on which measure has greater efficacy and whether Defra's current measure is one that you would feel was robust enough.

Professor Barrett: I do Defra's modelling so maybe someone else should answer that.

Laura Sandys: Well, there you go. What more can you say?

Professor Barrett: I can say that there is considerable and almost unanimous agreement inside the academic literature, which is supported by some very sound analysis, that multi-regional input/output modelling provides us with a robust picture of the total change in emissions. Where variation and uncertainty exists is when we look at the sector levels and we get down to sectors. Some sectors can show considerable uncertainty. But we have considerable certainty with the overall figures. That was shown to some extent when we first did the report for Defra in 2006. They were clearly worried about the implications of that study, so they commissioned an extremely extensive uncertainty analysis to go along with that study. That has been published by Defra and also published in the academic literature. That showed additional uncertainty on the top-level figures of an additional 3%. So it was still within a range where we can say that they have gone up over time.

We have limited other methodological options to do that, and other countries are also now using input/output approaches to do it.

Q8 Laura Sandys: What would your critique be of your colleague here?

Elena Dawkins: I think there are some slightly different variations in the modelling that you can take. There are emissions embedded in bilateral trade or multi-regional input/output modelling, for example, which I have described in the submission. There are studies that have compared those two methods and one other method, and they come up with similar overall results but they do vary in their total figures, for example, by country.

I recently compared the emissions for Sweden with three different methods, one using a two-regional input/output model that was done just for Sweden and the rest of the world, and one using a multi-regional input/output model and the emissions embodied in bilateral trade. Overall, the results were saying essentially the same thing, so the consumption emissions for Sweden were higher but they did come out with slightly different results. So there is variation but generally the patterns are the same whichever method you use. That occurs over the time-series as well; the time-series for the UK has come out consistently increasing using the different methods, but just with slight variations in the overall percentages and totals.

Q9 Laura Sandys: If you were to put forward, let's say, an international agreement based on consumption—a sort of assessment—do you think that it would be robust enough in many ways to be examined and be challenged through trying to establish an international agreement?

Professor Barrett: I would struggle to see it being implemented at that level, simply because I could just see lots of litigation. I could see lots of countries

challenging all the results if it favours them or doesn't favour them. We would not argue at this point about shifting the targets because it would also mean that you would have responsibility outside of your immediate policy or sovereignty. So in that respect, I am not sure if it would stand up to that. But what it does do, though, is add further integrity to climate change debates; it helps give insights into responsibility, into how significant clean technology transfer should be. It also, to me, asks us to consider policies that we may not have considered otherwise. While we may not have responsibility, we do have some influence over those emissions and if the global goal is to limit emissions to 2 degrees, then I think there is enough evidence to suggest that we need to almost implement every policy that we have available to us to achieve such an incredibly tough and stringent goal.

So, to me, it is about additional information to give us greater insight to widen our policy scope, not to try and totally redesign the whole international negotiations.

Dr Bows: I will just add one small point to that. One of the issues is that it is cumulative emissions that matter, not the emissions level that we get to by 2050, and that means that the more you can do in the short term the less difficult it will be to reduce emissions for a certain level of climate change. If you have a greater scope of policies that can tackle the demand side then that will actually mean that the UK is having greater influence over global emissions because it will be accounting for a greater share, be trying to influence a greater share of emissions, and therefore have a little bit more control over the ultimate climate change that will occur but also tackling demand-side policies that may reduce emissions in the very short term, which is what ultimately we really need to do.

Professor Barrett: China have quoted their consumption-based emissions in international negotiations on an increasingly regular level, I suppose. Roughly, depending on which study you look at, about one-third of their emissions are basically someone else's. So acknowledging that that is the case is important, and this hopefully would help to lead to a more responsible and constructive discussion, as opposed to constantly suggesting that the other one has responsibility.

Elena Dawkins: Those emissions do deliver growth within their country as well, though.

Professor Barrett: They do.

Elena Dawkins: So I think that is the argument they come back with, but by the same token I think other countries might resist territorial emissions targets because they would impinge on their development goals. So maybe they will be more willing to accept that consumption approach.

Professor Barrett: That was one of the reasons why the US Bill went down. They said they would only let the Bill come in and have pricing of carbon in it if they could price the carbon on imports, otherwise it wouldn't go through. So it can be used both ways.

Q10 Chair: This is an important subject but slightly arcane, I think, for the average member of the public. To give an illustration that might bring it home a bit, beef is a particularly clear case of where switching to consumption from production could produce quite a significant change in the outcomes—in the emissions reported. In effect, that would mean any country that is a significant beef importer would experience an increase if you measured consumption rather than production in relation to that product.

Professor Barrett: Yes it would. In figure 5 in our submission we show which products would be greatly affected by switching from one system to another, and the key products—while beef would be a significant one—at the more aggregated level we saw electronic equipment, vehicles and transport equipment, and textiles being some of the most significant, where 80% of the emissions of UK consumption of those products sit outside the UK. But when we look at the other extreme—electricity—more than 92% of emissions sit inside the UK, so therefore any policy to affect that territorially will be effective.

Q11 Chair: Those are particularly good examples because they are ones that people will easily understand, but just staying with beef for a moment.

Professor Barrett: Yes, sure.

Chair: Agriculture seems to be something that to a significant extent has escaped the attention of people trying to address the need for emission reductions, and of course with the world's dietary habits changing to more meat consumption that is also likely to increase in the future. I am also struck by the fact that in America they eat an above average proportion of beef; are we getting to the point where it would be useful to have a little flag every time you buy a Big Mac to say what emissions you are contributing to?

Professor Barrett: This is a question about carbon-labelling, I suppose.

Dr Bows: There are lots of things that we consume, that we spend money on, that have different levels of carbon intensity. My background has been in energy, but it is interesting in the food debate—and we are working on food at the moment—there is an assumption that we are talking about the emissions associated with the full supply chain and not just the emissions that are produced in the UK, and I think people are aware of issues like food miles and the emissions associated with things that they consume. If we are going to succeed in reducing emissions in absolute terms, then we have to look at where those absolute emissions are occurring and where the most emission-intensive patterns of consumption are occurring. So we need to do research to find out—and you have done a lot of research on this already—where the most emission-intensive sectors are and how we can develop policies that tackle those sectors. So you might have to look at the supply side in terms of the actual production; in agriculture that would include the technology and the ways of reducing methane emissions from cattle, for instance, but also the actual consumption side as well. So we have to look at both the consumption and production side of it if we are going to be successful.

Professor Barrett: Could I add my scepticism on carbon-labelling to that, which is when I was at the Stockholm Environment Institute we were the independent advisors for Defra on the methods for the

paths to 2050. We came to the conclusion that at the moment the data and methods were not adequate enough to do a completely comparable and consistent carbon label on a product, and I am also sceptical that people would always necessarily use that information effectively to make the right decision. Added to that, it gives the option of potentially ensuring that the carbon impact is merely included in the price, which is clearly a label that people do take account of more often, but that also potentially sidelines more progressive policy. So I am sceptical of just trying to label everything and then asking the public to make the right decision.

Dr Bows: One aspect where I think labelling might have an influence is down the supply chain and not necessarily at the consumer end, so if a supplier is perceived as having some sort of damaging label on their product that might be an incentive for them to improve the supply chain emissions. But I am the same as John, really; I don't think that will have an influence particularly on the consumer.

Q12 Sir Robert Smith: I had better remind the Committee of my entries in the Register of Members' Interests relevant to this inquiry, which include the oil and gas industry and also shares in energy-intensive users.

Professor Barrett, you said about electricity that if you reduced emissions from that source, that was a reduction within the territory.

Professor Barrett: Yes.

Sir Robert Smith: But isn't there a potential perverse consequence that you have reduced the emissions because you have off-shored the industries that would have used those emissions, and so they are using electricity in another country to provide the products. So the net effect on climate is—

Professor Barrett: I suppose that could affect the demand for electricity, but what I was referring to was that lots of the policies in the Low Carbon Transition Plan set out by the CCC are to completely replace the UK's infrastructure with a new renewable electricity system, and that specific policy would therefore have an effect. But I agree that demand will be subdued if emissions sit in imports as opposed to an increase in domestic production.

Q13 Sir Robert Smith: If you just have the production-based emissions, what are the main perverse and harmful incentives?

Professor Barrett: This is something where we declare that maybe more research is required. But we do feel we can say something about it, and that is that we may potentially ignore policies that could have a greater reduction in emissions at least cost because we are ignoring a significant chunk of options on the demand side. In the study that we undertook and have recently published in the academic literature for the Waste Resources Action Programme—WRAP—we looked at 13 resource efficiency strategies for the UK and how they could affect both our territorial and our consumption-based emissions. The consumption-based strategies were extremely more effective at achieving emission reduction, and in some cases there is also evidence that they could boost the UK economy by boosting service sectors through the restorative economy, that is the repairing of goods and services, therefore maintaining skills within the UK as opposed to buying a new imported electronic good each time. So there is some evidence that suggests they can both be effective and, at the same time, could actually be revenue generating for the UK, so they sit on the positive side of a margin abatement cost curve.

Dr Bows: If you only look at the consumption-based then there is a potential—I am not sure how realistic it would be—for the carbon intensity of exports to be ignored. So if you only looked at consumption, you might not worry if your business is only for production for consumption elsewhere. I think that is one of the disadvantages of just looking at the consumption side.

Elena Dawkins: Then if other countries have a consumption-based target and we export to them, then we would want to have the best industry possible in order to market that improvement that we have here, and actually the UK can sometimes be more efficient than other countries so that would be beneficial for us if they took on consumption-based targets and we were exporting to them.

Sir Robert Smith: It does seem that you need to look at it with both measures.

Professor Barrett: Very much so, yes.

Q14 Sir Robert Smith: Because one other perverse thing would be that presumably, for a developing country, production-based measures would mitigate against the use of fertilisers to improve their agricultural production.

Dr Bows: Yes.

Elena Dawkins: As I say, also, with things like consumption-based emissions you have mechanisms like the clean development mechanism, which is embedded naturally in that system of accounting. So you would be trying to help other countries that you are importing from reduce their emissions, and we have looked at some of the agricultural sectors in particular and found that in some of those developing countries there might be more opportunities to help them reduce those emissions and improve the emissions intensity that then would affect our consumption-based accounts when we import those goods. So it can have positive impacts on them as well, potentially.

Dr Bows: The issue around agriculture is very interesting because the non-CO2 greenhouse gases, particularly the ones associated with fertiliser, are going to be very tricky to reduce, and we are not going to be able to produce all of the food in one particular place. Food consumption and food production is going to have to happen all over the place, and different places will be impacted, and already are being impacted by climate change in different ways. So we really need to look at where it will be most efficient to produce the particular agricultural products that we need, and not penalise those countries for those emissions going up because of the fertiliser inputs that might be required. As temperature rises basically you need more fertiliser for some of these things.

Q15 Sir Robert Smith: But I suppose the bottom line is that measuring our consumptions shows our impact on the climate.

Professor Barrett: Yes it does, but it is more than that because it can show us the options ahead of us as well. So therefore, I don't know why we would not want all the information available to us to make the best possible decisions.

Elena Dawkins: From a policy perspective as well, the consumption approach might appear more relevant to a householder if they are thinking about reducing their emissions as opposed to putting all the burden on an industry somewhere else. Thinking about it from a consumption perspective might help with that.

Q16 Dr Whitehead: DECC have said, from a policy point of view, that consumption-based reporting has very limited use in policy evaluation. Is it your view they would say that anyway, or do you think that they are perhaps looking at that from the wrong end of the telescope?

Professor Barrett: It is strange because they have used some of our analysis so they obviously find some application somewhere because, as part of the UK Energy Research Centre, we have undertaken research to understand the whole upstream supply chain impacts of energy technologies. David MacKay has been extremely interested in those results. That was derived using a consumption-based model; so they have used the data themselves. Defra have used it even further. They have used it to understand exactly how the economy is behaving and how much carbon intensity has improved emissions; how much of our emissions relate to our increase in consumption. It is being used extensively across countries across the world. So I think maybe they don't recognise the full range of applications of models from this perspective.

Q17 Dr Whitehead: Is there a distinction perhaps between policy evaluation—where you can make better sense of consumers' patterns and activities by looking at consumption-based reporting internally to the UK, as indeed some local authorities have done, for example—but when it comes to the UK's borders, the sovereignty issue then looms large?

Professor Barrett: We do have other policy options beyond the consumption side. We are currently doing a significant study with UKERC and the Centre for Low Carbon Futures on the use of border carbon adjustments and how much carbon would be captured, what is the leakage of each individual sector and what are the options of extending the EUTS to account certain sectors and price them effectively. So there are options. That probably would happen more at the EU level, but there are options available to ensure fair treatment of industry, both inside Europe and outside. I feel we have a duty with such stringent targets to explore all the options available to us, so I don't see a distinction or a concern about monitoring from both perspectives.

Q18 Dr Whitehead: Certainly, I have heard effective policy dismissals of consumption-based measuring essentially beyond our borders, that they are beyond our jurisdiction and therefore there is no great leverage on that. How would you counter that from a policy point of view, and do you think that in whichever combination you might use consumption-based emission reporting, then there is actually a policy grab beyond the UK's borders?

Professor Barrett: I think if you draw an artificial line that isn't relevant to climate change and the impacts that it has, you have to some extent lost sight of the overall goal, which effectively is to reduce emissions. Sometimes it is useful for us to implement policies that we could only implement within the territory of the UK, but I would not understand why we would not want to explore policies that could potentially create revenue in the UK and reduce our emissions imported from somewhere else. I don't know why we would not want to do that.

Dr Bows: Arguably, it is already happening with aviation: when aviation comes into the EU Emissions Trading Scheme we will be influencing all departures and arrivals through the carbon price in the EUETS, albeit not a carbon price that is commensurate with the UK's 2 degrees goal. Essentially we are going to be influencing passengers that are outside of our jurisdiction by having a policy such as that.

Q19 Dr Whitehead: Isn't there a sense in which this produces a new paradigm of inter-sovereign relationships in the process, and therefore from a policy point of view it appears to upset the applecart very substantially, as far as what is a sort of agreed process on negotiations and discussions? Therefore it might be seen as actually harming those discussions to the extent that it sets that new paradigm in opposition to what progress you might be able to make in those other discussions.

Professor Barrett: If those discussions were so advanced that they were so close to a global cap, then I would hold back and not say anything until such an agreement was signed. Instead, I think we are at a situation where we need to overcome the barriers, and so therefore new information to me can only be useful to do that. Two things are possible here: we have to be careful to distinguish, as I mentioned, between responsibility and attribution. Calculating our consumption-based emissions does not mean we have legal responsibility over them, and clearly there is a PR job to be done in the way that we document that. But also this information could be used to try to overcome key bilateral agreements for particular sectors in particular countries. Imports from China are significant, so this information could be used to promote bilateral agreements with the steel sector between those two countries. I know that discussion has happened along those lines already. So, in that respect, I think it opens up options as opposed to limits them, at a time when international negotiations could do with some help.

Q20 Ian Lavery: In terms of the climate change negotiations, the UK at this point in time is particularly vulnerable to the international criticism

because of the leakage of emissions, which is larger than all other industrial nations, and yet DECC asserts that the UK is still only responsible for 2% of global emissions. How accurate is DECC's assertion with regards to the 2%?

Dr Bows: One thing I would just say is that Shanghai can probably say that they have 2% of global emissions. Anybody can say that they are 2%, and I just think that grabbing on to that sort of quantity and making statements on the back of it is really irresponsible in relation to climate change.

Professor Barrett: We discussed it before and we said that 49 other territories could claim 2% and therefore should they not do anything about climate change? In that respect I am not saying it is not accurate, as from a territorial perspective it is, but I think we could be careful with our language to improve our integrity at the international level by recognising that we have a greater influence than 2% from consumption-based emissions. There is also our lead, and I very much welcome the comments that the UK Government makes to try and push for a global deal that other countries clearly do not make. I feel it will add further integrity to the UK's argument.

Q21 Ian Lavery: That is exactly right. If you think it is accurate what is wrong with the figure of 2%? What is inaccurate about the figure?

Professor Barrett: It is inaccurate in that it does not count our trade-adjusted emissions. So it is accurate from a territorial perspective, but it does not take into account the fact that we have other emissions associated outside the UK to satisfy UK consumption.

Q22 Ian Lavery: Do you think there should be an acknowledgement by the UK Government about its role in increasing emissions from developing countries and economies, as a consumer of goods and services? Do you think if they made such an acknowledgement that it would be respected? Do you think it would help or would it hinder the climate change negotiations?

Professor Barrett: My suggestion is that it would probably help and also it is not as if the UK is not doing anything to affect the emissions from its imported goods already, but at the moment that the evidence is fragmented, which is why I suggest that one of the next steps is to pull together all of the different strategies and policy areas where we are affecting them. The statement that "We recognise that we contribute to emissions outside the UK" should be followed by "and we are undertaking a number of policies, strategies and initiatives at the international level that recognises that". These could include being a strong advocate for a global cap; exploring the use of border carbon adjustments; exploring the use of bilateral agreements; exploring the reallocation of clean technologies to other countries; and looking at demand-side strategies, such as food waste and the longevity and use of products, and so on. So it can be, not spun, but organised in a way where the UK recognises its impact and also highlights what it is doing.

Q23 Ian Lavery: It is very interesting. Could this perhaps have a huge consequence on anti-trade policies with the UK?

Professor Barrett: Could you elaborate on that?

Ian Lavery: Could the emphasis on consumption-based emissions lead to protectionist anti-trade policies?

Professor Barrett: I know that there are potentially challenges for the WTO in relation to this. Recent academic analysis or analysis by lawyers, would suggest that it is possible to introduce border carbon agreements and there are a couple of clauses in relation to this, although I would be surprised if we see that. Another point is that the current price of carbon is too low to really affect strong protectionist policies.

Elena Dawkins: You are seeing it as an environment standard. If you are trying to adhere to an environmental standard and therefore importing goods that meet that standard, that can be similar to other environmental legislation where we do not import certain products below certain standards. I think it can be viewed in a similar way to that as a positive thing and potentially help encourage the mitigation efforts and shift production to those areas where it is most efficient in terms of carbon.

Dr Bows: I think there is also policy making, not just at the national level but obviously within organisations and businesses that are global and international and have reach across that, through supply chains, and I think that we are already starting to see policies being implemented within organisations to try to encourage the reduction of emissions within supply chains. So if organisations are starting to think in those terms, then we need to be thinking about that at a national level as well.

Professor Barrett: I would add that the UK is, in virtually all sectors, more efficient than the global average of those imports and a system of consumption-based accounting would highlight that the UK is performing better in terms of its emission intensity, so it is CO2 per pound spent. At the moment it potentially faces a price, even though it is not large at the moment, which imports do not. So therefore we need to find ways to encourage better carbon intensity and production inside the UK. I think this is one system that highlights a higher than average global performance by the UK.

Q24 Chair: I think 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?

Professor Barrett: We would say no because I would suggest you need to have a number of policy levers or a considerable number of policy levers to have control over those emissions if you were to have a target associated with them. You are at the whim of potentially other countries' climate change decisions on whether they go up or down and therefore that becomes very difficult to police what the UK should be responsible for and what others should be responsible for. So I would not suggest a complete change or a target at this stage but we would suggest

that the UK documents how it can affect those emissions in a positive way, and at the same time try and promote harmonisation at the UNFCCC in the global calculation of these emissions.

Dr Bows: I would agree with that. If we start to monitor and measure more regularly then obviously we will get better at that and we might be able to identify the aspects of the consumption-related emissions that we can influence, and maybe at that point you can start to set targets around those but obviously there will always be some emissions that we cannot necessarily have influence over and so it would be very tricky to set a target on that basis.

Q25 Chair: When you say we cannot have influence over the emissions from some items, presumably we can reduce our consumption of those items if we choose to, but you are saying the production methods used in other countries are completely outside our control?

Dr Bows: I wouldn't ever say completely but certainly you have a lot less influence on their energy system and their electricity provision—which is the energy that is then used for manufacturing those products—but, yes, at the consumption end you would have an influence. Yes.

Elena Dawkins: I think you would have targets for the mechanisms perhaps, so targets for technology transfer or targets for helping those countries or, if you identify where your main imports are from, targets for tackling those areas in particular and trying to help them reduce their emissions intensity. The inventory for one country can be based on data availability and the quality of data in lots of other countries, because of the nature of the way the models work—in some of the models you are taking data from up to 113 other countries. So it can be quite difficult to influence all of those different areas potentially.

Q26 Chair: Even if we did not have an actual target, could we commit to try and achieve a reduction in consumption-based emissions?

Professor Barrett: Yes, I would start by recognising and understanding all the policies that could affect them, and if we were to implement those policies then I suggest it would be appropriate to judge whether those policies have failed or whether they have achieved what we hoped they would. So in that case, yes, we could do that.

Q27 Laura Sandys: Just very quickly on that, there are other mechanisms, such as when we enter into bilateral trade agreements, when we are looking at innovation, product safety can become a barrier to certain products being imported. If, over a period of time, there was similar move on high carbon consumption, do you think labelling could play a big part or a marginal part in changing people's behaviour and also driving innovation in the sector?

Elena Dawkins: I think it is slightly model dependent because at the moment if you are looking at a 123-sector model you are looking at the average for that sector so you can definitely identify the sector that has a high emissions intensity compared to other sectors, but all the products that you potentially buy are aggregated to 123 sectors, or 57 sectors in other models, so to label one individual product and say that this is higher than another without doing some kind of process lifecycle analysis would be quite difficult at that scale.

Professor Barrett: I would say that the ability of carbon labels to do that would be limited, for the reasons that I mentioned partly before. I think this information could be more useful to drive forward bilateral agreements at the sector level to stop leakage, to address competitive issues, and also to invest to achieve the greatest bang for your buck.

Q28 Dr Whitehead: Could we talk about border tariff adjustments briefly? They might presumably be seen as illegal under WTO rules as a perceived trade barrier.

Professor Barrett: There is disagreement but there is more agreement in the literature to suggest that it would be appropriate and could be possible under WTO rules. What we could not do is put a tax that does not replicate the tax that we have placed on the product or the sector as a whole. It must emulate that policy, but there are environmental clauses where such a tax could potentially be brought into play. It is not conclusive but the literature does seem to be agreeing that it would be a possibility.

Q29 Dr Whitehead: This would be Europe-wide?

Professor Barrett: To me it would be a Europe-wide response to leakage from the EUETS. That would be the starting point, because we could not put a price on other products where we had not chosen to price that product. Therefore it must replicate the EUETS.

Q30 Dr Whitehead: So this would make an assumption about trade within Europe?

Professor Barrett: That is captured, so if we buy from a traded sector in Germany then it should, in theory—if the mechanism is working as effectively as it should do—have the same price.

Q31 Dr Whitehead: You have, as in the globe-travelling yoghurt pot, examples of products that fly in and out of the EU in the process of their production and then finally land up on your table having travelled half way around the globe, or some of the components travel halfway around the globe and then wonderfully merge in your yoghurt pot. How might that work?

Professor Barrett: Without giving a full explanation of a multiregional input/output model, those complexities are taken into account. You understand which products feed into every other product in every other country. This generates an extremely large matrix of all the interactions between industries and sectors. So we have measured the flow in and out of the UK and while I am loth to say the precise figure, I do have a figure in my head that around 80 million tonnes of carbon in the UK relates to the flow of products that go out and in again, of the 1.1 billion total from a consumption-based approach. So it is not a trivial figure and it can be measured. The project that we presented to the WTO recently on border carbon adjustments used this model. It is currently out for review and will be published shortly after Christmas,

and it will show the extent of all these flows and all the leakage related to sectors coming in. The biggest problem is trying to capture those effectively because steel does not necessarily come in as steel. It comes in hidden in a car, for example, so therefore you have to be slightly cleverer than just measuring raw steel imports.

Elena Dawkins: That is at the sector level so using these models you cannot identify that yoghurt pot on its own, you can only identify the sector which probably is something like food products not elsewhere classified, or something like that.

Professor Barrett: There is a homogeneity problem, yes.

Q32 Dr Whitehead: Right, but the actual effect of border tariff adjustments would ultimately land on the consumer's wallet, would it not?

Professor Barrett: Sure, as does any pricing of carbon. Yes.

Q33 Dr Whitehead: But under those circumstances, bearing in mind that consumers are purchasing particular things, then as you say it would be perhaps rather difficult to say, "3p on a box of yoghurt because of its world-travelling pedigree". Would you be able to do that? That would effectively put a backpack on products. Would that, in your view, make low carbon products more attractive to consumers or merely cause consumers to be completely confused about what they are paying for?

Elena Dawkins: I suppose that is the same with any carbon price, if you are allocating that to the industry, how much of that they take on themselves or how much they pass on to the consumer, or how much they manage to mitigate so that they do not have to pay the costs of that. I suppose from a consumer perspective, they would rather not pay more for their products but if we want to include carbon and if we want to include those environmental externalities that we are not necessarily currently paying for, then it is important that they are embedded within the costs.

Q34 Dr Whitehead: I am not sure I entirely understand all of this but what sort of trade-off in products—and it may be that you have had a look at this—would there be in terms of a transfer to consumers of border adjustments so that presumably there would be a number of products that would become relatively cheaper as a result. There would be a distribution trade-off in terms of—

Professor Barrett: Sure, I wouldn't try and guess the whole supply chain of the product and then add the value at the end. It is so much easier to tax production and then let the markets decide. The prices then flow through all the interdependencies of intermediate demand and you do not have to try and guess it at the end. So to me a border carbon adjustment figure is mainly driven by competitive concerns, but at the same time I think it would be easier to place the production on the factories where it is coming from as opposed to trying to guess and estimate with all the uncertainty down the whole supply chain. So that is how the adjustment would work, I think.

I was talking to someone at the WTO about this and he said it would never happen so his advice was, "Don't worry about it". Even though you may be able to argue that it was legal, he thought that this might be used as a mechanism or a tool to try and bring about more progressive targets territorially within other countries as opposed to a mechanism that might come into play. In reality we will have to wait and see, I suppose.

Chair: Good, that neatly brings us to 11.00 am. Thank you very much indeed for a very interesting and helpful session for us.

In the absence of the Chair, Sir Robert Smith was called to the Chair

Examination of Witnesses

Witnesses: **Jeremy Nicholson**, Director of Energy Intensive Users Group, **Ian Rodgers**, Director, UK Steel, **Fergus McReynolds**, Senior Climate and Environment Policy Adviser, EEF, and **Dr Richard Leese**, Director, Energy and Climate Change, Minerals Products Association, gave evidence.

Q35 Chair: Thank you for getting here very promptly to enable us to get started sooner than expected on our consumption-based emissions inquiry evidence. We have your biographies so if I may, I will ask the first question. On this debate about the impact of production-based approach to emissions, do you see it as giving it an entirely false view of the true impact of the UK on emissions?

Ian Rodgers: Are you asking, does the production-based approach give a false view?

Chair: Yes.

Ian Rodgers: It certainly gives an inaccurate view, yes. It gives a false view of the UK's total contribution to climate change, I would argue.

Q36 Chair: Do you all share that view?

Dr Leese: I would agree.

Jeremy Nicholson: Certainly the comments we have had from other intensive sectors, as well steel and mineral products, is that we are getting an incomplete picture and therefore an inaccurate one, which is unhelpful for policy makers and indeed for the industry. We certainly do not regard consumption-based reporting as a panacea. As I am sure you will find out from this evidence session, as with the earlier one, there are a number of problems with it, but it should be part of the picture we are taking into account. It has been a concern for us for some time that not only the Climate Change Act in the UK but various other pieces of legislation at the European level have given inadequate consideration to consumption-based emissions reporting.

Fergus McReynolds: Again, I would share the view that it gives an incomplete picture. In particular,

drawing on the comments from the last session in terms of policy development, it does not give us an accurate picture of what is happening and it can lead to unintended consequences because of that.

Q37 Chair: Do any of you have examples where the current production-based approach has forced manufacturing overseas?

Ian Rodgers: Speaking for the steel sector, no we don't. We have to look at the policy measures currently in place to encourage the steel industry to reduce its emissions, and that is primarily the EU Emissions Trading Scheme. Currently we have free allowances under the EUETS. So it would be implausible to argue that current policies, which of course are based on a production accounting methodology, have resulted in carbon leakage. What we have seen is a progressive increase in market penetration by imports of steel and that is all about our relative competitiveness compared with other countries. There is no doubt that, for example, the drive to decarbonise the power-generating sector has resulted in higher electricity prices across Europe and, in particular, in the UK, and that is driving down our relative competitiveness.

I think the third impact that we will see is that, certainly in the steel sector—and I am sure Richard will say the same for the cement sector—many of our companies are part of multinational groups. The investment decisions are no longer made in London, they are made in Mumbai, Helsinki, Barcelona, and indeed Russia and the USA. That will be an influence. The UK and EU's approach to mitigating climate change will be an influence on future investment decisions: if they think the UK is an increasingly expensive place to manufacture steel, they are more likely to put limited investment funds into other countries.

Dr Leese: If I could just add to that. In the written submission from the Mineral Products Association I drew attention to the announcement from Lafarge, one of the world's biggest cement manufacturers, who put a hold on investment in Europe and cited climate change policy as part of the reason for that. More recently we have seen in local press in the UK emissions trading cited as potential reason for a company that may lose jobs in the workforce. I don't think it can be claimed to be the whole reason, as Ian said, but it is certainly an influencing factor either on investment or on decision making to close plants in what are the worst market conditions that we have seen since records began in the cement industry in 1950.

Jeremy Nicholson: The concern we have had raised by most energy intensive industries is not so much about imminent closures, although there have been one or two high profile closures announced recently where concern about the influence of environmental costs on energy has been a factor. The primary concern is investment leakage, investment—as we have heard from multinational businesses—that can go elsewhere, where the risks are perceived as being lower due to less onerous climate policies, sometimes in other parts of Europe, but more particularly outside. We do have examples, if the Committee would be interested, of increased import penetration in glass, ceramic, brick-making production and other intensive industries that appears to have accelerated in recent years. Of course, that is not in itself evidence of change that has arisen as a result of climate policy, but it is consistent with it, and we believe it is a factor. It was certainly a factor in the recently announced closure of the aluminium plant in the North East.

I would also remind the Committee that important though the EU Emissions Trading Scheme is, it is only one client policy measure that impacts our members' bills. Obviously for bigger electricity users one should include electricity taxation in the form of the climate change levy and now also the UK-only carbon price floor, and of course the mounting costs of renewables as well.

Fergus McReynolds: Building on that in terms of wider manufacturing, those questions over investment and investment in the UK are not only being asked by multinational companies. We are seeing evidence from our membership that they are exploring investment in other regions, and—I will echo the points that have been made by my colleagues—while that is not entirely carbon legislation, part of it is. Carbon legislation is part of the cumulative effect that these policies, which are not being borne by other regions, are having on investment decisions. Again, we have evidence of that and we would like to share that if you would like.

Q38 Chair: To get a better handle on the consumption approach, you need more robust data. Tata Steel suggested that to start with we should have a default worst-case assumption on the consumption data until the people can come up with better data sets and maybe that would incentivise industry to produce clearer consumption data. Is that something you share?

Ian Rodgers: Yes, I think it is probably appropriate if both Richard and I answer this question because the profiles of our sectors are very different. For something like steel, which is a material at the start of some very complex supply chains, the process of calculating embedded emissions the further downstream you go becomes far more complex. Certainly, if we are just looking at the imports of steel products themselves it is very easy to take the approach as suggested by Tata Steel of taking the worst-case figure for embedded emissions in a steel product and then allowing the producers in another country to demonstrate that in fact their emissions performance is better than that, and then you can start adjusting the data accordingly. But the further you go downstream the more complex the calculation becomes, as the steel gets incorporated into components and into vehicles—and we heard earlier that vehicles is one of the largest sectors where you get this distortion between production and consumption-related emissions.

Dr Leese: Yes, I think for cement it is obviously much easier. It is a standardised product in many respects and factors can be used if you either import cement or its intermediate clinker into the UK. We have seen, as I put in the written submission, that imports into the UK are around 10% for cement, and that 10% is

not currently counted within the Climate Change Act and the Committee on Climate Change budget reports. I think it would be responsible of us to start calculating the consumption emissions but I think it is a first step. We have to recognise what the numbers are before we go into something more detailed such as targets and I think for some sectors it is going to be easier. As Ian mentioned, there are supply chain difficulties with doing that. We should not forget the supply chain issues once materials arrive into the UK or are produced in the UK. In the cement industry, for example, cement is largely used in concrete, and concrete used in buildings with a high thermal mass can be much more efficient than buildings without a high thermal mass. We should not forget about the lifecycle of products and their benefit to society. Our glass colleagues, if they were here, would tell us that making a triple-glazed product is more CO2 intensive, but in the long run it would save energy.

Q39 Ian Lavery: Just on something you have already mentioned, at the aluminium smelter in Lynemouth—which is in my constituency—they have said quite clearly that, as a result of high energy prices and the cumulative burden of emission taxes within the UK, they are going to close the business unless they can find a buyer. How much of a cumulative burden are the UK's emission reduction policies?

Jeremy Nicholson: There is some uncertainty about the precise figures, but if we start with the estimates that are produced by the Department of Energy and Climate Change themselves—which we suspect are underestimates, but nonetheless are considerable, and I think they are a good starting point—we can see that there could be increases in industrial electricity prices in excess of 40% by the end of the current decade, purely as a result of the cumulative burden of climate policies such as energy taxation, emissions trading, the carbon floor price and the various subsidies for renewables. There is uncertainty about the percentages there because we do not know what is going to happen anyway to fossil fuel prices over that period. Then there is also the question of the cost of direct emissions, the process emissions in industries like aluminium, steel, cement and so on, which to some degree are covered by free allocation under the next phase of the emissions trading scheme but not equally in all cases. I do not think there is any doubt that if you do an analysis of the sort of industries that are most at risk, it is precisely those such as aluminium that are the most electro-intensive and the most trade exposed. Of course the unfortunate decision about the Lynemouth smelter follows not long after the closure of the Anglesey smelter, where the issues were slightly different and that was in the depths of recession. However, lack of access to secure, predictably priced and adequately competitive low carbon energy supplies was a factor in the closure of the other smelter too. I think it is imperative that we learn lessons about this before less electro-intensive sectors are in due course affected by similarly difficult decisions.

Fergus McReynolds: Also, if I may comment, we have produced a piece of research that compares the electricity prices for electro-intensive industries in Germany and those prices in the UK. Looking at those from the most recent complete year in 2010, the differential between those was 10% and our estimates would see that rise by 2013 to a 15% differential, of which 24% of that price in the UK would be borne by carbon legislation, by climate change legislation. So from 2013 there is a growing difference between the prices of electricity that are paid across Europe as well.

Jeremy Nicholson: Further to that, there is a very great difference in the extent to which European member states place the burden of climate policies on these intensive trade exposed industries. For example, on a recent trip to Germany with the Energy Minister, Greg Barker, we met a number of German industrialists and learnt a lot about what was happening there. Whereas the standard rate of renewal subsidies is €35 per megawatt hour in Germany currently, which is paid by most consumers, a large electro-intensive business might only be pay €0.5 per megawatt hour and there are up to 90% discounts available on the €20 per megawatt hour eco tax. I mention these as two other climate policies that have just as much impact on the operating cost of an aluminium smelter or another electro-intensive business as the cost of the EU Emissions Trading Scheme, significant though that is. I do think we need to ask ourselves questions.

We will get back on to the specific issue of consumption-based reporting in a moment, but the issue we are trying to address is the competitive imbalance that arises from all these policies, and it is not, by the way, just confined to having a level playing field between Europe and the rest of the world, the UK needs to ensure that we have a level playing field within Europe as a bare minimum to allow manufacturing to remain here.

Dr Leese: If I could just add to what has been said about the cumulative costs, in the cement industry and the lime sector, which I represent, the principal costs are from direct emissions. If we see full auctioning in the EUETS, the cost to the cement sector could be €63 million[1] per year at €30 per tonne of CO2, and the lime production costs would increase by 50%. Work has been done to illustrate the impact, or the potential impact, of carbon leakage on the cement sector whereby the whole of the UK's cement and clinker production is at risk at just €24 per tonne of CO2. So that is just one element. Added to that is the carbon price floor, where in 2013 £2.5 million will be added to the electricity bills of the cement manufacturers and £600,000[2] to the lime manufacturers. My members are also in climate change agreements in the carbon reduction commitment in their wider business. So layer upon layer of added carbon tax, which, with two sectors listed as the most vulnerable to carbon leakage on the European list produced by the Commission for EUETS, lays those sectors vulnerable to any unequal carbon taxation.

Q40 Ian Lavery: Is it fair to say that cumulatively the burden is still high as far as the four individuals

[1] *Note from the witness:* "I should have said €260 million"
[2] *Note from the witness*: "£300,000 not £600,000"

are concerned, representing different parts of energy-intensive industries?

Jeremy Nicholson: I think it is unquestionably the view from the energy-intensive sectors that we work for and hear from, but, of course, it has to be seen in context. If the rest of the world will sign up to this agenda there would be no competitiveness issue arising from this. In some utopian world, we would have a global price for carbon, but the question is what we are going to do until we get there. The Committee has been asking about whether we should be looking at order tax adjustment or other mechanisms and there are advantages and disadvantages of that, which I am sure we will explore. But we are such a long way off an equitable pricing-in of carbon, even incidentally on a consistent basis with respect to taxation and renewable support policies within Europe, let alone outside. This is a risk issue for industry. We should not exaggerate that risk but it is hardly immaterial and it is a major factor—in some cases, the dominant factor—in some of the recent closure announcements that we have heard.

Q41 Ian Lavery: You mentioned before, Dr Leese, the introduction of the carbon floor price in 2013. Do you think that is going to make things better or will it make things worse?

Dr Leese: It will make things worse. It is directly off the bottom line. That is £2.5 million off the bottom line of the cement sector—a sector that has seen a reduction in output of 34% since 2007. We are probably one of the worst affected sectors by the recession because we supply directly into the construction sector, so it can only make things worse.

Ian Rodgers: In the case of steel, particularly the electro-intensive steel making process, which is the electric arc furnace, it will be an immense extra burden and one that is of dubious environmental benefit because I have certainly seen green economists argue that the net effect of the carbon price floor will be to increase emissions in other EU countries to the same extent as the UK reduces its emissions. So it is ultimately a fairly futile tax.

Dr Whitehead: But it does raise lots of money for the Treasury.

Chair: In the short term.

Q42 Dr Whitehead: How do you distinguish between what you have defined as carbon leakage and the other factors that may lead to, say, a shift of manufacturing out of the UK relating to low cost labour force, availability of natural resources, and so on? How do you tease the actual effect of carbon leakage out on the real processes as opposed to theoretical threats of carbon leakage, which is what essentially we have been talking about here?

Ian Rodgers: I don't think you can definitively arithmetically isolate one factor, but if we look at steel, firstly, it is a capital intensive sector not a labour intensive sector, so labour costs are of relatively less importance. In terms of raw materials, if we look at the largest steel producer in the world, China, they import all of their iron ore just in the same way as we in Europe import all of our iron ore. So, again, in terms of access to raw materials, the Chinese industry certainly has no comparative advantage.

The other major cost is energy and therefore discrepancies in energy costs have a disproportionate impact on sectors such as steel than on other less energy intensive sectors. I don't think you will ever find a decision that is based purely, simply and uniquely on climate change policy; there is always a whole host of other factors coming into play.

Dr Leese: I would agree with Ian, the cement sector is not a particularly large employer so labour costs are probably not a huge factor. As for access to raw materials in the UK, limestone is one of the most globally abundant raw materials and all of the cement sites in the UK are sitting on 50 to 60 years' worth of reserves and yet we still see imports in the range of 10% to 13%.

Jeremy Nicholson: Further to that I think no one would question in the intensive industries that decisions about closures or indeed starting up new plants rarely hinge on one single factor, but let's face it, if you are running a chemical process such as chlor-alkali chlorine production or industrial gases, energy could be accounting for anything up to 70% of your production costs, it is about 40% to 45% for aluminium smelting, and typically a quarter of the cost or thereabouts in steel production. This is such a big factor in any commercial decision, it would be strange for additional costs related to climate policies not to have some bearing.

As to teasing out which of two or more factors may have been influencing closure decisions, I would draw an analogy to something that happened five or six years ago, completely unrelated to climate policy, which illustrates the sensitivity of these industries to energy price rises. Five or six years ago, the UK had some problems with the competitiveness of our gas pricing as we were making the transition to import dependency—unrelated, as I say, to climate policy—in the year or two that followed, we saw both temporary production reduction in a number of gas-intensive industries and some permanent closures too. That is an illustration of how sensitive gas-intensive industries were to gas prices becoming uncompetitive internationally in quite a short space of time. I think we would argue that the danger is that we are heading into similar territory if electricity prices become similarly out of line for those industries, whether as a result of climate policy or otherwise. I don't think that fully answers your question, but it does illustrate the sensitivity of these industries to a major input cost becoming significantly out of line with one's competitors.

Fergus McReynolds: In terms of wider manufacturing, it is difficult to disaggregate between all of the impacts, but a recent survey that we ran with senior executives from the manufacturing sector said that two thirds of them saw opportunities in the low carbon green economy in supplying and also being part of that economy, but only one in eight thought the place to invest in that was in the UK. The examples they cited were in terms of consistency, and climate policies were part of that, as well as the growth strategy. So it is a concern.

Q43 Dr Whitehead: So in terms of energy-intensive industries particularly, you again have a question about which end of the telescope you would look at it through. While one may say that in terms of the UK landscape, energy-intensive industries are by their name rather intensive users of energy, nevertheless by international comparison they are not as intensive as other energy-intensive industries elsewhere in the world, therefore perhaps consumption-based accounting could put that into context. It has been argued from a global ecology point of view that keeping energy-intensive industries in the UK rather than exporting them is overall rather a good thing.

Dr Leese: I think it has to be, not just because if you compare a plant in the UK with a plant in, say, the Far East you might find that the plant in the Far East is quite efficient, because there are some new plants out there. But in getting the material from the Far East into the UK—and not just the transport emissions, but all the emissions associated with supplying that plant in the Far East—makes, generally speaking, the footprint of supplying that material to the UK higher. I don't think we should ignore that in our greenhouse gas accounting.

Ian Rodgers: I would echo that. Looking at the two different steel-making processes, for the electric arc furnace, the carbon intensity of steel produced through that route is almost entirely dependent on the carbon intensity of the electricity generated to produce the steel, and obviously it is the carbon intensity of the UK grid that is the prime consideration. So compared, for example, with steel produced in China where they are heavily dependent on coal, then, yes, UK steel and European steel would be less carbon intensive. Looking at the other steel-making process, as Richard said, it depends how modern the plant is. A lot of plants that have gone up in China are brand spanking new and will be state-of-the-art, but there is also a huge tail of old inefficient plants emitting twice as much carbon as we would normally emit in Europe.

Jeremy Nicholson: In the energy intensive users group we have done a number of projects, together with the TUC, looking at both the impact of climate policies on intensive industries and the opportunities for decarbonising them, and currently we are working on a report looking at those sectors' contribution to the UK economy, which is considerable.

As we have heard, none of our members are unalive to the possibilities of the green economy in terms of demand for their products, the question is whether they are going to carry on making them here or whether the economics are going to increasingly dictate that these products are imported. The examples of these are legion. You cannot build wind turbines, onshore or offshore, without a considerable quantity of cement or steel. Where is that going to come from? Similarly for expanding transmission and distribution grids, or for high speed rail, or indeed for nuclear or tidal barrages and so on. Civil engineering input into that is significant and this would be an opportunity for any manufacturer: the problem comes if one of your single largest variable costs is being pushed out of line with our competitors not so very far away on the borders of Europe and further afield.

Q44 Laura Sandys: You have raised a very, very interesting issue. When you go out and you procure through your supply chain and you buy steel or iron ore, you are looking at aggregates. In many ways what you are doing—and I am sure you are very efficient at it—is buying at the best price, looking at long-term supply, ensuring that you are keeping your input costs absolutely as low as possible, and then in parallel to that you say that if one was looking at green energy rather than carbon-based energy you would obviously be able to minimise your input costs quite significantly. Have you thought, now we are trying to open up the electricity market, of going into generation yourself?

Ian Rodgers: In fact every integrated steel plant in the country does generate its own electricity using waste gases that are produced elsewhere in the process.

Q45 Laura Sandys: But is that green or is there some carbon dimension to it? Is there some form of reduction that you can establish by using waste energy to generate—

Ian Rodgers: Yes, sorry, that is precisely what we do and integrated steel plants have been doing that for decades.

Laura Sandys: Right, I apologise for my naivety.

Ian Rodgers: No, no. The processes of firstly turning coal into coke, and then secondly of smelting iron ore and coke into liquid iron, both generate significant quantities of gases which are combustible. Those gases are collected and reused elsewhere in the plants.

Q46 Laura Sandys: How about reengineering your processes and looking at green sources of energy as part of your production?

Ian Rodgers: In the integrated sector, the main source of energy in effect is the coal that is used to produce coke, which is there for its chemical content. The coke is used in the blast furnace as part of a chemical reaction. You need the carbon in order to—

Laura Sandys: I am showing amazing naivety—

Ian Rodgers: I am at the extent of my own technical knowledge, I assure you. This process—the blast furnace process—has been taken virtually to the limit of how carbon efficient you can make it. So the industry across Europe is now looking, in a collaborative project, at what is the next step-change technology that we need, which probably will involve carbon capture and storage, but also with other technologies added on so that we can achieve that technological leap into a lower carbon form—.

Q47 Laura Sandys: To be frank, that must be the very big prize for you, if it is your largest component of cost within your production—or one of your very largest—innovation in that sector must be extremely important for you.

Ian Rodgers: Indeed, it is a multi-Euro research project that is going on collaboratively. It has to be said, though, that if—for example—we fit carbon capture and storage on to our blast furnaces and we can prove that is technologically feasible, that will entail not just huge capital costs, but also higher operating costs. So you do not necessarily get a cost

improvement as a result of being more carbon efficient.

Q48 Laura Sandys: Yes, but it would take away the carbon dimension that you are complaining about, that you are saying is a major problem in making those investment decisions.

Ian Rodgers: It would reduce that carbon dimension, yes.

Dr Leese: Likewise both the cement and lime sectors are researching carbon capture and storage, because in the cement sector 60% of the emissions come from the burning of limestone, so it is the process emissions rather than the combustion of the fuel. In the lime sector, it is as much as 70% process emissions, but carbon capture and storage will double the capital cost of a cement plant and double the operating costs. So it is out of reach at the moment, not just technically but economically.

But coming back to your original question about fuel switching, in the cement sector we have done a tremendous amount in terms of switching away from fossil fuels. We now replace 37% of the thermal requirement of the kilns in the UK with waste derived alternatives, a good proportion of which are biomass fuels. We have seen a 57% reduction in CO2 emissions in the cement sector between 1990 and 2010, so we have done a huge amount in terms of fuel switching. The lime sector too is starting to use waste-derived fuels in the speciality lime sector.

Q49 Laura Sandys: I am sure a lot of your members are in the business of developing more efficient—

Jeremy Nicholson: Indeed, but I would point out that the solutions for self-generated energy supply and for improving efficiency and reducing the carbon footprint are going to be different for different intensive sectors. There is already a lot of combined heat and power in the industrial sector, more I think in industry than any other sector of the economy, and in sectors like paper it is used routinely. For other processes, it is less practical to have on-site generation but that does not mean there cannot be long-term contracting arrangements with low carbon baseload energy suppliers. I think we are all looking to the electricity market review process here to see whether options, particularly connected with nuclear but other low carbon baseload may be feasible and therefore act as part of the solution to address the carbon leakage question that obviously the consumption versus production debate is designed to address.

Q50 Laura Sandys: But that is predicated on us being successful in getting the investment into the low carbon energy sector?

Jeremy Nicholson: It is, and some of that—at least for secure, competitive, industrial baseload—is coming rather late for a number of our members.

Q51 Laura Sandys: Could I ask a question mainly to Mr Nicholson because it is more to do with general manufacturing rather than energy intensive industries.

Chair: In which case it might be better—

Laura Sandys: Sorry.

Fergus McReynolds: That is fine. No, sorry, I think it may be that I would be better placed to answer that.

Laura Sandys: About manufacturing? Light manufacturing, not energy intensive?

Chair: Yes, the brief was wrong. Jeremy Nicholson is energy intensive.

Laura Sandys: I do apologise. At least I read the brief. When one is looking, let's say, at different forms of manufacturing, there many questions about China and competitive advantage and what impact our change policies are having. When you really look at things outside the energy-intensive sector, in many ways we are really talking about labour costs rather than climate change policies, are we not, which really make the difference?

Fergus McReynolds: I think it is part of the picture. I think the discrepancies or the differences in terms of labour costs are themselves reducing over time—

Laura Sandys: Yes, it is not inflationary.

Fergus McReynolds:—in China, and it is not perhaps the bargain that it once was that you could offshore to Asia and it would be cheaper to manufacture. I think in terms of what we are seeing is also the quality and the value that is added in terms of manufacturing here in the UK, there are supply chains that want the supply to come from here but it is about ensuring that that is competitive. For some of those issues—I think I made the point earlier—the effect is cumulative, it is step by step, a percent here and a percent there, but overall there is a marked difference. Those areas where we are significantly different are on those climate policies. I think the message that we have from our membership is that their supply chains, the people that are supplying—

Q52 Laura Sandys: You do not think the change in employment legislation would be more of an issue than our climate change legislation?

Fergus McReynolds: For me it has to be in the round, and we produced a report *Green and Growth* in September this year that looked at the wider growth strategy in the UK and whether that itself was being impinged on by UK climate policy. We are about to publish in the middle of December our follow-on report that looks at the solution to this, and a large component of that is about how the growth strategy in the UK needs to support investment in the UK. So it looks at the impact of the climate policies, how we think that could be improved but also what we feel is necessary to improve the investment in the UK through the growth strategy. I agree that both of those things that need to be looked at, but they need to be looked at in the round and not separate from each other.

I think in terms of what we are talking about here today, the same could be said about the consumption agenda. Not that the consumption agenda is the one thing that we should focus on, but it is the area that is lacking currently from thinking in terms of how we address our climate change impact.

Q53 Ian Lavery: The Stockholm Environmental Institute considered the challenges to a border tax adjustment and looked at the border tariffs. In your

view, would a border tariff adjustment make the UK a more welcoming place for manufacturing or would it have an adverse effect on the UK?

Ian Rodgers: Firstly, the UK cannot unilaterally impose any tariff on its borders, that is an EU prerogative so it would have to be the EU as a whole. Secondly, yes, there has been a lot of work looking at how one might be able to make border adjustments compatible with the WTO. That work has just shown how difficult it is—a joint report produced by the WTO and the UNEP said that the key consideration within the WTO is the notion of national treatment. So you would have to treat imports at the border in exactly the same way or pretty damn similarly to the way you treat domestic products.

We heard in the previous evidence session that you could, for example, have product standards whereby, for example, only fridges achieving a certain level of energy efficiency could be put on the market in the EU. That sort of thing is fine but that is not looking at the emissions produced, the emissions made, during the production of the goods. The question is how to achieve national treatment for that, in the context of the EUETS, which for products like steel and cement will continue to see a proportion of free allocation right through to 2020. There will be a balance of allowances that will have to be bought, but the impact of that on each company is going to be different; so how would you emulate that at the border by applying a similar tax to a Chinese steel product that equated to the cost that European steel was incurring at that particular time? It would be impossible. It would be a lot easier if we had a European-wide carbon tax instead of the EU Emissions Trading Scheme. I think that would still be of immense technical complexity to achieve national treatment, but nevertheless currently I do not believe that you could construct a border mechanism, either volume or value related, which was WTO compatible.

An alternative route, of course, would be to negotiate a multilateral agreement whereby all the participants—and this may well be a route to take if we ever do establish consumption-based targets—agree to suspend their rights in the WTO. The measures might not be compatible with the WTO agreements themselves but it would, in effect, mean that you didn't get trade disputes, because everyone has multilaterally agreed that there will not be such trade disputes. In the absence of that, I think border tax adjustments could lead to some serious trade disputes.

Q54 Ian Lavery: Just on a point of clarification, are you saying that legally there could not be a UK BTA?

Ian Rodgers: Legally there cannot be a UK BTA, no. We do not have control over measures applied at our borders on the import of goods. The Treaty of Rome put that entirely within the hands of the European Union.

Q55 Ian Lavery: Do you think in any event, if we were to have a BTA it would be unworkable because of the complexity of working out the carbon content of what comes in from different companies?

Ian Rodgers: Yes. Complexity makes it very difficult, complexity also makes it very difficult to make it WTO compatible.

Dr Leese: I think there has been some literature on the subject and there is a debate about whether it is WTO compatible or not. I think some conclusions say it might be easier for a product like cement and clinker, where there are fewer countries, to upset with such a move because the imports are not so great and it would not be imported in a product such as a car, as steel would. But border adjustment mechanisms would be important, and consumption-based accounting would give you the information to judge whether border adjustment is possible. The possibility of border adjustment mechanisms then gives you the leverage to use in an international agreement. I think it is that important dynamic that could lead us to a better accounting system for the globe as a whole.

Q56 Dr Whitehead: There is a further problem of disaggregation, isn't there, in terms of looking at UK's consumption-based emissions either from the point of view of a loss of UK's market share to imports or alternatively just to the fact that we like consuming things and therefore we are consuming rather a lot more and we keep on doing so. How might one get a handle on that?

Dr Leese: In cement we are one of Europe's lowest consumers of cement per capita. So in that respect we could still import and still consume what we need to consume.

Ian Rodgers: I think environmentalists might respond by saying, "Does it matter? Does making this distinction matter?" If the objective is to get global emissions down, that may well mean that people have to consume less.

Q57 Dr Whitehead: Presumably the squaring of the circle is putting a premium on a product that has lower embedded emissions and presumably, among other things, saying, "Buy my bag of cement because it has got sewage and car tyres in it rather than being made with very carbon intensive methods". Are there methods by which consumers could be persuaded to distinguish, do you think, embedded carbon in products for consumption?

Jeremy Nicholson: I am not clear that there is a great drive from consumers for energy intensive products from low carbon sources yet, although that may come. I think we may see this in the construction sector, and my colleagues will probably want to talk about that in a moment—steel and cement that are being used for "low carbon" housing and so on, so that it is low carbon in construction as well as low carbon in operation. There seems to be very little evidence that there is large consumer demand when you ask people to pay a premium for "lower carbon" products yet. One would have to be very optimistic to think that carbon labelling would make a great deal of difference to that and I think the danger—as we heard with earlier evidence—is that a lot of time and effort is spent on that to little effect. But at a macro level, understanding something about the carbon footprint of products and indeed basic materials, both in a production and consumption sense, could be

extremely valuable. I don't know how much we can learn from recent history on this, but you mentioned the difference between change and import penetration and growth in demand for products, but there could be things to be learnt from the recent recession where we have seen a savage reduction in the demand for certain goods and yet in terms of brick-making, glass and one or two other products we have seen import penetration increase over that period at the same time. So that might indicate something about increasing vulnerability to import penetration in those sectors, even if the overall demand goes down.

Ian Rodgers: We have definitely been seeing quite a lot of call from within the supply chain for more information on embedded carbon in the products that we supply. In the construction industry certainly, which is a relatively simple supply chain, but also elsewhere in manufacturing, it is relatively easy to provide data for a generic steel product. The problem comes where you seek to buy the steel product with the least embedded carbon. Which steel product has been produced most carbon efficiently? The data just does not really exist currently to do that. So the sort of data that is going down the supply chain is generic data about steel as a product. So it is not really driving purchasing decisions as to which source of steel to buy, but might driving purchasing decisions or design decisions in terms of which material to use in a product.

Dr Leese: I think in my membership, the asphalt sector, you can get the carbon footprint of the asphalt plant that is your supplier but, as I mentioned earlier, the embodied carbon issue is sometimes a bit of a red herring, because while there is a wealth of information on the carbon footprint of cement and concrete, it is how you use that concrete in a building that is really important. Designing the right building has shown that after just 11 years, the CO2 investment—some would call it penalty, some would call it investment—in the concrete in a high thermal mass building would be paid back. Now, we all build buildings to last a lot longer than that, particularly concrete buildings and heavyweight buildings.

Q58 Dr Whitehead: The suggestion of what is being said is that, from a procurement point of view, being able to procure on a low carbon specification would be fraught with difficulties?

Ian Rodgers: I think it is fraught with difficulties currently, on current knowledge of the data, certainly for steel. I echo the point made by Richard that for sectors like construction, it is actually asking the wrong question—it is far more important that buildings are designed to perform in a carbon-efficient way than that they use one steel product compared with another steel product that might have marginally less carbon embedded in it.

Fergus McReynolds: I think there is a good point to be made there in terms of procurement, be that public sector procurement or procurement within complex supply chains, looking at an outcome approach so that consumption emissions or perhaps lifecycle analysis give you a good indication of the outcome that you want to achieve. So, for example, in construction, it would be housing stock that is low carbon over its lifecycle, including its construction and its inhabitant. There is a good argument for outcome-based procurement strategies as well.

Q59 Laura Sandys: Would looking at a consumption-based approach allow the hot spots in the supply chain to be identified? You talk about an audit of your supply chain to give us more information about where energy-intensive activities are happening within that supply chain: would it deliver greater transparency and in many ways possibly deliver greater innovation?

Ian Rodgers: Potentially it could. On the level of today's knowledge, no, it would not. You would need a lot more data on an individual company's carbon efficiency to identify carbon hotspots in the supply chain. I would see it as a natural development from just starting off with consumption-based accounting in the first place. As we become more sophisticated with the data then it is the sort of thing that might show up, yes.

Fergus McReynolds: I think I would agree that when you have the capacity to do so it is a hugely valuable tool, but it is very difficult. I think there are mechanisms for looking at embedded carbon, but there are—for a lot of SME companies—barriers to doing so in terms of the cost of looking at carbon footprints, particularly looking at a single product carbon footprint. Some of the major suppliers of that evidence will charge in the region of £30,000 to £40,000 to look at an embedded carbon footprint for one product. So there are barriers. There is work ongoing at the moment and it does have value when you can identify those hot spots in this sector, because sometimes it shows up something that you would not have realised and gives you a clearer picture of exactly where you need to concentrate.

Dr Leese: Perhaps I could give an example of what could be lost in the supply chain if we do not go towards a consumption-based accounting system. My lime members supply the steel sector, which as a by-product produces ground granulated blast furnace slag, which is then used in cement and concrete production. In cement production, we use over 1 million tonnes a year of by-products and waste materials and yet we only produce about 15,000 tonnes of waste as a sector. In the industrial supply chain in the UK, there is an added benefit to having a domestic cement production and steel production and so on, and that will be lost if we do not go towards some kind of consumption-based accounting.

Q60 Laura Sandys: While I know there is a resistance to some of the climate change legislation, in many ways it is driving innovation and is an incentive for you to look at the supply chain more effectively, for example. Would you say that when you are looking at your UK production as opposed to other parts of your international companies, that in the UK and in Europe you are innovating more effectively, or

are those investments decisions just being made very clear—black and white—that this is a more expensive market to operate in than X, Y and Z?

Jeremy Nicholson: Recently, unfortunately, I think it has been more towards the latter and you can understand why. It is not because there is an anti-environmental attitude in industry: if there is money to be made out of the green agenda you would imagine that the investors in it would leave no stone unturned to ensure it is suitably exploited. But these are difficult times, and small differences in the cost of producing something in one region as opposed to another—when margins are under pressure, and economic growth is slow or non-existent in parts of Europe and beyond—make a big difference. This is not a comfortable time for people to be making speculative investments, whose success may depend on the political and economic sustainability of some of the climate policies we have adopted here and elsewhere. You can understand that in the current international context that is a difficult thing for someone to bank on.

Ian Rodgers: There is no doubt that for industries such as steel and cement there is a lot of economic logic in making the product as close to the customer as possible, for all sorts of reasons. I think it is unlikely that any of my member companies are suddenly going to say it has got too expensive for us in the UK, we are going to shut down this blast furnace in wherever and move it to China or India or Russia or somewhere where the cost base is more attractive. I don't think that will happen but what we will see is a progressive loss of market share to imports coming from lower priced countries if we don't ensure that the costs of operating—the climate-related costs of operating—in the UK are not kept broadly comparable with those elsewhere.

You mentioned the word "incentives", and that brings us to the issue of the stick or carrot approach. If we get assistance with research and development, for example, that will immeasurably help us take the next technological leap. If we are hit by higher costs as a result of having inadequate allowances in the EUETS, for example, that will have the opposite effect.

Laura Sandys: Thank you.

Chair: Thank you very much. Thank you for your evidence, it has been most useful in preparing our report and it is a fascinating area to explore at this time with so many challenges facing the industries. Thank you very much.

Tuesday 17 January 2012

Members present:

Mr Tim Yeo (Chair)

Dan Byles
Ian Lavery
Christopher Pincher
John Robertson
Laura Sandys
Sir Robert Smith
Dr Alan Whitehead

Examination of Witnesses

Witnesses: **Dr Keith Allott**, Head of Climate Change, WWF-UK, **Eric Lounsbury**, Associate Director, Carbon Trust, **Guy Shrubsole**, Director, Public Interest Research Centre, and **Chris Tuppen**, Director, Aldersgate Group, gave evidence.

Q61 Chair: Good morning, and welcome. Thank you for coming in to discuss this subject, which we find very interesting, even if it is somewhat technical for a lot of the outside world. May I start with a general question? Do you think that measuring emissions on a consumption basis is going to show that the UK is responsible for a much larger proportion of global emissions?
Dr Allott: I can start. On a consumption basis, the UK's share of global emissions is clearly more significant than under the production or territorial approaches. What is interesting is what that tells you, and what you do about it, in terms of policy conclusions. That is a particularly rich area to explore. The UK does have a very significant responsibility for global emissions, and there are different ways of looking at our responsibility, other than by consumption. You could look at our historical emissions, because of which we are probably the biggest contributor to the carbon already in the atmosphere. You could look at the carbon impact of the UK in terms of our investments from the City of London, which would also give you a much bigger figure than our 2%. You could look at the UK's role in the world, in terms of our cultural, industrial and financial leverage. I think we have a huge responsibility in the UK to show leadership, however you measure the metrics of the UK's footprint.
Guy Shrubsole: Absolutely. I would just add that, while obviously historical responsibility is vital and an essential part of the measurement, it is also useful that the consumption approach to measuring emissions shows that the UK is continuing to be an important contributor to rising emissions in the world because, as the Committee will have heard in earlier evidence, on a consumption basis, UK emissions have actually risen by 20% since 1990, despite the fact that domestically emissions have dropped by around 14%. That is a very important finding, and it is important that we are honest in the way that we account for emissions, which is why I would wholeheartedly support a consumption-based approach, as a complementary measure to production-based accounting.

Q62 Chair: Would it be helpful if the Government acknowledged this more clearly and publicly?
Guy Shrubsole: Yes, absolutely.

Q63 Chair: Will this also be embarrassing for some other countries? Would the United States' position look even worse?
Chris Tuppen: I think it would be very helpful for the Government to look at this and report. It is complementary to how the Government encourage businesses and organisations to report their carbon emissions. If you were to consider the UK as a business, UK plc, then companies are being encouraged very much to look at the emissions in their supply chain, as well as at their direct operational emissions. It would be very complementary to the way in which the Government are encouraging business to look at its emissions.

Q64 Chair: Yes, that seems quite a strong point, but you can see why a Government—of whatever party—might be reluctant to go in for too much self-flagellation. Would it therefore help if we were to suggest that other countries should do the same thing? There clearly would be other countries in a similar position to Britain—countries that have been claiming a reasonable, or sometimes not even terribly good, performance, and whose performance would look much worse if measured in this way.
Guy Shrubsole: We should not necessarily feel that we are leading on this. Already there are other countries starting to take a consumption-based approach to looking at emissions; Sweden and Switzerland, I believe, are already beginning to implement this and to create legislation around it. Also, in the Scottish version of the Climate Change Act, there is already an obligation on the Scottish Government at least to account for consumption emissions.

Q65 Chair: Commendable though initiatives from Sweden and Switzerland are, are any big countries doing this?
Guy Shrubsole: I believe that that is the sum total of countries doing it so far, but obviously the UK has always prided itself on being a leader in climate change mitigation efforts.

Q66 Chair: Will the public understand this, anyway?
Dr Allott: I think this needs to be messaged clearly to the public. There is a potential risk in the messaging around this that could reinforce what is actually a very dangerous and frankly misleading narrative that it is

not the UK's fault, that it is all China's fault. That story is out there in the public mind, and it is being amplified in the media, for instance. It is actually very misleading and dangerous. Presented in the wrong way, there is a danger that this approach could be used to say, "So it's not worth us doing anything domestically." That is completely the wrong conclusion to draw from this approach. We need to carry on doing what we are doing already on the production side to decarbonise our economy, and do it faster and better, and we need to look clearly at things that we can do here and in other countries to improve the material efficiency of our economy.

Q67 Laura Sandys: May I follow on from that? Would you not say that by looking at consumption, we engage the consumer in a way that you cannot through production? Consumers do not run nuclear power stations, but they can make decisions. Even if it is not a perfect science, and even if we do not get it absolutely right, do you not think that this is a mechanism by which there is communication, a change of behaviour, and potential uplift?
Dr Allott: Absolutely. Done right, I agree. I was just warning that it can also be played in an unconstructive way. It needs to be handled sensitively and well, but it can be used to engage people, to change behaviour, and to have better decisions about how we choose to consume.

Q68 Chair: On behaviour change, what are you expecting? Are you saying that we should stop buying goods that are produced by energy-intensive companies in China that are using electricity produced by coal? Is the solution simply not to trade? Is that what you are suggesting?
Guy Shrubsole: Certainly not. What consumption-based accounting does is exciting, because it opens up a whole new scope of policy looking more comprehensively at demand-side measures, and not simply supply-side measures, as you mentioned. That will engage the consumer far more, and will mean having a proper discussion about green production and green consumption methods.
Laura Sandys: And about waste as well, which is a fundamental issue in our society.
Guy Shrubsole: Yes. These policies are already being pursued by DEFRA, but they are not necessarily being—
Laura Sandys: Incentivised.
Guy Shrubsole: Incentivised. Exactly.

Q69 Chair: I wonder what the practical consumer behaviour change is. If you are talking about demand-side, are you going to say, "Don't buy these goods"? Is that what you are saying?
Eric Lounsbury: You cannot have quite that direct a message, can you? One of the things that it opens up is adding transparency to decisions, so you can say, "Look, this ingot of aluminium is different from that one. They've come from different places, and different emission intensities have gone into them." That is an important part of what the consumption approach could be. At the Carbon Trust, we have had some experience with this on the consumer level, in trying to influence consumer decisions as they see a direct consumer product in the supermarket. It is a powerful differentiator.

Q70 Chair: In the end, what you are saying is: "Don't buy them."
Eric Lounsbury: No. You can provide the information.

Q71 Chair: What do you then expect the consumer to do with it? Just feel a bit bad about buying something? Or not buy it? It has to be one or the other.
Chris Tuppen: I think one needs to look at the consumer in a broad sense here, and not just as the end consumer buying something in a supermarket. A lot of purchasing decisions, especially international, cross-border ones, are made at a business—and, indeed, sometimes Government—level. Those procurement decisions can be influenced much more strongly by looking at a consumption-based reporting model.

Q72 Chair: So Tesco is going to say, "Okay, chaps, we'll put up the prices by 5% in order to buy from some country that is a bit more green"? Is that what is going to happen? You are not in the real world, are you?
Chris Tuppen: I am very much in the real world. If I look at what is happening with businesses and things like fair trade and working conditions in the supply chain, companies in this country and internationally have made quite significant changes happen within those supply chains as a result of their procurement activities, not necessarily in terms of spending more, but in terms of longer-term contracts and building partnerships and relationships. The same kind of influence can happen with carbon and energy in the supply chain.
Eric Lounsbury: It is also dangerous to presume that the more carbon-intensive ones are necessarily the cheaper products. I think it is not always necessary to make that trade-off. That will sometimes be a trade-off, but I do not think it is at all the case that no one is willing to pay a premium—any premium.
Dr Allott: I could give one specific example, which may be useful, to do with food, which I think is a good example of how this could be used well. About 20% of the UK's GHG consumption footprint comes from food, if you ignore land use change. If you include the indirect impact of the land use change, it could rise to about 30%. A major contributor to that—probably more than half comes from this—is meat and dairy, which is actually a very small part of the sector. Changes in individual consumption, and also procurement decisions and supply chain management by major food companies, can give you a real handle on that, but a lot of those emissions arise outside the UK.
With that sector in particular, you get a whole new approach towards managing the footprint, and you bring together consumer choices and the approach of retailers in the food supply chain very effectively through a consumption approach in that sector. For other sectors, like the power sector, the levers are in

a different place, and you need to look at where the levers have the biggest impact on outcomes.

Guy Shrubsole: I might just add that this is really about partly insulating the UK against increased price rises in the future, because as Governments are moving around the world to combat climate change, in countries such as China, there already is an implicit carbon price in production. As China and other countries that manufacture the products that we import come to tackle climate change more effectively, the price will actually rise. To combat that, we should be becoming more resource-efficient as a country. We should be reducing the material throughput of goods that we import to this country, thereby insulating ourselves against those price rises.

Q73 Laura Sandys: This shows my lack of knowledge about who has done the analysis, but has anybody done a full analysis of the amount of carbon we waste—that is, that we use for non-productive purposes? Right across the food system, the amount of waste is unbelievable, but in all sorts of other parts of our lives, waste is endemic. Has anybody put a carbon price on that? You start to value that and then you also get some uplift by people changing behaviour or valuing things in a different way.

Guy Shrubsole: To give one answer, I am not aware of studies that have been done of that sort. It rather comes down to what you mean by and define as waste. One area that I know DEFRA is looking at currently is around longer product lifetimes. Actually, it is a form of waste if a product is disposed of before it is worn out, or if it has a level of inbuilt obsolescence to it. That is clearly a form of waste of energy and resources that should be being discouraged, but as yet there are only tentative moves towards that, whereas a consumption-based approach would help to enable that.

Chris Tuppen: I am not aware of any UK-wide figure that calculates that sort of wasted carbon, although I am aware of some analysis looking at specific product streams, and particularly looking at the end of life or often very rapid obsolescence of a lot of products these days that come in, often from the far east, with a lot of embedded carbon in them. Of course, if we use them for a year or two—take a mobile phone, for example—all that embedded carbon then gets lost from the system if it simply goes to landfill. The opportunity to get the reuse, remanufacture and, ultimately, recycling of materials all happening within the UK would be something that would flow very much out of taking a consumption-based view of carbon accounting.

Q74 Sir Robert Smith: You all seem to agree that a consumption-based approach would give a better picture of the UK's impact than a territorial one; would it be fair to say that?

Dr Allott: I do not regard it as an either/or proposition. In practical terms, I think we have a very well-established accounting framework based on territorial emissions. We have an EU policy and accounting framework, and a UK Climate Change Act based on that framework. That is robust, and it is helpful in guiding many aspects of the transition to a low or zero-carbon economy in the UK. It works, but the danger in relying on any single metric is that it can lead to perverse consequences. Having the consumption-based approach to reporting alongside the established approach gives additional insights, guards against perverse consequences, and can help to improve policy formulation.

Q75 Sir Robert Smith: Would others have a similar view?

Eric Lounsbury: I agree with that. Some work that we did shows that consumption adds quite a lot to the UK's responsibility—about a third in 2004. Indeed, that could grow to mean that half of the total consumption emissions of the UK by 2025 are from overseas. The conclusion is not that focusing on production emissions is not worth while; in fact, quite the opposite: we should succeed in reducing our production emissions over that time, which is valid and essential. However, as a complement, the figures tell us, "There's another problem, by the way. Don't forget about the fact that you're going to use more."

Q76 Sir Robert Smith: Yes, because if you are reducing production by increasing consumption—

Eric Lounsbury: Well, it is not necessarily—

Sir Robert Smith: If you were.

Eric Lounsbury: One of the things that we looked at is how much of that is displacing something that would have happened in the UK, and how much of it is just increasing somewhere else. It is not necessarily a trade-off; indeed, the broader effect is that we are just consuming more stuff. If we have tackled one half of the problem, which is producing the stuff that we produce here more carbon-efficiently, that is a huge part of the battle, but we should not forget about the other piece of it.

Guy Shrubsole: I would agree. It is not that there is a direct trade-off, necessarily, between a policy around production and consumption; it is the fact that, although we are becoming more efficient, and technological efficiency is improving, our consumption has, so far, actually outstripped that efficiency. The efficiency gains that have been made have, so far, been outstripped. That is why we have a rising level of consumption emissions.

Q77 Sir Robert Smith: How far do the complexities and uncertainties of calculating consumption limit the usefulness of such a measure?

Eric Lounsbury: I guess it depends what uses you have in mind. One of the key points is that there are absolutely key uncertainties, but, for some things, we can say pretty definitively that consumption, and the import of emissions due to consumption in the UK, do add to the total footprint. Certain countries are a bigger part of that than others. Certain product classes and certain commodities matter more than others. Calculating consumption helps you focus on the problem. Will it be down to such a level that you can establish caps, as is done in current reporting frameworks under the international negotiations? It is probably not there yet, but that is not necessarily the bar you are trying to get to. There are probably some uses that work, and some that it is not quite ready for.

Chris Tuppen: The way in which the consumption-based reporting that DEFRA has commissioned from Leeds University is modelled is good at a national level, and at being able to calculate some of those consumption flows at a macro-economic level, but if one is looking to translate that into action in response to that, at a particular product level, it does not naturally translate.

The economic input/output models that have been used effectively chunked up all products into, I think, 57 categories. That means that each of those categories has a massive array of products lumped into them. If one then wants to move into a more detailed policy-level or purchasing-level response, one needs much more detailed analytical information, which usually comes only directly along the supply chain from the suppliers themselves. Often, that information is not forthcoming and not actually there at the moment, which is why we are encouraging people to see this as a journey.

Ultimately, when there is much more detailed information, and more information flows are coming through the supply chain, one could get to the point of establishing targets and objectives. At this point in time, it is about using these things to influence the overall purchasing behaviours of organisations, as well as encouraging those organisations to interrogate their suppliers and to ask for the information to start flowing through the supply chains. That information could ultimately feed into a more accurate assessment methodology at a national level.

Guy Shrubsole: I think the subject can get very detailed and arcane very quickly. There is a danger that we get too preoccupied with trying to get the nth level of detail. We should not lose sight of the bigger picture, which is that what information we do have shows that the UK's emissions have increased on a consumption basis and, therefore, that that is something that ultimately needs to be addressed if we are actually to contribute to reducing climate change. I think this is absolutely about the level of detail for a specific level of policy, but there is already an enormous set of uses that this approach could be applied to.

Eric Lounsbury: I would just add that we should not feel too overwhelmed by the task ahead of trying to get to the next level of detail about some of this information. For example, the aluminium sector feels like this big, giant, global sector, and I think there is something in the order of—I cannot remember the exact figure—120 primary aluminium smelters globally. That is something that you can get your hands around, and you can make real detailed assessments of what is going on in that sector and its big share of emissions. Similarly, some of the work that we have done in labelling at the Carbon Trust has shown that as you do more and more specific product labelling, you can do it quite cost-effectively as you build up the databases that underlie each bit of the supply chain. There are no insurmountable problems to get to the next level of detail.

Q78 Sir Robert Smith: Is the labelling making a difference?

Eric Lounsbury: Well, that is one of the key questions. The point came up earlier about willingness to pay for something that is lower-carbon. The jury is still out on how much consumers value that ultimately, but there is an underlying desire. In surveys that we have done in the past, the majority of UK consumers have said that if they knew about a lower-carbon product, they would buy it. Now, can we parse the data that actually show that they are buying lower-carbon products? We have not been able to do that yet.

Sir Robert Smith: Obviously, if there are other factors that are equal—

Eric Lounsbury: Yes.

Dr Allott: On that front, I have some personal scepticism, on some of the products, as to whether it is actually making any impact on individual behaviour and decisions, but the tool, in terms of allowing companies to manage their supply chains and improve the performance of the supply chain, is probably making a genuine difference. It is easy to see just the public output, which is the label on a packet of crisps, and one may have a certain level of scepticism about whether anybody is going to choose a slightly lower-carbon bag of crisps when they might want prawn cocktail instead. However, the company may have been able to do some very significant things all the way along its supply chain to improve the management of the carbon.

Chris Tuppen: And indeed did, in that situation. They discovered that farmers were selling the potatoes by weight. The more water there was in the potato, the more the farmer got paid, but it took more energy to cook the crisp—to dry the water out in the manufacturing process. Actually understanding that full life cycle analysis did reduce the total carbon footprint of the crisps. It had a very practical output.

Q79 Dan Byles: On the supply chain, that is quite an interesting example. Do you think it is perhaps fair to say that individual companies, rather than Government-level initiatives, are going to be driving this? Can the EU ETS ever be subtle enough to capture the supply-chain emissions of products in the way that companies that are interested for what you might call more personal corporate reasons will? It is hard to imagine us setting up a regime that would have made that company do that. Do you see what I mean?

Chris Tuppen: Yes. First of all, it is not just companies. A good example is the NHS. They have set themselves a consumption-based reduction objective. The biggest share of NHS emissions is in the supply chain. They are not from running hospitals or driving ambulances. Drug manufacture is the biggest issue. I do not know too much about the European Emissions Trading Scheme—maybe Keith can answer that—but by setting that objective within the NHS, they are now talking to the drug manufacturers about the carbon intensity of the drugs they are bringing in and what the restrictions are around that and how they can drive that down for their overall consumption-based carbon footprint.

Dr Allott: I would say that, frankly, we need many tools in the toolkit to address this incredibly complicated issue of carbon. We need tools that do

direct things, such as decarbonising the power sector, and those may be things like the EU ETS or frankly just a very good framework to drive forward renewable energy. That would be great. Price mechanisms are not very good at reducing consumption of electricity alone, to take just one example. You need to have other complementary policies, such as a targeted energy efficiency programme, product standards or procurement policy by Governments or major corporations. Frankly, you need a whole suite of complementary policies.

Q80 Dan Byles: Does the current EU ETS take that into account? You mentioned that two thirds of the emissions associated with aluminium use in the EU originate outside the EU ETS area. Are they in any way taken into account at present?
Eric Lounsbury: Not at the moment, no. I think you are referring to some of the analysis we did. To build on the idea of complementary approaches, we need different approaches for different kinds of product. Some of the analysis that we did showed that about half the emissions that are embodied in products traded internationally are from commodity-type products, and half are from more finished products. You cannot put an international, border-adjusted carbon price on something that is not priced within the zone into which you are importing. Straight away, if you look at the EU ETS and the mechanisms that exist in Europe, you cannot start talking about putting border-adjustment mechanisms on cars or on computers. You can talk about doing that kind of thing for the things that are covered by the EU ETS, such as steel, aluminium and cement. There are very clear regulatory approaches that could work there, but you are probably going to be left with some of the more voluntary approaches of labelling and communicating the carbon intensity of the more complex goods that you are importing.

Q81 Dan Byles: Are you talking about when we start getting down to the Scope 3 indirect emissions and those sorts of things?
Eric Lounsbury: We will stick with aluminium. About half the aluminium-related emissions that are embodied in imports to the EU do not come into the EU as big things of aluminium; they come in as other stuff. We need to have that full sense of "what is that thing that you are importing?" If it is a PC, for example, what are the range of things that have gone into that supply chain—the Scope 3 emissions that are embodied in that product as it is imported?

Q82 Dan Byles: Would it ever be feasible or valuable to mandate the reporting of Scope 3 emissions on products?
Chris Tuppen: It would certainly be feasible to do it. As I said earlier, the data at the moment are not robust enough coming out of the supply chain to give figures that companies would feel comfortable addressing targets against. Often, on the data that come from things such as life cycle assessments—particularly if one is doing it at a more sectoral level with these economic input/output metrics—there can easily be 30% error. If you are trying to set yourself a company target of a few percent over the next few years, say, and you have errors of 30% and most of your emissions might sit in the supply chain under Scope 3, it is not getting to the point where it would be appropriate to mandate that as part of the formal carbon reporting and targeting that a company may do. However, I think companies should be strongly encouraged to start to bring those data out and start to be transparent—

Q83 Dan Byles: The Aldersgate Group has said that it thinks the UK should be a pioneer in this. What do you mean by that?
Chris Tuppen: I am not sure that necessarily the UK should lead. On the question that was asked earlier, I think we should encourage other companies. Indeed, at a corporate level, the organisation that effectively oversees the corporate reporting guidance out of which Scopes 1, 2 and 3 derived had been doing a huge amount of work on this area around Scope 3 emissions. That has been a very strong international collaboration.

Q84 Dan Byles: In a sense you are saying that at the moment it is too early to be mandating it, because it is not quite that finely tuned yet, but we should all keep going forward at our own speed and encourage people to do it, and at some point further down the line we might find that the granularity is there to start making it more formal. Is that effectively what you are saying?
Chris Tuppen: Yes.
Eric Lounsbury: I think that is broadly right. Not every company is reporting Scopes 1 and 2, as we know, which is why it is being considered whether that kind of approach should be made mandatory. Indeed, many companies, if you asked them to do it, would struggle to make Scopes 1 and 2 happen. That said, we are now at a point where we could imagine mandating that, which probably was not the case 10 years ago. In a few years' time I do not think it would be unimaginable that we could be in a place to mandate Scope 3, and it would be valuable to do so.
Dan Byles: A bit of evolution, rather than revolution, at the moment, perhaps.

Q85 Christopher Pincher: I was interested by something that Mr Lounsbury said earlier, and I think you have all picked up on it, which is that by 2025 half of British emissions will be embedded in imports from overseas. But DECC has said that it uses the territorial approach to emissions because it believes that Governments have a "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." To what extent does Britain have an influence over the very significant amount of emissions that are embedded in overseas products?
Guy Shrubsole: If I might read out something that DECC itself stated in a document released under freedom of information earlier this year. In relation to consumption emissions, they state "we recognise that we do have a certain amount of control over emissions from abroad, as this is where many of our products

come from. Consumer demand can be a powerful influence on manufacturers…by purchasing these products, we are contributing to that energy consumption." So, of course, nobody is really suggesting that we have control over what happens in factories in China, for instance, but as a result of our consumption patterns we do have influence—we have consumer choices, purchasing capabilities and government procurement contracts—on these emissions.

Dr Allott: I think that is true. There is a lot more that we could be doing here in terms of our resource efficiency, product policy and approach to consumption across a whole range of economic activities in the UK. There are other aspects where the UK does have real control over elements of the disparity between the territorial emissions and the international emissions.

The first is a decision coming up this year formally to include aviation and shipping emissions within the Climate Change Act. That decision has to be taken by the end of this year and is one significant chunk of the disparity. We sincerely hope that the Government will follow what we expect to be the advice of the Committee on Climate Change by including those emissions in the UK's carbon budgets. That is one aspect.

Another aspect is that it is important to take a global perspective on these emissions in parallel with the UK perspective. What is the overarching international policy framework to help those producer countries decarbonise? This is partly about moving towards a stronger international agreement, which the UK is quite strong on trying to achieve, and we desperately need that. We cannot solve all this just through a UK approach; it needs to be seen in the context of a global approach. But there is stuff that the UK can do by driving forward existing commitments and provision of international climate finance to countries such as Brazil to help stop deforestation, which will have a direct impact on the emissions from, say, our food chain. Copenhagen has a commitment to provide climate finance of $100 billion a year by 2020. That is actually part of the obligation of consumer countries to help the transition in other countries.

The final aspect of this is that there is also scope for some bilateral approaches between Governments, where there is a particular trade dependency, to look at ways of working to improve carbon efficiency in particularly important lines of trade.

Q86 Christopher Pincher: What I am hearing is that either the Government act bilaterally or internationally to come up with a framework that will mean that Britain is not unnecessarily hampered in its production or consumption of goods and services or it is for individuals to make consumer choices about what they do or do not buy, but you do not think that Britain should act unilaterally to impose consumption tariffs on embedded carbon. Is that correct?

Guy Shrubsole: Tariffs are really only one policy lever.

Christopher Pincher: And that is an example—

Guy Shrubsole: It is obviously a controversial one, because it is often seen as a unilateral measure that would be taken—or often imposed on a developing country. What we are really looking at here is, I think, two things. The first, as Keith has said, is bilateral deals: the potential for integrating environmental standards into bilateral trade deals in the future. There is a whole scope there that should be looked at in much more detail.

Secondly, I do not think it is just about devolving all this to individual consumer choice. I do think that we need some sort of green consumption road map, just as we have a green economy road map, which would bring together experts who are already looking at this, and those within DEFRA and DECC. There is a large number of people in DEFRA looking at this. Unfortunately, I do not think there is sufficient joined-up government between DEFRA and DECC on this as yet. If that was to be done as a cross-Government initiative, we would see a whole host of new policies that could come through, and that would influence consumer choice and encourage greener behaviour.

Q87 Christopher Pincher: What sort of policies would they be? From the quotation that you gave me from the Department of Energy and Climate Change, it is very much a case of "It's for the consumer to decide"; that was what I inferred from the quote you gave me. What do you think the Government or a Department can proactively do, in terms of policy?

Guy Shrubsole: I am thinking perhaps of some of the policies that were mentioned slightly earlier, such as incentivising longer product life times or working to waste less food; that obviously has an impact on territorial emissions as well as on overseas emissions from the production of that food in the first place. At the moment, that is not being incentivised, because we are looking with only one eye, as it were, at domestic emissions; we are not looking to capture the additional savings that could come from taking a consumption perspective. There are already things that are being done, but I do not think that they are being done or captured in a particularly systematic way, and they are not being applied across Government either.

Dr Allott: You gave the example of the UK unilaterally introducing some sort of border measures across the piece. I think that this needs to be seen in terms of a global effort. The danger of taking that type of approach is that it can come across as very protectionist, and it can undermine the drive for a truly multilateral approach to this issue. You need to be very careful with things. The risk of perverse consequences there is quite serious.

By the way, I think perverse consequences are one of the key things to focus on, in terms of policy formulation. We mentioned the EU ETS before. A really good example would be the fact that bioenergy is currently treated as zero carbon at the point of combustion. That is fine, because you can capture emissions once, and you have to have an agreed convention. The problem with that convention taken blindly is that you could set up a system where we import lots and lots of very, very carbon-intensive biofuels across their life cycle, driven by the fact that they are counted as zero carbon under the EU ETS. Clearly, that is a perverse consequence. There are things you could do to guard against that, to do with

setting minimum standards for the life cycle GHG benefits of bioenergy that is used and imported into the UK for power combustion, for instance. There is a real safety-net issue here, as well as a proactive policy, guarding against perverse consequences and showing a new window on just how to improve consumption policy.

Q88 Chair: There is a case for doing what you have just described anyway, isn't there? Bioenergy is a good example. There is good bioenergy and bad bioenergy. It makes me happy when we draw very clear distinctions like that.
Dr Allott: Exactly, but it still seems to be happening. Anything that increases the intelligence of policy appraisal is a good idea. Frankly, people should see that one anyhow. I would contend that they are not seeing it. If the consumption-based approach helps to increase the rigour of that awareness of a perverse consequence, then I think that is a good thing.
Chair: I should remind the Committee that I have an interest in a biofuels company, which is relevant to what we have just discussed.

Q89 Sir Robert Smith: You were saying how the UK—just a minor point here—probably could not do much on that. It would have to be an EU-wide regulation, wouldn't it?
Dr Allott: On—
Sir Robert Smith: On imports.
Dr Allott: On sustainability criteria, for instance, for bioenergy, yes. I think they already exist to some extent for liquid biofuels, but biofuels are increasingly being used for many other purposes, and not just as liquid transportation fuels. Potentially, that could be a really important part of a transition to a green economy, but we need to be doing it to a very high standard, so it is a very good example of the need to increasingly look along the supply chains at the product standards. The consumption approach can provide an insight into that problem. The precise policies that you come up with may not be to do with consumption-based reporting; you might take a specific lever to tackle a specific problem, but you have identified the problem and put dimensions on it.

Q90 Ian Lavery: Looking at the carbon leakage, there is a massive difference between the UK emissions calculated on a territorial basis as compared to the emissions calculated on a consumption basis. Why is that the case?
Dr Allott: I think there are two reasons. The overarching reason is globalisation—the historic structural shifts in the economy over the past couple of decades, which have led to a big change. The reason why I think the disparity is possibly bigger for the UK than for some other, say, western European countries, may be because we have also at the same time made relatively good progress in the UK in reducing our production emissions, substantially through the dash for gas, which, arguably, was not really driven by climate change policy. So our production emissions have come down relatively well—nowhere near enough for what they should have done from a climate change perspective, but they have come down relatively well compared to other countries; and at the same time there has been a globalisation shift of manufacturing, and the increasing service sector. If you put those things together, I would say that accounts for almost all of the change.
Eric Lounsbury: I echo that. We did some earlier work on the impact of carbon leakage at different carbon prices, and different carbon production, and while leakage is an important thing for some select sectors, the overriding feature here is increase in trade. The trade balance in the UK increased from less than 1% to about 5% of GDP in the decade before our analysis on carbon flows, which was based on 2004, so in that decade before—from 1994 to 2004—it increased substantially. That is the overriding factor in increasing the contribution of imported emissions, rather than leakage, as a direct effect of climate change policy.

Q91 Ian Lavery: Is the difference more due to strong carbon leakage or weak carbon leakage? When I say strong carbon leakage I mean the fact that countries are moving their manufacturing abroad, and when I refer to weak carbon leakage I refer to a general increase in consumption and therefore an increase in imports.
Guy Shrubsole: It is almost entirely down, so far, to weak carbon leakage—that is increasing consumption, rather than being driven by climate policy. If you look at the graphs that show the last 20 years of emissions trends in the UK, strong climate policy has really only come in during the last few years. It would not be at all tenable to claim that climate policy of itself has driven emissions overseas. You can see that actually, in the last 20 years, there has been an increasing trend, and that has been driven by, as Keith says, structural changes in the UK economy. Growing consumption has outstripped efficiency saving.

Q92 Ian Lavery: In the Chancellor's autumn statement in 2011 he announced about £250 million compensation for energy-intensive industries, to basically compensate for the impact of carbon taxes and climate policies. Do you believe that the energy intensive-industries are justified in claiming that compensation?
Dr Allott: I think we need to be very careful here; that is my starting position on this. There has been quite a long history of, frankly, scaremongering by several major industry groupings, going back several years at European level; also, at the UK level, when Digby Jones was the head of the CBI I think he spoke at a parliamentary inquiry—in 2004, I think—about the first phase of the emissions trading scheme. In fact, it may have been earlier than that, in 2003. He was accusing the then Government of sacrificing British jobs on the altar of its green credentials. That was the cap that led to a carbon price of zero. Having said that, looking forward there is evidence that certain sub-sectors may be facing some genuine issues, but I think it needs to be put very carefully, on sound evidence, rather than a general assertion that all industry is facing a risk. Any support that is given to sectors needs to be based on much clearer evidence

and transparency than we have seen so far. The Chancellor has not said who will receive this support. Secondly, there should be something in return—some clear commitments—from the sectors benefiting either from exemptions to the carbon floor price, or from increased exemption from the climate change levy. I am thinking in terms of increased environmental benefits from energy efficiency improvements, a greater obligation to think about the constructive use of waste heat for combined heat and power, and some serious innovation commitments. Otherwise, we are in danger of giving something for nothing for generalised industry lobbying, rather than looking at the specific problems that certain sectors may face.

Q93 Ian Lavery: Rio Tinto Alcan is in my constituency, and it just announced that it is closing the plant because of the climate policies and the green taxes. That flies in the face of what you are saying. It brings me on to the next question. The written evidence from the WWF suggested that the idea that businesses were being driven overseas by carbon regulation was greatly exaggerated and possibly groundless. You have just touched on that. Do you still believe that that is the case?

Dr Allott: I think that that has been the case to date. I think that we are now at a stage where there are some genuine issues affecting certain subsectors. The one that you touched on is increasingly one of them, potentially. What I am saying is that we need to be careful on transparency, and on the evidence base for the policy design that may be appropriate to tackle this approach. That is not always the case in what I am hearing from certain lobbies.

The other thing that I would say is that there is a real danger of a cascade of inaction. That includes the lack of ambition at European level, where we are stuck on a 20% target for 2020, which is essentially little more than business as usual. The reason why Europe is struggling to show the leadership that we need internationally to move up to at least the promised 30% is substantially because of lobbying by the heavy manufacturing industry within Europe. There is a danger of a cascade of inaction, which leads us not to address the climate problem, which we urgently need to do. We need smart policies to tackle specific real issues, where they are clearly shown to exist.

Guy Shrubsole: Surely the medium to longer-term solution to this is going beyond tax breaks without strings attached to investing in green, clean manufacturing here in the UK. Obviously, the current focus of something such as the Green Investment Bank is rightly on investing in the energy sector and energy efficiency. In the medium term, if we are not to have to keep coming back to this problem as we reduce emissions further, we have to invest in a clean manufacturing sector in the UK and across the EU.

Sir Robert Smith: In light of that question, I remind the Committee of my interest in the Register of Members' Interests: I have a shareholding in Shell and a shareholding in RTZ.

Q94 Laura Sandys: We have covered some of the issues that I was interested in on border tariffs. May I go down a bit of a different line? When we are talking about carbon emissions, we are talking about a production-based operation. In many ways, it is very much easier to set those limits. As you say, there are only 15, or whatever it was, aluminium smelters in the world. Those are things that are easy.

When we are talking about consumption, we are relating it to demand as well. I would have thought that we could make a more extreme impact on our carbon emissions consumption if we started to understand how consumers respond, whether that is business-to-business consumers or end consumers. Who is doing the work? Who should be doing the work, and where would you like to see the work being done on behavioural science and how we change people's behaviour? I do not know whether any work has been done on the Fairtrade mechanism and what creates a different response. I am not saying that I am a great advocate of everything that Fairtrade stands for, because it has its own repercussions. Where do you see the blockage, not from a Government point of view but from a societal point of view, and how can we overcome that?

Chris Tuppen: From a business perspective, at the b-to-b consumer level, it is very much around the business case for action. On supply chain, a lot of it has been around the reputational impact of getting it wrong in the supply chain, and the damage that that has on the brand.

Q95 Laura Sandys: But that needs a sensitised consumer. You have to start with a sensitised consumer to create a reputational problem.

Chris Tuppen: Yes, and one might imagine in the future a similar kind of brand impact if companies were getting it wrong on a carbon level within their supply chain. One might imagine that in the future, but as you say, that needs the end consumer to be involved. There are many other aspects of risk management within an organisation, in terms of things such as continuity of supply and resilience in your supply chain, which will also come into play here.

There are also straight cost-efficiency measures, if we can demonstrate that reuse and re-manufacture of items is more cost-effective, and if we can demonstrate to business that the linear economy of "dig it up, use it and throw it in a hole in the ground" is not the most cost-effective way, particularly when one looks at resource constraints in the future. It is clear that in many areas of resource availability we are going to hit limits, and therefore bringing that sort of resource availability agenda alongside the carbon agenda can make quite a convincing case to organisations that they really should start looking at waste flows. That would have a benefit, in terms of reducing the consumption-based carbon figures.

Q96 Laura Sandys: May I pursue that a little? In the agricultural or food production sector, a lot of food is wasted at the farm. It is rejected because it is not beautiful. Could we look at regulations that created a declaration by procurers from those farms to say how much they have rejected on aesthetic lines? How do we create change in that environment?

Guy Shrubsole: Absolutely. There is not enough recognition of the amount of food waste within the

supply chain, and there is currently a lot of focus simply on consumer-side food waste. This is something that I have become more aware of recently. Yes, a suggestion such as the one you make that supermarkets, retailers and suppliers become more responsible, perhaps through extensions of the Courtauld commitment or similar mechanisms that the Government have set up, would be a very good step forward.

Chris Tuppen: May I give you the example of washing machines? I know that is not about the food chain. If one looks at washing machines, going back about 10 years or so they were less reliable but much easier to repair. Today, because of the globalisation of the supply chain and the ability to import very cheap washing machines, which have been designed to be built very cheaply but not to last a long time, a lot of the cheaper washing machines have a life cycle of only about 800 to 1,000 wash cycles, which is not a lot of wash cycles. One change that could be made is to say that washing machines should be guaranteed not for a year but for a certain number of wash cycles. That would change consumer behaviour quite a lot, because people would see how many wash cycles each washing machine was designed to run for. Each washing machine would have a counter on it, and you would be able to see exactly how many cycles it had been through.

The business model would need to change. The business model today is designed to accept that a certain percentage will go wrong in guarantee—that is built into the cost modelling. That modelling is not designed to lengthen the life of washing machines. While the up-front cost of washing machines would go up, their total life costing would come down quite significantly.

Chair: As we have another panel to see, I think that we will have to call a halt there, but thank you very much for the ground that you have covered. There may be one or two points that we would like to pursue in correspondence with you, if that is okay. Thank you for your help.

Examination of Witnesses

Witnesses: **Dr Wendy Benson**, Principal Adviser, West Sussex county council, **Michael Berners-Lee**, Director, Small World Consulting, **Richard Leafe**, Chief Executive, Lake District national park, and **Richard Sharland**, Head of Environmental Strategy, Manchester city council, gave evidence.

Q97 Chair: Good morning and welcome. I think you heard the previous evidence, so you will know what our approach is, although we are now looking at a slightly different aspect. May I start by asking all of you, but perhaps particularly the local authorities, how the model of Small World Consulting has helped you in what you do?

Richard Leafe: I am Richard, from the Lake District. We were the first local authority, if you can call a national park authority that, to use this consumption-based approach. In a nutshell, it has been a really helpful way of accurately defining where the carbon comes from and how it is consumed in the Lake District. It has been a very useful tool in working out which sectors we most need to engage with and talk to about their emissions, as well as in explaining to those sectors—those partners whom we work with—and to the general public at large what is important about carbon in the Lake District, where that carbon is spent and, importantly, what can be done about it. It has given us much more clarity and a better understanding of the actions that we can take to tackle this issue in the national park.

Dr Benson: I agree with Richard. I work at West Sussex county council, and we have used the footprint to introduce a local carbon budget for the county and an operational carbon budget for the council. We have found that it is a much clearer way of engaging with people. As yet, we have not done much work with the general public, but in terms of our own service heads, we have been out talking to all our directorate leads. They are very engaged, and they find the framework we are proposing to them very clear and easy to understand. It is a little like being able to tell a story, in that the production emissions give you a bit of the introduction to the story, while the consumption-based emissions give you much more of the body of the story to understand.

Richard Sharland: I am Richard Sharland, from Manchester. It is a similar story for us. It is very early days, and we only have the work that has been done over a few months. The really key thing for us is that these metrics create the opportunity for a different kind of dialogue between sectors and interest groups right across the city and Greater Manchester. In the city's climate change strategy and the Greater Manchester climate change strategy, we see changing the culture as being as important as meeting emission targets. There is an opportunity for consumption-based metrics to create a quite different set of dialogues, particularly with consumers, but also to make stronger connections between consumers and businesses, and between consumers and public sector organisations.

Michael Berners-Lee: The wider context of this is that organisations and people on every scale are seeking more and more to understand the climate change impacts of the things that they do, and more and more organisations and people are realising that that involves indirect carbon, as well as direct carbon, which takes you straight away into consumption-based metrics. Actually, for a lot of people it is instinctive. When you ask people about the carbon impact of something, they instinctively think about the indirect stuff as well as the direct stuff.

Q98 Chair: How much are you constrained in terms of getting real value from this by the many complexities and uncertainties? I dare say that you are refining the model anyway, but is there a danger of some scepticism about the work because there is so much uncertainty?

Michael Berners-Lee: There is uncertainty, so it is an exercise in developing management information in order to see the impacts so that you can put them into the decision-making mix. That needs to be good enough. So it needs to be done in a practical and robust way while finding a balance between recognising the uncertainties and mitigating them as much as possible. It is important to face how much uncertainty there is, and there is a lot, but that does not negate the exercise at all. We are always very clear, and our clients understand that there is uncertainty, but you still can create a good enough model that allows you, at least in broad terms, to get a much better handle on the impacts and issues you should be managing. It is possible over time to refine that somewhat. Even in the long term, consumption-based metrics will always have a degree of uncertainty. That will never negate the exercise, but it is always important that we are clear about that.

Q99 Chair: Can data availability be improved to try to reduce the uncertainties?
Michael Berners-Lee: Yes, it can always be improved. Let us look at all three of the organisations here, for example. When you start going down into a more local scale than the national level—our approach was to use an environmental input/output analysis and then scale it down to look at how it translates to a local level—we are asking questions about what we know about the local level that will allow us to modify our results compared with what might be a UK per capita average. Yes, better data would have helped. One very simple example is that car travel information from, say, the DVLA coming through MOTs about car usage would be very useful in understanding how residents travel.

Q100 Sir Robert Smith: Looking at the Lake District analysis, what did you find from the consumption-based approach that a production-based approach would not have achieved?
Richard Leafe: A couple of things, really. I think what stood out with the data is that, when we looked at the picture as a whole, we were quite surprised to find the proportion from foreign flights used by visitors to the Lake District was large—it was a third of the total carbon budget—yet of our 16 million visitors a year, only 10% come from abroad, so it was quite interesting to see how that was skewed. When you take flights out of the picture and just look at what is happening within the park itself, we were quite surprised to see the significance of the accommodation, food and drink sector, particularly the size for drink that is consumed in the park itself.

Q101 Sir Robert Smith: Soft drinks?
Richard Leafe: All kinds, bottled water and bottled beers in particular, so it was music to my ears to hear that we needed to promote more the consumption of locally produced beer in the national park as a critical way of tackling our carbon footprint. The analysis gave a real focus on that sector, which obviously then led into a number of projects with the tourism sector to engage with suppliers and to talk to them about the importance of carbon usage and what they can do about it.

Q102 Sir Robert Smith: Did you look at reducing the impact of the flights?
Richard Leafe: Flights are a difficult area for us. Our attention instead has gone on making sure that we market the Lake District to a domestic audience and encourage more people from the UK to visit, and when they visit, to travel, if they can, by sustainable means, or to use sustainable means of transport when they are in the national park, and ideally, to stay longer and get more value out of the carbon that is consumed in their travel there. So no, we are not attempting to do anything directly with the proportion who arrive by air, but of course, if we can encourage more people domestically to holiday at home in the Lake District, perhaps we are saving some carbon by displacing journeys that they may have made overseas themselves.

Q103 Sir Robert Smith: Would that show up at all?
Richard Leafe: I don't know whether it would show up in the stats, but it is a good thing to do.
Michael Berners-Lee: It is clear that the longer people stay, the lower the carbon footprint per day.

Q104 Sir Robert Smith: No, it was the other calculation, that if they had not gone to the Lake District, they might have gone to the south of France.
Michael Berners-Lee: If they are making a choice, it does not show up. If they make a choice to do something else that is equally high carbon, no, it doesn't show up.

Q105 Sir Robert Smith: Only 10% was the flight though, so you have a big part of the carbon footprint that you cannot do an awful lot about. Was that fairly allocated? If a tourist comes and spends a couple of days in London, then goes up to the Lake District, perhaps goes somewhere else, and then leaves, do the flights all go to the Lake District?
Michael Berners-Lee: No, we did our best with that. It is always a question of working with the data, but we tried to allocate pro rata. So, if somebody flew from Australia for three weeks, and they spent three days in the Lake District, that is one seventh.
Richard Leafe: I would not want to give you the impression that because a third of the overall carbon budget is to do with international flights, that means we have given up on the other two thirds of what can happen there. A lot can go on. I have a better little diagram that describes the pie chart in colour when you take the flights out, if you would like to have a look at that. It is just a bit better than the one we put in the paper.
You can see that when we take the flight element out of it, the transport and accommodation of the visitors in the Lake District, and buildings for resident populations and local authorities become very significant. They are things obviously that we, as a park authority and the partnership in which we work, can do things about. For instance, we have used those figures to support a bid that we made successfully to the Department for Transport's sustainable transport

fund for £5 million of investment in sustainable transport in the Lake District. That is just an example of the kind of initiative we can pursue as a result of having this evidence base.

Q106 Sir Robert Smith: What sort of challenges did you encounter in trying to meet the consumption-based reduction target?

Richard Leafe: We have set ourselves a target of a 1% reduction. The Lake District is responsible for 2.3 million tonnes of carbon, and we are assuming that, to be in line with the national reduction targets, we need to reduce that by 2% a year. We assume that 1% comes from national action, so we need to be responsible for a 1% reduction, or 23,000 tonnes a year.

For a start, it gives us a nice little framework to go at, and then, what we have attempted to do is identify, on a consumption basis, the projects that we know we have in the pipeline to tackle the various sectors in the project, and add up the carbon savings that we roughly estimate we think we will get out of them. At best, we are about halfway—last year, we were about halfway to that 1% target—so we have about 0.5% of savings from projects that we know about in the Lake District. The challenge, therefore, is to increase the amount of activity and projects that we are aware of that are tackling carbon across the full range of sectors in that pie chart. Obviously, we will get the greatest bang for our buck if we concentrate those on the biggest chunks of accommodation, tourism, transport and so on.

Q107 Laura Sandys: I really wanted to focus on Manchester. From your submission, we are really talking about some of the biggest emissions being in food and waste. As you probably heard from the previous panel, it is something that interests me a lot. How have you been able to tackle this? What sort of measures do you believe that you need to put in place to change behaviour, whether in labelling or in incentives or penalties? How do you see your assessment being driven forward into positive outcomes?

Richard Sharland: It is very early days, but on the food side in Greater Manchester we are setting up a food panel, and that will take the consumption work, but also connect it with work on health and on diet. It will try to bring together those who are leading on those areas of the agenda to say that we now have completely different data, because, as you were hearing from the previous panel, food production and consumption in direct emissions is virtually negligible, so it has been regarded as being a junior partner and as an issue of low importance in climate change. Consumption figures turn that on its head. So we are setting up a panel, and they are going to look at how we—that is not just local authorities, but also the NHS, universities and others—start to take that forward.

There is another driver as well. We set out two objectives for climate change in the city's strategy. One is reducing emissions, and the other is changing behaviour. We have set up a carbon literacy initiative, and the thinking behind that is to create a shared framework across the city for progressing an understanding of carbon, so that means working both with schools and universities, but also with specific client groups. Taxi drivers are an example. The opportunity in the carbon literacy project of bringing food and waste directly into that programme is going to be very important, partly because the personal calculators that a lot of people are using and a lot of the programmes in schools are focused on food and waste as really important issues. We can now connect all of that to the outcome of the city. That is our initial thinking at this stage.

Michael Berners-Lee: I would add that this carbon literacy angle is very important. You talked about how we can develop the sensitised consumer—

Q108 Laura Sandys: For example, have you ever spoken to WeightWatchers?

Richard Sharland: As far as I am aware, we have not.

Q109 Laura Sandys: To be frank, it is the same sort of issue. People are counting calories. Carbon is different, but how do people respond to this accounting or assessment process? I just feel sometimes that the whole issue about both energy and carbon can be quite geeky if you actually start to look at this from a consumer point of view. One should consider WeightWatchers or people who look at calories as part of how they assess things and start to bring things back into consumer language.

Also, I do not know to what extent anyone has done the cost per unit of carbon to me, the consumer. We are looking at carbon taxes right across the board. How much is it costing me to waste or to not utilise things in the most efficient way? We have a very sophisticated consumer out there. Are we using them effectively?

Michael Berners-Lee: This question about how best to engage people is being asked hard in a lot of circles, and no one really knows the answers for sure. But some analysis of where the cost lines up with the carbon has been done, and if you do that around food, one of the things that is clear is that arguably one of the simplest ways in which households can save money is to adjust their diet. Food waste, on the face of it at least, is a very simple example. There is a lot more money tied up with the carbon in your food than with your energy bill, for most people. With this whole area of how best to engage people, some people are engaged by geeky, numerical stuff—relatively few of us—but to send out much more palatable broad messages to consumers so that they understand in broad terms what the issues are, somewhere along the line that geeky numerical stuff needs to be done and needs to be out there.

Q110 Laura Sandys: But who is doing this behavioural analysis? In some ways you could be working in your county council and there is absolutely no connectivity to the person on the street. But there are people who are making difficult arguments with consumers, who are then responding and changing their behaviour.

Dr Benson: We have been looking at behaviour change at West Sussex, working with a consultant

who has been advising us on a framework for just that sort of work, and looking at how best we can engage. It is the sorts of things that Mike was talking about, the different languages that you have. It does not necessarily need to be a consumption narrative around some of the issues, of food waste for example. It could be around convincing people that rather than needing to waste less food because of the emissions we save from putting waste in the ground, it is all around the issue of having fun using up leftovers. So we are looking at that currently, and are developing a framework to help us apply the information from the footprint.

Richard Leafe: My contribution to that is that when the consumer is on holiday, they are in a space that allows them to experiment with doing things differently. We have a campaign called "Fair and Local", which is about fair trade and local, seasonal food that we try to get the accommodation providers, restaurants and cafés to promote to the visitor. That has economic benefits for the national park itself, as well as carbon saving benefits, and perhaps it is something different for the consumer. So, we start to play around with that behaviour change, by what people experience when they are relaxing, on holiday.

Richard Sharland: For us in Manchester, our whole approach to climate change is a collective one, so all the organisations in the city work together and build a vision of what the Manchester brand and its future look like. As Mike has said, you need lots of different messages for different audiences. One of the things about our city is that there is a passion for the city, so we can plug into that and engage businesses and residents in the city's future. The opportunity for a low-carbon economy will be realised more quickly if more people and businesses get engaged. Promoting the virtuous cycle of consuming and buying locally, particular in the food sector, is really important.

Q111 Dr Whitehead: I would like to go a little further with your points, Wendy Benson, on West Sussex. How much easier do you think it has been to engage with residents, with the information gained in a consumption-based approach? You mentioned some initiatives, but are they initiatives that are hoping to engage residents, or is there greater engagement under way?

Dr Benson: It is much more at those early stages. We are just looking at how we engage, but we also have an environment and climate change board within the county, made up of local authority, public, private and third sector organisations. They certainly have found the footprint, Mike has presented that work to them, again, they really do get it—they find it very simple to understand. Similarly, with our heads of departments at the councils, we really were not sure how people would accept and be comfortable with the framework, but having presented to these senior decision makers, they really do find it very simple and easy to understand.

Q112 Dr Whitehead: You have concentrated your analysis on consumption by residents. Like the Lake District, there is a large national park in West Sussex—I am not saying exactly the same as the Lake District, heaven forfend—and do you have a sense that residents might say, "Well, actually, this is about us, but what about those people who are coming to the area?"? Should they not be included in the analysis, in the same way that it has been done as far as the Lake District is concerned, bearing in mind that there are significant numbers of visitors to West Sussex?

Dr Benson: We have not really encountered that issue yet, or we have not encountered that as an issue thus far. I am trying to think how we would deal with that—

Michael Berners-Lee: For all three—the Lake District, West Sussex and Manchester—there was a discussion about the best boundary to choose and the kind of information we particularly needed for this particular area. For the Lake District, we took the view that—because we knew that, on average, there are as many visitors as residents within that boundary—we had better put visitors in, but for West Sussex that was not anything like as obvious a decision, and it is quite a considerable chunk of effort to go and look up what on earth was going on with visitors. Not to say that it would not be a valuable exercise, but it is not quite as staringly an obvious thing to do as it is for the Lake District.

Q113 Dr Whitehead: Conversely, West Sussex certainly appears to have domination of aviation in the consumption-based carbon footprint of the residents. Is that because West Sussex residents happen to fly to a lot of places, or is it because there is an airport right on the boundary of the county and, therefore, people are getting free flights as a result of working at the airport?

Dr Benson: Certainly what the data showed is that having an airport located within the county is a significant issue. The data showed, when we looked at the district and borough levels, that the ones surrounding the airport had a higher percentage of people flying from them than the outlying districts and boroughs.

Q114 Dr Whitehead: How might you factor that into the points you made about what transpired as far as the discussion on how different areas would treat consumption-based analysis? That appears to be a particularly distorting factor, doesn't it?

Michael Berners-Lee: The first thing to say about aviation is that we included in all three analyses a mark-up factor of 1.9 for high-altitude emissions—that is throughout all of the analyses—because there is reasonably good evidence that that gives you a better surrogate for the climate change impact of activities. That is one reason why, when you look at the aviation stuff, you might see it higher than in some analyses, but I think there is good evidence for doing that, and DEFRA supports that as well.

It is also worth emphasising on aviation, but also on all the other information that comes out of this kind of analysis, that it is not telling you what to do. The analysis is not telling Carlisle that it should not expand its airport, or Manchester or Gatwick. All it is doing is simply presenting some information to go into the decision-making mix. We hope that all decisions will take that into account. Whatever the

arguments about airports and travel habits, that will be part of the information mix.

Q115 Dr Whitehead: What I am thinking about, though, is the extent to which the exercise is, and has to be, rather more than just saying, "Well, that's interesting. Look at what the residents of this area are getting through on a consumption basis." I assume this approach is capable of generating policies at national level, so issues about how different factors come into play in different places are relevant to that overall approach.

Michael Berners-Lee: Yes. My answer to that would be that, in the first instance, you just have to see the information and you have to make sure that all this stuff is commonly understood. The next stage is understanding exactly how that feeds into policy. There may not, in all cases, be an immediate route, but at least the information is there in the equation. Richard picked out food for the national park; in fact, both Richards picked out things that stood out, that came out from the facts and that looked actionable, so off everyone went. Not everything that comes out of all analysis always necessarily translates into action.

Richard Sharland: For us, one of the issues about aviation is that we had set out as a city to have a collective approach that embraces the full spectrum of passion—from sceptics through to activists—because we believe that is the right way for our city to engage all parties. Aviation was one of the most difficult issues in terms of progressing and keeping that collective together. As I have said a couple of times, it is still early days, but the data have created an opportunity to have a completely different dialogue about whose emissions the aviation emissions are and what approaches we might want to take as a city to improve the emission quotient at the same time as maintaining our economic position. The city has been clear that the whole climate change challenge is actually an economic opportunity, but we have to maintain the energy in the local economy to meet it. This approach is enabling us to have a much more integrated and different dialogue about that complex and thorny issue. It would be great to come back in a couple of years' time and tell you where that dialogue has gone.

Q116 Ian Lavery: On supply chain emissions, how successful has the consumption-based approach been in identifying carbon hot spots in the supply chain, and particularly those associated with procurement?

Michael Berners-Lee: The analyses that looked at businesses—of the three groups here, only West Sussex and Manchester looked at businesses—take a very broad-brush approach, but they suggest some broad issues. For example, in Manchester, where the information is more fine-grained, you will see some industries in the mix where the vast majority of emissions are in the supply chains, and the energy consumption plays only a small part, whereas there are other industries where it is the other way round. So, straight away, that puts a perspective out there in terms of how those things are managed. I can talk about bit more about some of the businesses that Small World is working with—of every size from a bed and breakfast up to a couple of multi-billion pound businesses—that are looking at the carbon in their supply chains.

Environmental input/output analysis on its own does not get you all the way, but it suggests where you might look more carefully. When you start opening up supply chains, you always get a lot of uncertainty. We are back to that question of trying to get practical management information that is good enough. You always have trade-offs about how hard you dig until you get to the point at which you are confident that you have got a good enough understanding to start managing the issues. It is always an opportunity-focused agenda, whether that opportunity be a cost-saving thing, or—more likely at the moment—a reputational thing.

Q117 Ian Lavery: You mention small businesses. Would increased consumption-based information enable many of the small businesses that you have just mentioned, in particular, to identify these carbon hot spots?

Michael Berners-Lee: Yes.

Q118 Ian Lavery: Listening to what has been said and reading the briefs, it seems to me terribly complex—how you will actually obtain the necessary correct, accurate data. How difficult is it?

Michael Berners-Lee: It does not need to be always as difficult. I am back to this phrase of practical management information that is good enough and sound enough to let you take much better decisions. It does not need to be all that difficult. We have worked with bed and breakfasts, microbreweries and other very small companies, where at most they might be able to afford one day of a consultant's time to go and get the whole picture. You have to be clear about the uncertainties, and you can base a lot of it around environmental input/output analysis and direct them to where the likely issues are. Sometimes you have to dig further and do a bit of more process-based analysis. It is not, in my experience, usually useful in those businesses to do a very detailed process-based life cycle analysis of a product, which is a very costly exercise that very often has as much uncertainty wrapped up in it as top-down approaches have, albeit that that is not always made clear.

Q119 Sir Robert Smith: Do you have a view on the debate about whether our emphasis to date on just the production side has led to offshoring of our emissions?

Michael Berners-Lee: I am not sure whether to date it has so far led to that offshoring, but I do think that there is a perverse incentive. To the extent that the UK is incentivised to cut its production-based emissions, as it goes further down that route the perverse incentive to offshore will get stronger and stronger. There is an obvious clash going on, and the picture is importantly incomplete without consumption based metrics.

Q120 Sir Robert Smith: Presumably, in a sense, the wider issues of globalisation have led to an offshoring anyway of production, maybe for labour costs or for reasons other than emissions. Do you think in the longer run there could be concerns if you just focused on production?

Michael Berners-Lee: Yes, very definitely. The cleaner and lower the UK's direct production-based emissions become, the greater the incentive will probably be to sidestep that by offshoring.

Q121 Sir Robert Smith: If we went to purely consumption and you were an exporter, there would be no incentive to make an efficient production side.

Michael Berners-Lee: Yes, and a message that you have probably already heard quite strongly is that actually both production-based and consumption-based approaches are useful in their way.

Chair: Right, I think that brings it to a close. Thank you very much indeed for your evidence. It has been very helpful to us.

Tuesday 31 January 2012

Members present:

Mr Tim Yeo (Chair)

Dan Byles	Christopher Pincher
Barry Gardiner	Laura Sandys
Ian Lavery	Sir Robert Smith
Dr Phillip Lee	Dr Alan Whitehead

Examination of Witnesses

Witnesses: **Gregory Barker MP**, Minister of State, DECC, **Ben Golding**, Deputy Director of Strategy, DECC, **Lord Taylor of Holbeach CBE**, Parliamentary Under-Secretary of State, Defra, and **Sara Eppel**, Head, Sustainable Products and Consumers, Defra, gave evidence.

Q122 Chair: Good morning and welcome to the Committee. I apologise for keeping you waiting this morning. Apparently, the webcast production team do not recognise the fact that you are all world-famous and recognisable, both visually and audibly, to anyone who might be tuning in, so we are asked to get you to identify yourselves first, perhaps just on a left-to-right basis.

Ben Golding: Ben Golding, Deputy Director of Strategy, Department of Energy and Climate Change.

Gregory Barker: Gregory Barker. I am the Minister of State, Department of Energy and Climate Change.

Lord Taylor of Holbeach: I am John Taylor and I am Parliamentary Under-Secretary of State at Defra.

Sara Eppel: I am Sara Eppel. I am Head of Sustainable Products and Consumers at Defra.

Q123 Chair: Thank you all for coming in. We are interested in this subject because of the very stark contrast between the measurement of emissions on a territorial basis and those on a consumption basis. One shows emissions going down and the other shows emissions going up. That is why I am particularly glad to have Ministers from both Departments here this morning. Could I start by asking what DECC's view is about the impact that the UK has had on the climate since 1990, based on their measurement of territorial emissions?

Gregory Barker: Mr Chairman, this is a quite complex subject with many strands. It might better inform the Committee's questions, if I make an opening statement to set the scene as we see it and then you can get into the nitty-gritty, if that is all right.

Q124 Chair: We would be delighted if you would. Has it been cleared with Defra?

Gregory Barker: The important thing is to start by saying that emissions-based reporting would take a different approach to the internationally agreed methodology for estimating and reporting greenhouse gas emissions, which uses a territorial or production-based approach under which countries are responsible for emissions generated on their territory. While we very much understand where the Committee is coming from in their analysis and their line of questioning, we need to be very clear at the outset that this is a very different proposition from that which is internationally agreed. While consumption-based emissions can provide very useful insights into how to decarbonise economies and to track our underlying progress, we consider that there are a number of very significant difficulties with such a proposed approach that need to be borne in mind.

Firstly, and I think most importantly, it is not in accordance with the rules that are agreed internationally for reporting to the UN Framework Convention on Climate Change, the UNFCCC, the overarching UN body, the Kyoto Protocol or the EU. The fact of the matter is there is no pressure from other countries of any meaningful type for such a change. It would be in the current circumstances difficult or well nigh impossible to negotiate a global emissions reduction treaty on the basis of consumption-based emissions, and we would almost certainly fail if we tried to do that. The attempt to do that could delay an effective solution on climate change potentially for years or even decades, given how slow the UNFCCC process works.

It would also, we believe, be impossible to base international emissions reporting and getting a true picture on agreements on embedded emissions figures because they are fundamentally much more difficult to calculate accurately. They are uncertain and very difficult to verify. It would also certainly be impossible to agree internationally on a mechanism for allocating consumption emissions to different countries and it is likely, even if you were to get round the first course, that that would then be challenged under the international trade regime, particularly by developing economies.

We only have direct influence over our domestic, home-produced emissions. We obviously have much less leverage over emissions that occur abroad compared to those in the UK. That is why we are working hard with our partners on reaching agreement on an international global deal. As you know, we did actually make significant progress, as I reported with the Secretary of State to this Committee, at the UN Climate Conference in Durban in December, including on a number of key issues important to both developed and developing countries. We have secured a roadmap to negotiate a new globally legally binding agreement no later than 2015. We also agreed that we would adopt a second commitment period of the Kyoto Protocol by the end of this year, and between now and the next conference in Qatar in November we will need to develop the detail of a second commitment period, including emissions reductions

targets. We also made significant progress in building on the Cancun Agreement, including agreements to operationalise the Climate Fund.

This is a major step forward but there is still a lot to be done. If we were to now suddenly introduce into that process either a new proposition for accounting for carbon emissions or even just another discussion that was serious that could potentially undermine—and there are those that wish to undermine—the whole UNFCCC process or the dialogue or the credibility of the current emissions reporting regime, I think that could be very dangerous, given how fragile the climate negotiations are.

Formal negotiations, though, are, of course, only one part of the UK's approach to tackling climate change. In parallel, we are already taking practical action on the ground, both in the UK and around the globe, to help tackle climate change beyond our own territory, most significant of which is the commitment of £2.9 billion over the spending review period to help developing countries adapt to climate change and move to a new low carbon growth path and the UK-China Low Carbon Co-operation Memorandum of Understanding, signed last year during a visit from the Chinese. We are collaborating on India, on the development of flagship energy efficiency projects.

Q125 Chair: Does any of this actually refer to the subject the Committee is looking at?

Gregory Barker: Basically, what I am saying, Mr Yeo, is that consumption-based carbon emissions are interesting, they are illuminating, but they are also potentially a huge distraction. If we were to pursue it, not as a line of academic interest but as a serious alternative or serious proposition to the current globally accepted basis, it could have perverse consequences, which none of us would want to see, by undermining the integrity of the current international regime.

Q126 Chair: You have been personally sufficiently interested in this subject for a very long time to know that there are serious flaws in relying exclusively on the territorial-based measurement and that is an obstacle for some countries towards reaching global agreement. I may say, incidentally, the ease of reaching global agreement is not conspicuously apparent in the progress that has been made in the last few years, relying exclusively on territorial measurements. Just going back a bit, if you look at the situation in the early 1990s, there was no international pressure then to reach a global agreement. It was the leadership that Britain particularly gave in the 1990s that achieved the outcome in 1997. We did not wait around to say, "Oh, we won't do something until some other countries are pressing us to do it". We said, "This is a global problem that we understand better than almost any other country, due to the quality of our scientists, and we are going to get on and try to persuade other countries to do something about it". Now, what this Committee is suggesting is that we should at least consider the severe shortcomings in exclusive reliance on a territorial basis of measuring emissions and look at how we can at least take account of the, I think, perfectly justified concerns of some countries, to whom the West has largely exported its emissions in the last 20 years, for a more equitable approach. I hope that DECC will at least have the intellectual curiosity to explore the subject more widely than your prepared statement has suggested is likely.

Gregory Barker: I think it is certainly a useful comparator. Obviously you want to take into account consumption-based emissions when considering the progress that we are making in our own economy and it is a very useful tool to compare and contrast. But what I think I am saying very clearly, Chairman, is that just at the point when we seem to have got the race started towards a global treaty, there is a danger that we are getting off our horse and trying to find another one to ride. The use of territorial rather than consumption-based emissions is the language of the international dialogue. While I can certainly see the advantages, and you would not want to ignore consumption-based patterns, if it were anything more than being intellectually curious, if it was anything more than wanting to use it as a check and a contrast and a control exercise, if this Committee were proposing, as you seem to be doing, that we should be pushing it forward as an alternative measure of accounting for global emissions, I think we would have severe problems with that. That would look like embarking on a new course of direction just when we are getting a glimmer of hope that we might be showing some success in the UNFCCC.

Q127 Chair: The Committee is not proposing anything at the moment. It is conducting an inquiry. We are going to reach some conclusions and we shall write a report that will certainly contain proposals. But what we do feel is that there are a number of dangers in relying exclusively on territorial measurements. One is that there may be a complacency in countries like the UK about our achievements, which look quite impressive on that measurement but look rather unimpressive on the other measurement. Perhaps we could ask Defra now what they think—since they use a different basis for measuring emissions—the UK's impact on the climate has been since 1990.

Lord Taylor of Holbeach: Well, I will be going over similar ground, Mr Chairman, of course—

Chair: No need. We know all that.

Lord Taylor of Holbeach:—because inevitably we are basically in agreement on this issue, although we have slightly different roles in determining it. My Department has a key priority of supporting a strong and sustainable green economy. Over the past five years we have been building up evidence of the scale and nature of carbon emissions generated from our demand for products and services as UK citizens; in other words, comprehensive information on our carbon emissions. We know that we need to understand our impacts. We need to share this with business and to help them think about the impacts of their global supply chains.

Over the past few years we have developed a methodology and indicator to capture the trends in our consumption and we have begun monitoring total UK consumption emissions, as you know, on an annual basis. However, Defra and DECC agree that

consumption-based emissions reporting cannot replace the territorial approach to reporting. Reporting at territorial level is a requirement, as Mr Barker has said, for all signatories to Annex 1 of the Kyoto Protocol and there is no reason to change this approach. Territorial emissions reporting is secure. We can be sure that the data we report is right. We cannot be so confident of the data that is collected under the Global Trade Analysis Project, GTAP, because this is input by academics and industry trade associations around the world and we cannot, in effect, control it. Clearly, we cannot be so confident of the quality of this data.

We see the consumption emissions data as helpful in giving us a complementary perspective on our global impacts and the two approaches should be seen as complementary rather than alternatives. Taken together, territorial and consumption emissions provide a more complete picture of the carbon emissions associated with the activities of UK citizens and businesses. I hope the Committee will be in a position to agree with that.

Chair: I would not bank on it.

Lord Taylor of Holbeach: Total consumption emissions in 2008 were over 1,000 million tonnes of CO_2, while territorial emissions amounted to 620 million tonnes of CO_2. Consumption emissions, therefore, added an extra 75% impact to the territorial emissions level. While territorial emissions have fallen by 20% since 1990, consumption emissions have risen by the same level. Defra publishes in the Sustainable Development Indicators a time series of carbon dioxide emissions associated with consumption and in 2011 we published a breakdown of emissions by sector and country. We think this evidence helps business to better understand the macro impacts of the products and services they are providing to meet our demand. Businesses tell us that this evidence is valuable.

Government policy can target consumption emissions at several levels, from micro to macro. For example, at the product level we published the first international carbon footprinting methodology, PAS 2050. At the product group level, the product research forum that we fund through WRAP is publishing generic data on product groups to help an SME find open access information about, if I can quote, "the emission hotspots in supply chains".

Government's own footprint, which we published in 2010, shows that 75% of our carbon emissions came from our procurement supply chain. The sector and country data, which we published last summer, and the UK's international impact, using the multi-regional input-output model, are also areas that we study. By making data accessible, we can help overcome some of the major barriers to sustainable consumption and production. By supporting EU-wide product minimum standards and energy labelling, we can encourage people to buy the most efficient products and reduce their overall—

Q128 Chair: Could we table this as written evidence? I do not think we are getting very far. We are using up a lot of time now. We can table your statement.

Lord Taylor of Holbeach: Yes, I have finished.

Q129 Chair: We will publish it. If we had the Department of Transport saying their road safety policies are very successful, deaths have gone down by 10%, and the Department of Health saying actually hospital admissions from people injured in accidents have gone up by 10%, we would have a problem. We seem to be in that situation between these two Departments. Which of these measurements do you think is a better indicator of our performance on climate change?

Gregory Barker: I think clearly territorial emissions. We do not have an economy stuck in aspic. We have a shifting global economy. The Coalition wants to address the shrinking manufacturing sector that we have seen over the last decade or more, or the last two decades, and we want to see us take more responsibility. I think consumption-based emissions are a useful tool. I would like to see more up-to-date data. The data sets that we inherited, I think understandably because they are so much more complex to gather, are pretty out of date. The most recent figures we have are 2008. Lord Taylor will be publishing the 2009 figures relatively shortly, but that is still quite historic. But they are much more complex data sets. I don't want you to get the impression or the impression be given to the Committee, Mr Yeo, that we are antipathetic towards consumption-based carbon emission analysis. It can provide a very useful alternative view on the economy and it is one that we need to take into account. What I am saying is that I do not think that we would want to see it replacing or detracting from the overall global effort and global framework, which is based on territorial emissions. But there are other countries that are nudging towards this sort of practice as an addition to their territorial, not as an alternative but as a helpful addition, such as the Netherlands and Germany. I hope that we will be able to increase both the accuracy and credibility of our reporting data and that other countries will join, but I don't see it as being a magic wand.

The data I have at my disposal are relatively old, but the analysis from Defra showed that between 1992 and 2004, prior to the EU emissions trading system launch, there were four major drivers of decarbonisation. One was relocation, and I think this is what you are really concerned about with consumption emissions particularly. That accounted for about 30% of our effort. Efficiency was reckoned during that period to account for 32%, a shift towards services and away from manufacturing within our economy, which your Committee would also be interested in accounting for, 17%, and a switch to gas accounted for 21%. I think it is very useful to look at this and understand how our economy is evolving. What that taken together means is that 70% of improvement in territorial emissions over that period resulted from improved efficiency, the shift to services or a switch to gas.

Q130 Chair: Those figures are certainly helpful. I am not sure how much credit we can take in terms of successful climate change policies because our economy, for other perfectly good reasons, has

switched to being a more service-based economy. It has been helpful but I do not think it has been the result of climate change policy. Finally on this section, how much account does DECC take of the consumption-based emissions figures in forming policy?

Gregory Barker: I have to be honest, Mr Yeo, with figures like that, which are not in real time, and with the complexity, it is a useful way of comparing the territorial emissions data. Obviously, if there was a big counter-story emerging from that we would worry about it, but it is not the primary driver of policy at DECC, which remains territorial emissions. The fact of the matter is we have our targets set for us by the Committee on Climate Change, who recommend the carbon budgets. We can't have lots of dashboard indicators. That is our primary goal and, as you know, any good chief executive or successful company does not have lots of different indicators they look at. They will focus on one or two key priorities, and our priority is territorial emissions, not to the exclusion of everything else, not without the context that comes from consumption, but we have to say that our first three carbon budgets, which are very stretching, we are set to overachieve by 96, 132 and 87 million tonnes respectively. That is on course to an 80% reduction in emissions by 2050. On complacency, or whether we are doing as much as we should, in order to do even more you would be taking us beyond the 80% trajectory in territorial emissions and almost into negative territory. I think you would start to stretch the credibility of these targets, certainly with the wider population and industry.

Q131 Chair: Let me put it to you that if a company chief executive had one indicator saying that profits were down by 28% and another one saying they were up by 20%—which is the divergence—that seems to me a pretty substantial divergence. It seems to be sufficiently large—

Gregory Barker: Of the same company?

Chair: Yes. The DECC statistics show that territorial emissions fell by 28% between 1990 and 2009 and DECC have admitted that on a consumption basis they rose by 20% between 1990 and 2008—admittedly one year shorter. Again, a figure, I think from your own Department, acknowledged that the 2008 total greenhouse gas emissions was 620 million tonnes on a territorial basis; on a consumption basis, it is 75% higher than that. I think there are some quite worrying figures here.

Q132 Dr Lee: With reference to the use of consumption, future CO_2 emissions in the world are going to be driven by the consumption of the Chinese. Do you think our emphasis upon territorial measures undermines our negotiations with the Chinese or enhances it?

Gregory Barker: I think it clearly enhances it. I think to get into a consumption argument with the Chinese would have a potentially very damaging impact on trade relations. The welcome news is at Durban last year there was acceptance of the need for a single global legally binding treaty, based on common but differentiated responsibilities, but with everybody accepting that all nations need to come within the purview of the single treaty and that we look at global emissions as a whole. That is the most accurate and feasible way of assessing the impact of climate policies in the round. It would just be well nigh impossible for us to take responsibility. It is one thing to analyse, it is one thing to observe, but to take responsibility for emissions that we have indirectly caused in China—

Q133 Dr Lee: I am not suggesting that we take responsibility for it but I am suggesting that the reason that our footprint has gone up in the last decade in consumption terms is because of human behaviour, the way in which Britons have chosen to purchase plasma screens or whatever. In the future that will be the Chinese doing that and they may also be producing it. If we have adopted an approach of patting ourselves on the back and saying, "Well, we have reduced our emissions territorially" but actually our human behaviour has not changed and indeed has become worse in climate change terms, and we go to the Chinese and we say, "You have to get your act together, you are consuming too much", I suspect they are going to turn round and say, "Well, that is pot, kettle, black". That is my point.

Gregory Barker: That is not my experience of talking to the Chinese in international negotiations. I think there is an appreciation in both developed and developing economies that we need to change our economic model, that we need to become much more efficient, we need to decarbonise our energy sectors, we need to decarbonise the methods of production. It is not plasma screens fundamentally or people watching television or people buying things that necessarily creates high emissions. It is the way these products are manufactured. If we are able to work with the Chinese—and the Chinese can work with themselves, they lead in some of these issues—if they are able to decarbonise their energy sector with a greater emphasis on energy efficiency, a greater emphasis on production of renewables, then I think you are going to see a totally different model of economic growth and that is what we are planning for, both here in the UK and abroad. I think the view that the UK takes is that if we can become a model for successful, prosperous, low carbon growth, if we can demonstrate to developing economies that it is possible to increase your share of manufacturing trade, which is what we aim to do, if you can increase consumption while lowering carbon footprints, that is the most useful thing to do rather than shift it on to other countries.

Q134 Barry Gardiner: Minister, are this Government's policies on climate change adversely affecting the competitiveness of UK industry?

Gregory Barker: No.

Q135 Barry Gardiner: In that case, you must think that the Chancellor was wrong in his 2011 autumn statement to introduce compensation measures worth £250 million for electricity-intensive industries, mustn't you?

Gregory Barker: No, it is precisely because the Chancellor did that that I do not think we are damaging British industry. The Chancellor said—

Q136 Barry Gardiner: Sorry, I asked you about your climate change policies.
Gregory Barker: Yes. We are bringing forward a much more sensible, nuanced approach to climate change than the one-club golfing of the previous Administration. We recognise that due to the laws of physics there are some industries that will find it very difficult to lower their carbon emissions at the rate and scale that taxation sometimes seems to assume. As a result, within the constraints of public spending, we are adopting a model of economy that will be much more akin to that of Germany where they recognise the difference between energy-intensive industries, particularly the electro-intensive industries, the steel, chemical and—I have left one out.
Barry Gardiner: Cement?
Gregory Barker: No, not cement—aluminium industries. They have particular difficulties and there needs to be a greater appreciation of that. The Chancellor has recognised that, which means that we can say with much greater confidence that the impact on our overall competitiveness in the long term—of course there are short-term impacts—will be enhanced if you take together the package of measures. Obviously, you may be able to—

Q137 Barry Gardiner: If one has separated them out, what you are saying is that the Chancellor has offset the adverse effects on industrial competitiveness in those sectors from your climate change policies by giving that compensatory package.
Gregory Barker: What I am saying is that this Government, and specifically the Chancellor, is taking a more balanced view of the need to ensure that our climate change policies do not have perverse consequences or unintended consequences by hitting those that are unable to respond in the way that we would like them to and that we have a more sophisticated way of dealing with that, more akin to Germany rather than the one-club golfing of the last Government.

Q138 Barry Gardiner: Well, we can get into an argument about Germany but let's just focus on the UK for the moment. Will the companies that receive the Chancellor's compensation be obliged to commit to energy carbon-saving measures?
Gregory Barker: I expect so, but I do not think we—

Q139 Barry Gardiner: You expect so?
Gregory Barker: We have not published the detail yet.

Q140 Barry Gardiner: I would have imagined that it might be something that you would insist upon, Minister.
Gregory Barker: You will be aware, Mr Gardiner, that all of the companies that are likely to be impactful already will be likely to be taking part in climate change agreements or the climate change levy. They will already be under obligations to increase their energy efficiency. Of course, if energy is 70% of your business as a cost base, as it is for a chemical business, I do not think you will find many of these companies are really reluctant. The sorts of businesses that are being targeted are not typical of British industry as a whole. Typically, the energy costs of the average British business are much less than 10%, usually about 3%.
Barry Gardiner: But there are other things than energy, aren't there?
Gregory Barker: If I might finish my point, we are talking about businesses where the cost of production is around 70% energy, so this is not something that you can hide. But there is a law of physics that means that you can't create chemicals with current technology without a decarbonised electricity sector.

Q141 Barry Gardiner: My point is, Minister, that the Government is saying that it has to give a quarter of a billion pounds to these industries in order to get them to feel comfortable about putting in place the policies that you have suggested because otherwise they might reduce their competitiveness. Therefore, it would be sensible, would it not, to take the opportunity, while you have the carrot of a quarter of a billion pounds dangling in front of them, to ensure that in all sorts of other ways they are taking effective measures on energy efficiency, on waste, on other elements that would contribute to climate change?
Gregory Barker: Absolutely, and there are lessons from Germany there. Where we can get some additionality I am sure that we will want to, but we have not yet announced the exact details of that, Mr Gardiner, and I am afraid I am not in a position to announce it now. The principle I think we actually agree, yes, but we just need to be a little bit pragmatic about that.

Q142 Barry Gardiner: You will have seen the graph that has been presented to us where the discrepancy between the territorial-based emissions and the consumption emissions shows China going very firmly down in a green line and—
Gregory Barker: For ease, could you just identify the graph?
Barry Gardiner: It looks like that.
Gregory Barker: Do my officials—no, we don't have that, I am afraid.
Barry Gardiner: Let me give you mine.
Gregory Barker: Very kind. Oh, that is clear.
Barry Gardiner: Now, if I can look over Alan's shoulder at his, basically it shows China down at the bottom in the green line. In between or above China it shows India, then Germany, then Japan, then Canada, then the USA, and then at the top it shows the UK. For many of those countries we like to feel that we are doing better than the USA, we are doing better than Canada and so on, but what this shows is that on a consumption-based analysis—
Gregory Barker: Whose analysis is this?
Barry Gardiner: The UKERC, apparently.
Gregory Barker: Sorry, it is who?
Barry Gardiner: UKERC, the Committee's—you are very welcome to question the provenance of the figures in this—

Gregory Barker: No, it is just that I have not seen it before so I—

Barry Gardiner:—and try to undermine them as best you may, Minister, but if we can just look at the data that we have—

Gregory Barker: I am just rather impressed they have rather more up-to-date figures than I do.

Barry Gardiner:—you see the gap between the UK and the territorial-based emissions, a substantial gap that seems to be increasing, that shows that our consumption patterns relative to our carbon production is diverging very sharply.

Gregory Barker: I would think that would in large part be because we have done far more to reduce our territorial emissions than these other countries have. It would obviously be a factor, compiling a graph like that—the better you are at increasing. If your consumption were to remain static but you were to dramatically decrease your territorial emissions, you would expect to show that, wouldn't you, Mr Gardiner?

Barry Gardiner: Oh, indeed.

Gregory Barker: The fact of the matter is the UK has been very successful, far more successful than any of these other countries I think, in reducing our territorial emissions. In actual fact, the way that this graph is extrapolated is true but without seeing a corresponding graph on to the same scale that shows territorial reductions, it is not very helpful.

Q143 Barry Gardiner: I absolutely grant you what you have said, Minister. What it does show also is that the trend of consumption emissions in the UK is up while the trend of production—

Gregory Barker: I think it is impossible to extrapolate without knowing the balance between consumption and territorial emissions.

Q144 Chair: Just for the record, let me say this was a document that was submitted to us in evidence. It has been available publicly on the website. Its existence was drawn to the attention of your officials before you came to this session so they could brief you about it if they thought it was sufficiently important to address. That is, I think, important for everyone to know, both for the Committee and publicly. The figure is actually the consumption minus the territorial-based emissions.

Gregory Barker: Yes, so if your territorial emissions have decreased then you would expect to be at the top of the graph. We would be doing much better if our territorial emissions had increased, wouldn't we? If our territorial emissions had increased, it would improve our performance.

Chair: It is designed to show exactly the point that I made earlier on, which is that there is a very sharp divergence between the measurement of territorial emissions and the measurement of consumption emissions. It is particularly sharp in the case of the UK, which is exactly why I think it is the sort of issue on which the UK might be able to show some international leadership of the sort we showed 20 years ago and about which DECC seems, I think, disappointingly reluctant even to engage in an intellectual debate.

Q145 Barry Gardiner: Sorry, Minister, if I can just pursue the point. If our consumption emissions were proceeding at the same rate and in the same direction as our production emissions then they would be—

Gregory Barker: That would be a miracle.

Barry Gardiner: Indeed it would, but they would then be flatlining together; they would be coterminous. What we have here is a graph that shows us that our consumption emissions are increasing while our production emissions are decreasing.

Gregory Barker: But that is not what the graph shows.

Lord Taylor of Holbeach: If I may interrupt, I don't think we deny that. We have shown you a graph in the joint submission that we made—

Q146 Barry Gardiner: Indeed, your own Department, Minister, says they have increased quite substantially.

Lord Taylor of Holbeach: We have shown and we are well aware of the fact that the percentage of consumption emissions in the British economy is growing and I don't think either of us have denied that. But I think, as Mr Barker says, it is a reasonable point to make that the graph that you have presented to us would show an even more extreme situation had we been even more successful in pulling down our territorial emissions. It is interesting but it only reinforces information that we ourselves have provided for you in our joint submission.

Gregory Barker: I think the lesson is you can't rely on one indicator alone. I think we would share your view that consumption emissions are something that need to be taken into account. We do not believe that they should supersede territorial emissions or in any way undermine the UNFCCC.

Barry Gardiner: Minister, you have made that point both in your—

Gregory Barker: This graph in itself is not particularly helpful in isolation.

Q147 Barry Gardiner: Can I just return to the question that I would like you to answer? Given that you have helpfully, both of you, agreed that our consumption emissions are increasing, while I acknowledge and I am very pleased that our production emissions are going down, do you recognise that as in some sense representing a carbon debt, that space, that gap?

Gregory Barker: I don't know about carbon debt. I think other countries clearly have more to do to make their economies more efficient and that represents an opportunity to increase the competitiveness of their economies. It is not just a debt. I think if China is able to produce high-end consumer goods consuming less fossil fuel, that is not a debt that we redeem, that would be something that will be to the competitive advantage of China or any other country that is able to make a leap forward to decarbonise. I think it is not always helpful to talk about carbon debt. No, Mr Gardiner, I think it is an emotive term. I think it is a useful matrix to look at, but I think introducing terms that could be emotive and may be aligned with financial debt, for example, is not particularly helpful.

Q148 Sir Robert Smith: I had better remind the Committee of my entries in the Register of Members' Interests as a shareholder in Shell, an energy company, and an energy-intensive user, RTZ. Just bringing together what has happened so far, how successful has the UK been in decoupling economic growth from greenhouse gas emissions?
Gregory Barker: I think we have been relatively successful. If you look at our reduction since 1992, we estimate that we are currently in excess of 25% below—not on officially released figures, but our estimate is that we are above 25%. That certainly stands up well relative to the growth that we have seen in the economy. Certainly, we are not complacent, though, and we realise that there is a lot more that we need to do. It gets harder as you eat up the low-hanging fruit. A significant part of that figure would have been made up from the "dash to gas" under the previous Conservative Administration. There were years, particularly in the earlier part of the decade, where there was not a strong trend of decarbonisation relative to economic growth, but we think we have made progress and the policies that we have in place are really going to be helping us deliver that fundamental break between economic growth and carbon emissions.

Q149 Sir Robert Smith: Yet back in 2008 when Defra commissioned a report on an embedded carbon emissions indicator, the Defra officials briefed the Secretary of State, Hilary Benn, that Government needs to be cautious about over-claiming on its achievements in decoupling economic growth from environmental degradation. Is that still the view of Defra?
Lord Taylor of Holbeach: I think we are right to be cautious because the last thing we would want to do is to introduce a concept that Government was complacent in this area. There is still a great deal to do. It would be easy to say that when the figures are produced in March on the latest year, updating the consumption figures, the expected fall—the anticipated fall—in those figures is due to the downturn in the British economy. There are links, of course, but the drive to reduce greenhouse gas emissions is an absolute, regardless of the state of the economy, and that is the commitment made under the Climate Change Act on which we are both signed up.
Gregory Barker: It might be helpful if the Committee were to look at industrial output, which since 1990 has averaged about 1% increase per year, while emissions from the industrial sector have fallen by 46%. In buildings, emissions have fallen by 18% despite the growth in population and housing. Obviously, regulation and changes in practices have contributed to that in both sectors.

Q150 Sir Robert Smith: Would the industrialisation partly be the outsourcing of the supply chain?
Gregory Barker: I am sure there are many reasons.

Q151 Sir Robert Smith: Do DECC and Defra discuss together how to present this?
Gregory Barker: How to present it?
Sir Robert Smith: As to how well we have achieved or not achieved in terms of decarbonisation?
Gregory Barker: Well, we certainly take the view that we want to put as much information into the public domain as possible. DECC has just published in December the *Carbon Plan*, which is a very weighty tome indeed, which is certainly information rich. It includes an analysis of our progress to date, the problems we have encountered, the challenges that we have to face going forward, and it does get progressively more difficult, obviously, but it also charts the policy landscape we are putting in place.

Q152 Sir Robert Smith: In 2010, during the second reading of Lord Teverson's Bill on consumer emissions, DECC officials briefed their spokesman in the other place that measurement of emissions on a consumption basis was too complex and time consuming, when Defra is doing that actual job.
Gregory Barker: Well, there is no duplication then, is there?

Q153 Sir Robert Smith: No, but how can DECC take a view that it is too time consuming and complex when Defra is actually able to do it?
Gregory Barker: Well, we wouldn't do it if Defra are doing it.

Q154 Sir Robert Smith: But the actual practice. You actually do see it as not too complex?
Gregory Barker: Our overall view is that it is a given—there are very few people who would disagree with you—that trying to put together an accurate and reliable and credible consumption-based emissions report is incredibly complex and extremely difficult. Defra are doing an excellent job but I don't think anyone in Defra would say that it is easy and simple.
Lord Taylor of Holbeach: No—

Q155 Laura Sandys: But it has been achieved?
Lord Taylor of Holbeach: It has been achieved, but I think in my presentation to the Committee, Ms Sandys, I made it quite clear that we acknowledged that it was a less reliable set of data because it was based, of course, on information that we ourselves did not control. I think it is really important. I understand exactly the thrust of Sir Robert's questioning, and indeed the views that the Committee is expressing on these matters, but I think it is very important to get back to the original thing. We are sibling Departments. I remember when we shared the same nest, so to speak. We are perfectly capable of co-ordinating our efforts and there is no difficulty between the two Departments, but it has been Defra's responsibility to collect consumption-based data. We are doing that on behalf of the Government and it is the Government's view that consumption-based data is a useful steer but it is not the whole picture. The one element that we can control is the territorial-based data. We are obviously obliged to collect that data, we control the accuracy of it and we have an international obligation to use that data properly. The consumption data is less tightly defined, but it is a useful steer to Government and it is not being ignored.

Gregory Barker: I would wholeheartedly endorse that. I think Lord Taylor has encapsulated the view of Government brilliantly. I think the Committee is trying to suggest that somehow DECC is antipathetic towards consumption-based data. We are not. It is a very helpful way of having a check on our progress, but we do not see it as an alternative system that would be preferable to the territorial emissions data, which is the language of the UNFCCC. We probably should use it more going forward than we have in the past. We certainly need to improve the reliability of that data and it is complex, it is difficult. We can improve on that and use it more in the future, but I do not quite understand, if the Committee is saying we should replace territorial with consumption-based in terms of supremacy, we would not be going that far.
Chair: The Committee is not saying anything. It is asking questions, trying to find out what the Government's view is.
Gregory Barker: Yes.

Q156 Sir Robert Smith: One final sort of connection between Departments, Lord Taylor's predecessor at Defra, Lord Henley, was briefed when he joined the Department that although technological efficiency has improved the CO_2 impacts of our products, the rising UK consumption has outstripped the improvements achieved, reducing the overall effect. Is that something DECC would agree with?
Gregory Barker: I have not seen the exact emission, but it does not sound out of line. I think the Committee seems to be assuming that other countries will not be able to follow the decarbonisation progress of the UK. The fact of the matter is we are a low carbon leader. We have among the best record of any major economy in reducing our emissions, for a whole range of different reasons. We expect the whole global plan is based on the fact that other countries will be able, to varying degrees, based on common but differentiated responsibilities, to decarbonise their economies as well. While consumption has gone up because of the things that we import from the Far East, as their climate policies kick in as ours have, we would expect that profile to change.

Q157 Barry Gardiner: But behaviour is not just about reduction, is it, Minister? Behaviour is also about consumption. If our behaviour pattern has managed to reduce our production carbon but our consumption is increasing, don't we need to do something to affect the way people behave in their consumption patterns as well, because that is driving climate change around the world?
Gregory Barker: Well, obviously behaviour is important. We have seen that in the way in which the Government has approached its own 10:10 campaign, the way in which over the first 12 months of the Coalition we were able to reduce carbon emissions from central Government buildings by 13.5%. A significant portion of that came from behaviour change. So I would agree with you, Mr Gardiner.

Q158 Barry Gardiner: It is all behaviour change, isn't it?
Gregory Barker: It is not all behaviour change, no, absolutely not. There is a significant part that is behaviour change; there is a very significant part that comes from technology and increases in efficiency and the retirement of old, inefficient equipment. Behaviour change and technology often go hand in hand and if you give people a more attractive alternative they will take it, and often it is technology that makes it more attractive.

Q159 Sir Robert Smith: If I understand then, your long-term position is that we get a binding, successful treaty on production emissions across the world and, therefore, by definition we tackle the climate change because wherever our consumption goes it is low-carbon.
Gregory Barker: Everyone is going to have a budget, yes.
Sir Robert Smith: But we have not quite reached that binding—
Gregory Barker: Correct.
Sir Robert Smith: The worry is that we as a country are still impacting on the environment in the same way because our consumption has gone to those parts of the world where emissions are still high.
Lord Taylor of Holbeach: I think it is wrong, if I may say so, to assume that we are impacting in the same way. Of course, there has been some—
Sir Robert Smith: There is a worry.
Lord Taylor of Holbeach: Yes, I understand the Committee's concern. I hope, although, Mr Chairman, you were reluctant to admit that the Committee had an agenda, the thrust of the—

Q160 Chair: We have no agenda. We are genuinely trying to conduct an inquiry into a subject that has not had much attention, which should have more attention, but which may just check the complacency of a country that considers that we are doing so much better than anybody else. It is not absolutely clear that on an alternative measurement we are doing anything like as well as some other countries.
Gregory Barker: Which, Mr Chairman? Which other countries?
Chair: Wait and see what the report says. We will ask the questions. We will try to persuade you to give the answers.
Lord Taylor of Holbeach: I was trying to put my answer in some sort of context because I was acknowledging, I think, the reason for you asking us these questions, if I can put it that way round then. But there are ways in which Mr Gardiner's question about behaviour can be influenced and the Government is trying to deal with that through eco-labelling and energy-labelling. These are areas where consumer behaviour is hopefully being influenced, and every sign is that it is being influenced. I think that this is a pragmatic and practical way in which we can impact on supply chain carbon emission, which the consumption figures tell us is something that we should address as well as mitigating carbon emissions here in the UK. I accept that totally.

Q161 Laura Sandys: I am fascinated because what we sort of have or what appears to happen is that

both Departments are trying to justify why Defra has spent—I do not know, I would love to know, and maybe the Committee would like to know, how much it costs to get this data that Defra is collecting. You are collecting all this data. As a collective, both between DECC and Defra, it seems like, "Well, it is sort of useful data but we look at it and then we put it to the side and it does not really inform policy", and—
Dan Byles: You think it is useful but you don't know what to use it for.
Laura Sandys: Absolutely, but Defra thinks it is useful. DECC does not seem to feel that it is very useful—
Gregory Barker: The fact that it is so out of date is not helpful.

Q162 Laura Sandys: Could I just possibly finish? Well, yes, but the point is there is certainly trend analysis. Government makes policy on figures that are much further out of date than 2009 in so many different fields. I am interested in at what moment did Defra feel that it was important for it to invest the money in this interesting—and in DECC's view theoretical, in our view maybe much more than theoretical—project but that it does not then inform policy. Maybe the Minister for Energy could explain whether any policy in the DECC agenda has come out of these figures. It is either irrelevant and you should stop doing it because it is wasting money, or it is important and as a result policy should emanate from it. Forget the international side as well.
Gregory Barker: The only way to affect consumption, fundamentally, is not to stop consumption but is for the countries that are exporting the goods to us to take greater measures to ensure that the products that they export to us have higher standards and a lower carbon footprint.

Q163 Chair: That is not the only way. Obviously, it is one of the ways but there are some demand side measures that will directly affect consumption: greater energy efficiency, better building standards and so on. They are not reliant on decisions taken abroad. They are decisions that we take here.
Gregory Barker: Absolutely, and we are pushing this.

Q164 Laura Sandys: What policies have come out of the data collection that Defra obviously feels is important and is obviously spending money on?
Lord Taylor of Holbeach: I think it is very important to emphasise that one of the key users of this data is not the Government itself but also business. It is through business examining their supply chains and identifying carbon costs within their supply chains that you can influence business decisions and actually reduce not only territorial emissions in this country but also consumption emissions that may be elsewhere.

Q165 Christopher Pincher: It seems, Lord Taylor, that you are accepting that a consumption measure of emissions is better than a territorial measure of emissions because you said in your statement that 75% of emissions come from the procurement supply chain. That is quite a lot.
Lord Taylor of Holbeach: Yes.
Christopher Pincher: I think you would accept that a large chunk of that supply chain is extra-territorial, so aren't you accepting that a consumption measure is better than a territorial measure?
Lord Taylor of Holbeach: No, on the contrary, I think I also said that the difficulty with consumption-based is that the data on which we calculate it is less refined and less reliable, but it is an indicator. It is better than nothing but it is not perfect. The one thing, however, that we do control are territorial measurements, which we are obliged to because we are obliged under UK law, under the Climate Change Act, and we are obliged also in our international obligations. We can't transfer allegiance from one measurement to another. That is not pragmatic and it is not going to help us, but what we can do is to make sure that we make these consumption figures available because they do inform the debate and also those people who make decisions every day, which can reduce carbon emissions globally. We think that that is a worthwhile exercise.

Q166 Laura Sandys: This is a service to business that you are offering, not something that is changing policy or advising different Departments to look at different policy measures. No policy has come out of this?
Lord Taylor of Holbeach: I think all Government notes these figures because they are of interest and they do demonstrate that we still have a considerable global responsibility to encourage countries to reduce their carbon emissions. That is DECC's policy and that is Defra's policy. As I see it, there is no conflict between the two of us in that respect.

Q167 Chair: Just to address directly one of the concerns expressed by the Minister of State about the use of the consumption figures, that they are out of date, is it Defra's view they are going to show a sudden dramatic reversal of the trend of the last 20 years in the post-2009 period, or is it your view the trend will probably continue in the same direction?
Lord Taylor of Holbeach: I haven't seen the figures. I would expect they would probably show a reduction.
Chair: Really? A reversal of the trend?
Lord Taylor of Holbeach: Yes. But I am not in a position to confirm that because I haven't seen the figures.
Chair: There might be a reduction obviously based on the recession but—
Lord Taylor of Holbeach: I think I alluded to that when I was answering Sir Robert on his earlier question about linkage between industrial capacity and the figures.
Gregory Barker: It remains our view that the single most effective policy for addressing this issue is in an internationally-binding global legal agreement and anything else is going to be very much secondary to that because of the difficulty of getting reliable, auditable figures.

Q168 Dr Whitehead: How did DECC calculate the basis for the Emissions Performance Standard that is coming forward in electricity market reform?

Gregory Barker: Sorry, how did we calculate?
Dr Whitehead: Yes.
Gregory Barker: This is completely different to the—

Q169 Dr Whitehead: What were the emissions levels that were calculated in—
Gregory Barker: It was done in reference to a modern gas-fired power station.

Q170 Dr Whitehead: Yes, and coal-fired power stations, how was that calculated?
Gregory Barker: Sorry, I don't follow the question. We referenced the Emissions Performance Standard for what you would expect from a modern, efficient gas-fired power station and that was set as a benchmark. Coal is substantially a lot higher than that.
Dr Whitehead: 700 per kilowatt hour, isn't it?
Gregory Barker: Yes, something like that but coal is significantly above so it doesn't really come in, in terms of the calculation of the Emissions Performance Standard.

Q171 Dr Whitehead: Did the Department calculate all the emissions that arise from the coal-fired power station? For example, 51% of our coal is imported; is that counted?
Gregory Barker: You don't need to count it because it is impossible under our emissions performance standard to come anywhere close. If you did count it, it would take you even further away from being able to meet it.

Q172 Dr Whitehead: So, we didn't count it or we did count it?
Gregory Barker: I would have to get back to you but it doesn't need to be counted because the Emissions Performance Standard sets a minimum that coal and the current technology, without carbon capture and storage, doesn't get close to meeting. The only difference was it doesn't meet it or it doesn't meet it by a mile or doesn't meet it by 100 miles.

Q173 Dr Whitehead: I think my point is that if you did go back and find how well you had counted all the coal that had gone into UK power stations, as far as emissions are concerned, the answer would be yes, whether it was imported or not.
Gregory Barker: The answer would be yes to what?
Dr Whitehead: That you had counted all the coal coming into UK power stations for the purpose of calculating the emissions arising from UK power stations that are run by coal.
Gregory Barker: Sorry, I thought you were talking about the Emissions Performance Standard.

Q174 Dr Whitehead: When you drew up the Emissions Performance Standard you stated that the emissions from a modern coal-fired power station were about 700 grams per kilowatt hour.
Gregory Barker: We were talking about the direct output measurable on the site.

Q175 Dr Whitehead: Yes, from the coal that had gone into the power station. That is what produces the emissions, how we consume the coal.
Gregory Barker: Yes, the emissions performance side is something that is technically measurable on the site. We are talking about the direct emissions.

Q176 Dr Whitehead: Yes, absolutely, but do we make any distinction, when we are deciding on that measurement, whether the coal has been imported or not?
Gregory Barker: I don't quite understand your line of questioning, because the Emissions Performance Standard sets a minimum threshold. It makes no difference to the coal whether or not—
Dr Whitehead: Absolutely, where it comes from, you are absolutely right.
Gregory Barker: No, but the coal doesn't meet the Emissions Performance Standard, the EPS, and it is not met.

Q177 Dr Whitehead: It could come from China, for example.
Gregory Barker: Yes, but it doesn't matter where it comes from, it is still not going to meet the EPS.

Q178 Dr Whitehead: We are consuming it in the UK, we have imported it from abroad, we measure it against the emissions standard that is coming out of the UK. Isn't that a consumption—
Gregory Barker: No, I think you are confusing things.
Dr Whitehead: Isn't that a consumption measure of emissions?
Gregory Barker: Dr Whitehead, I think you are confused in your line of questioning. Are you talking about emissions or are you talking about the Emissions Performance Standard?

Q179 Dr Whitehead: We came upon an emissions performance standard as a result of measuring the emissions from coal-fired power stations that we then put into the Emissions Performance Standard alongside that from gas-fired power stations and other forms of energy production and we have done that regardless of the source of the energy that is producing those emissions, which is a consumption-based measure of emissions.
Gregory Barker: I am sorry, I think there is a difference in terminology here. The Emissions Performance Standard specifically refers to the policy that we have of imposing a moratorium on—

Q180 Dr Whitehead: Forgive me, I understand the policy. The point I am asking you to think about is what we do, what policy we carry out, as far as measuring the emissions in terms of our consumption of coal-based on what source it comes from. My suggestion is that we don't do that. We don't look at the source of coal, do we? We simply measure the emissions.
Gregory Barker: That is different to the Emissions Performance Standard, I think.
Dr Whitehead: One leads to the other.
Gregory Barker: I rather suggest it is a part of the EPS as a policy that is embedded in the EMR proposals and you just look at emissions from coal and I am sure—

Q181 Dr Whitehead: Wherever it comes from?
Gregory Barker: What we talk about in terms of emissions that come from a coal-fired power station is the emissions that are created in the burning of that coal on-site. You are quite right, we don't look at it, but I don't see the relevance of that to the Emissions Performance Standard.
Dr Whitehead: I am looking at the relevance in the other direction, which is that my thought on this is that you have said that we are responsible only for our territorial emissions and—
Gregory Barker: We are not responsible; they are the things that are under our control.
Dr Whitehead: Yes, indeed. That is what we can measure and that is what we should go ahead on, but as far as the policy that the Department runs as far as coal is concerned—leading, among other things, to the Emissions Performance Standard—that is not what we do, is it? We do something quite different. We measure what emissions arise from the coal wherever it comes from.
Gregory Barker: The Emissions Performance Standard will prevent the burning of coal.
Dr Whitehead: We are running a consumption-based emission measure as far as coal is concerned in the UK, that is my point, and the Department is deriving policy from it, isn't that right?
Gregory Barker: I am sorry, you have lost me now, I am afraid.

Q182 Chair: If I can mediate, I think the point is that the way we measure emissions at a coal-fired power station—which of course eventually may become impossible to operate for other reasons—at the moment is on a basis that comes into both categories. It is both a consumption-based measurement and a production-based measurement. We are treating the burning of coal, imported from somewhere else, as a UK emission, both in terms of territorial—because that is how it is done—and also in terms of consumption. I think the point is, isn't this a sort of tacit admission by DECC that the consumption basis has some validity? Have I interpreted that right?
Gregory Barker: Mr Chairman, we wouldn't disagree for a moment that there is some validity in consumption-based. I think what Lord Taylor and I have been trying to say is that we think it is a useful measure, so far as you are able to use it. I must say again, we are not antipathetic to this. We would like to see greater reliable data. We would like to see it more up to date. We would like to see greater rigour in the data sets that are available. We would like to see more countries do this, not just the handful of countries that currently undertake similar exercises to those which Defra undertake. It is a useful benchmark, I don't think we are disagreeing with that, but it does feel that you are trying to push us into a position that we are not taking. We think it is helpful to produce this information; that is why Defra does it. We don't overestimate how reliable it is nor do we underestimate the complexity of gathering it, but it is still a useful data-set and is useful to set alongside our territorial emissions.
But there is the big danger, which you haven't mentioned in this Committee, of double-counting, that when you don't have a universal, global methodology for the calculation of consumption-based emissions it is almost impossible to do so without double-counting. The emissions that are embedded in the extraction and export of coal from any given country will be included in that country's emission profile. We can't have double-counting. They can only be counted once and it depends where they come from.

Q183 Dr Whitehead: But DECC does that in terms of how we measure the coal that is coming into the country, as far as the emissions are concerned.
Gregory Barker: We only count towards our—
Dr Whitehead: Laura Sandys asked a moment ago whether DECC undertakes any policy consideration of consumption-based emissions. Well, clearly DECC does do that and in principle DECC, therefore, double-counts. But if DECC didn't double-count then the question of coal would look very different because coal would come in at 350 grams per kilowatt, because that is the only territorial responsibility we have, and then it would look very good as far as the EPS is concerned.
Gregory Barker: Can I come in? That is not my understanding at all, Dr Whitehead. Coal burnt in a modern power station emits significantly more.
Dr Whitehead: That is not my point.
Gregory Barker: The emissions performance standard that we will be introducing—
Dr Whitehead: I don't think we are going to get anywhere with this, are we?
Gregory Barker:—relates to the burning of that energy source on the site.

Q184 Dr Whitehead: Yes, I appreciate that. What presumably we have to do in terms of your statement, Minister, that we should be a model of prosperous, low-carbon growth, is account, among other things, for the backpack that that growth is carrying along with it.
Gregory Barker: Not if it creates double-counting. What we want is a—

Q185 Dr Whitehead: No, that is right, providing it doesn't create double-counting, but a model of prosperous, low-carbon growth presumably has to look at the lifecycle of what has gone into that growth, as far as carbon is concerned. It is absolutely right that we should not double-count but if, on the other hand, we are ignoring a part of the backpack because it doesn't happen to sit within our territory then we will come up with rather strange results as far as what our low-carbon growth actually looks like.
Gregory Barker: I think we would agree with you but it is an important reference point. I think it is very difficult to extrapolate, from the figures and data that we have available on historic consumption, anything other than that we need to do more. We are still in the foothills of decarbonisation. This Coalition Government wants to see more manufacturing, not less; we want to have an export-led recovery, not boost domestic consumption and fuel imports; we are trying to reshape the economy. There are a whole number of challenges that don't lend themselves to simplistic analysis by one single data set. The only

thing that we can be absolutely certain of is we can control our territorial emissions to a much greater degree than we can both control and accurately analyse our consumption.

We are not saying that this should not be an important measure. If we were to see a significant divergence—I haven't seen them yet but Lord Taylor has said that he expects the next set of figures to show a significant drop in consumption-based emissions—obviously we want to take that into account, we would be mindful of it, and if we were to see some extraordinary divergence we would want to look into that. But I don't think we are seeing that yet and I don't think we would want to take in isolation the graph that the Committee has provided because it doesn't take into account the fact that we are doing much better than many other countries to reduce our territorial emissions.

Chair: That is not a graph the Committee has provided. It was sent in evidence to us and we were asking your opinion about it. It is nothing to do with the Committee. It has already been published on—

Gregory Barker: No, but it is the graph that we asked to express an opinion on.

Chair: We asked you to comment on it, that is right. It is not published by the Committee; it is evidence we have received from a body that we thought was worth publishing. There can be different opinions about its value, and you have expressed yours, but it is not published by the Committee. It is not a Committee graph.

Gregory Barker: I wasn't suggesting it was.

Q186 Chair: They have not spent weeks trying to produce it. They just took evidence from somebody else.

Can I ask you a very direct question? Do you think if we were more transparent about our consumption emissions that would give us more locus in talking to other countries about the emissions for which they are responsible on a territorial basis but for which we are responsible on a consumption basis?

Gregory Barker: I think greater transparency is always a good thing. I am sure it would be helpful and I would very much welcome an improvement in the reporting of consumption-based emissions and greater transparency and greater up to date. But, as Lord Taylor said, we don't underestimate the difficulty in doing that, particularly when we are doing it in isolation and when there are only a handful of other countries who are attempting to unpick this global puzzle.

Q187 Chair: Do you think the way to try to increase the number of countries that are tackling this is to emphasise the difficulty of doing so or perhaps to emphasise the value of the results that might be achieved?

Gregory Barker: I think what I would be mindful of is that it is not seen—as I think there is a danger that it could be misinterpreted as—as a way of imposing tariff barriers and a new form of carbon duties on developing countries. This Committee has not mentioned the very significant scepticism and concern that there is in developing countries that when we talk about consumption emissions we are talking about ways to limit imports from the developing world who depend on that. That is the realpolitik, the elephant in the room that we haven't discussed. The mood music in these negotiations is so important, let alone the actual proposals, and if countries like China and India see that suddenly we are trying to have a big push on consumption-based emissions and to gather a global picture they will ask why are we doing this and it could be open to misinterpretation.

Q188 Barry Gardiner: I absolutely agree with you on that point. I think it is a very important point and I am glad you have made it, but you will acknowledge that there is another factor that plays into those discussions as well and that is that they would very much like to have on the table the fact that their consumption is so low. That is something that we have rather liked to sideline because we haven't liked to look at the per capita basis—we haven't liked to look at these things. Perhaps if you would agree that, while a bit more transparency on our talking about our consumption could have the impact that you suggest in the international arena, you would also acknowledge that if we were a bit more transparent about the per capita consumption and the per capita emissions of other countries, that would create a much better global picture where there could be improved dialogue and understanding.

Gregory Barker: I think it is very helpful. The interesting thing, though, is the huge divergence between economies. For example, in India the per capita emissions are about two tonnes, whereas in China they are higher than France and Italy per capita.

Q189 Chair: Does the Indian figure include domestic aviation?

Gregory Barker: I assume so.

Q190 Laura Sandys: In many ways, let's say moving from the global to the local, when you start to look at consumption-based assessments do you not feel—and this is something I bring up with DECC quite a lot about behaviour change, the consumer and so on—that these consumption measures are extremely useful to help with behaviour change? Lord Taylor was mentioning that business use your data already. What measures are you going to be using to disseminate this and how are you going to translate it into a way that could assist with demand-focused policy?

Gregory Barker: I totally agree. The Government is involved in supporting businesses to tackle emissions through their supply chains. We specify products that are lower carbon in manufacture and use, through mandatory EU standards, also voluntary labels and procurement specifications and these definitely create a pull through for green products in the market. Perhaps Lord Taylor would like to talk about it. A lot of this is led on by Defra.

Lord Taylor of Holbeach: Yes. I think I mentioned before the role we have and, particularly by using WRAP to give us product research, we think this is an important way of informing public consumer

choice as well as informing business in these decision-making procedures. It can be direct energy and also it can be indirect energy consumption in the manufacturing process that will build a picture of where we feel markets could support and sustain the greener alternative.

Q191 Laura Sandys: Do you feel that you have made headway in this and do you feel that you have policies in place that will reach the consumer? It concerns me that sometimes this becomes very much a carbon-to-carbon conversation rather than a carbon-to-consumer engagement.
Lord Taylor of Holbeach: Yes. We will all have had the experience of perhaps going into a white goods store and looking at fridges. We have labels on there about energy consumption that do inform decision making. I think most of us tend to shop with that information available to us and make our choices accordingly. Eco-labelling, energy-labelling may be relatively micro in their impact but cumulatively, of course, this is the way in which we influence consumer behaviour. Trying to reduce carbon emissions in the UK is essentially something in which consumer behaviour has a very large part to play.

Q192 Laura Sandys: I would totally agree with you but I would say that we haven't gone very far. When did we introduce those labels for white goods? It was a long time ago. I haven't seen policies develop from the perspective of consumption since then. Maybe I haven't gone to the right shops. But I think that it has stalled this agenda and I would propose that—
Lord Taylor of Holbeach: It is something that I get quite involved in. Eco-labelling, in particular, is something that is developing all the time. I think that we shouldn't underestimate that providing consumers with this information can be very useful and I think an informed purchaser is likely to make a better decision.

Q193 Laura Sandys: But how are you informing me?
Lord Taylor of Holbeach: By the labelling process.
Sara Eppel: Just to give you a bit more information about the process on the energy-labelling, we have 25 products that we are working through Europe-wide, so that is 27 Member States negotiating the minimum performance standards for each of these 25 products and then applying an A to G label on each of them. We have done 12 and we know that once stock has turned over we will be saving 7 million tonnes of CO_2 in the UK alone, just from those, and we are working through the next 13. So it is not stalled; it is very active.

Q194 Laura Sandys: Okay. When one starts to look at this consumption there needs to be an education of the consumer as well to reiterate how consumption and how their behaviours will impact the overall carbon consumption of the UK. That would be a Defra responsibility and not a DECC responsibility.
Lord Taylor of Holbeach: I think it is a Government responsibility really, in all Departments. BIS are involved as well. That is why the presentation we made was a joint one.

Q195 Sir Robert Smith: It is a bigger challenge to consumer behaviour, because the consumer goes into the white goods shop, buys the A-rated fridge, gets home, moves the old fridge in the kitchen, puts the A-rated fridge in. What do they do with the old fridge? If they put it in the garage for keeping their beer in then they are increasing their consumption. So it also feeds over to DECC in terms of actual energy usage in the home. Labelling helps but behaviour change is quite a big—
Gregory Barker: But as we know from the HFC story, a lot of fridges are thrown away. A lot of people, particularly in cities, don't have the space to create their own little pile of white goods.

Q196 Chair: On this point about labelling, I was disappointed to read in the *Financial Times* this morning that Tesco has decided to drop their scheme after four years because of poor take-up by other retailers. It may not be accurate but the *Financial Times* has carried that.
Could I just pursue this point about consumer decisions, which is very important? If we only look at a territorial measurement, decisions made by British consumers to source lower carbon products from other countries, which have a beneficial effect on global emissions, will not appear in our territorial measurement at all. They would, of course, appear in a consumption measurement. I think we are all agreed that we need to enable consumers to make lower carbon choices wherever possible, and labelling is an important part of doing that, but it might be encouraging to consumers if they saw more visibility from the consumption figures because they would know that something they are doing voluntarily was having a beneficial effect.
Lord Taylor of Holbeach: It can also affect territorial emissions. Not all the carbon content, if one might say, of goods that consumers are buying are imported. Having good labelling and buying carbon efficiently can affect our territorial emissions as well as consumption emissions, of course.

Q197 Chair: Of course it can, and I think we are all in favour of good labelling, but I was trying to get to the point that if we are trying to encourage consumers to make low-carbon choices, the benefit of their doing so will be less apparent if we emphasise always territorial measurements.
Lord Taylor of Holbeach: I don't think we do, in the sense that we publish consumption-based data, and indeed I hope I have made some contribution to the discussion on the value that I think that can bring to supply chain knowledge for business as well as for consumers themselves.

Q198 Chair: When will the next consumption figures be published?
Lord Taylor of Holbeach: 8 March.

Q199 Chair: That covers the period—
Lord Taylor of Holbeach: Ending 2009.

Q200 Chair: So, they are three years out of date?
Lord Taylor of Holbeach: Yes. The current set is maybe four years out of date. Part of the difficulty is collating this information from databases that are far from perfect, and I think I have made that clear. This is why we have to be careful not to get too hooked up on consumption-based data. It is the robustness of the data.

Q201 Chair: This will, of course, be the first year that the recession was really biting for a full year. Could I go back to the Minister of State. Government Ministers are fond of saying that the UK is responsible for only 2% of global emissions. Do you think that that is an entirely accurate picture?
Gregory Barker: Based on territorial emissions it is.

Q202 Chair: Right. So we should always have that caveat when that statement is made?
Gregory Barker: I think you have to appreciate that is the language of the UNFCCC. That is the language of international climate change negotiations. It is very difficult to unpick that picture and have a credible picture of consumption-based emissions, not just for the UK but for the global community, because simply that data doesn't exist.

Q203 Chair: You don't see the insistence on only using—
Gregory Barker: But, Mr Yeo, while we emphasise this point, we are not insisting on only using—we are not antipathetic to consumption-based emissions reporting. Defra does it. We will be publishing new consumption-based reporting. We would like to see an improvement in the integrity of that reporting. We would like to see other countries join with us. We think it is a useful measure, that is the point; we are not antipathetic.

Q204 Chair: Perhaps if I just finish the question. You don't see the insistence on only using territorial emissions measurements for the purposes of international negotiations—which is the present situation I accept—as any kind of obstacle to the change in the views of some developing countries about accepting a legally-binding agreement to have explicit caps on every country signing the treaty? You don't see it as any obstacle?
Gregory Barker: I think it would be perhaps not a very helpful generalisation to say there are going to be explicit caps on every country. I think that anticipates the nature of the global deal that is going to come under differentiated responsibilities. Certainly developed countries will have explicit caps and I think that explicit caps is something that we will move towards and that must be the ultimate goal. But I think introducing a parallel set of data that lacks integrity, is complex and is open to wide interpretation would not be particularly helpful if it opened up a parallel negotiating track.

Q205 Chair: Let me try to put the question another way in that case. Do you feel that the reluctance of some countries, developing countries particularly, to accept a national cap might be because of the flaws in a purely territorial-based calculation?
Gregory Barker: The reluctance, primarily, of the major emitters in developing countries to accept a cap is not because of a preference for a consumption versus territorial emissions regime but because of concern that any cap, however defined, will act as a brake on prosperity and economic growth, which they need to lift millions or billions of people out of poverty.

Q206 Ian Lavery: Local authorities, for example Manchester City Council and West Sussex County Council, have been measuring their emissions and setting targets based on a consumption basis. They appear to have made a lot of progress. Has DECC been monitoring any of this progress made by these local authorities?
Gregory Barker: I think we would want to encourage that. The more reporting, the greater transparency, the greater the rigour, the better, so that would be helpful but, again, not as a way of superseding. It is not an either/or. We very much see consumption-based and territorial-based emissions, whether that is locally or international, as complementary. We do not see one as superseded by the other.

Q207 Ian Lavery: In the local regions, aviation consistently makes up a significant proportion of consumption-based emissions. Is there any role for Government to reduce that, perhaps through the APD or the EU ETS?
Gregory Barker: Sorry, I wasn't quite clear about the first bit of the question.
Ian Lavery: Aviation in different localities in the regions has consistently been a large, significant proportion of consumption-based emissions and the question is, is there a role for the Government to reduce that, perhaps by the EU ETS or perhaps by the APD?
Gregory Barker: Absolutely, and this year we will be bringing aviation into the EU ETS. Whether it is through territorial or through consumption-based mechanisms, aviation is a big challenge and one that we can't duck. I am not familiar with what the profile of aviation to consumption emissions would look like specifically, compared to territorial, but I am happy to look at that further.

Q208 Ian Lavery: Would you agree that the experience of the local authorities shows that considering consumption-based emissions generates the potential for new policy options?
Gregory Barker: Yes, I am sure. As I said, the more information you have and the more localised and more specific it is to the people who are affected, the more helpful it is. Certainly, with behaviour change it may be an important yardstick and help inform local residents, or local businesses, about the things that they can particularly do. For example, we definitely encourage Scope-3 reporting—that is, reporting of

supply chain emissions—but recognise that by definition it is something that is out of the company's control in some cases and is difficult.

Chair: I think the message we had was you would like to finish by midday, so I apologise for that fact that we are two minutes behind target. Thank you very much indeed for a very illuminating evidence session and we have lots of material to work on. I can assure you we did not start the inquiry with any prejudged conclusions.

Written evidence

Memorandum submitted by Defra, DECC and BIS

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.

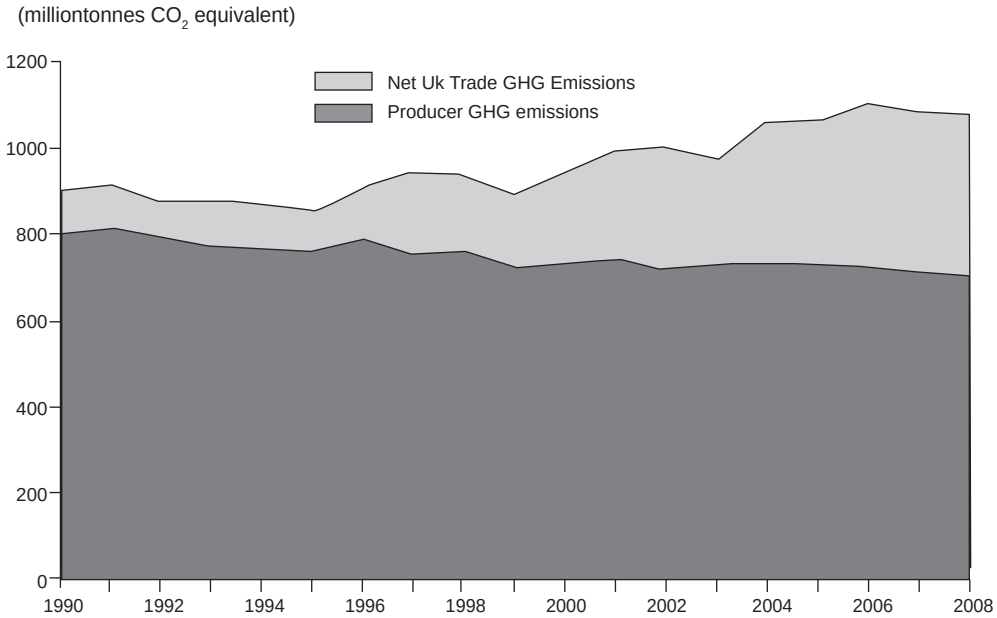
1.2 International emissions data, targets and action to mitigate climate change have focussed on territorial greenhouse gas emissions. However, it is now possible to make an estimate of consumption emissions as more evidence is now becoming available. The Government is monitoring total carbon dioxide 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 (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.[2]

Figure 1

GHG emissions relating to UK consumption, 1990 to 2008



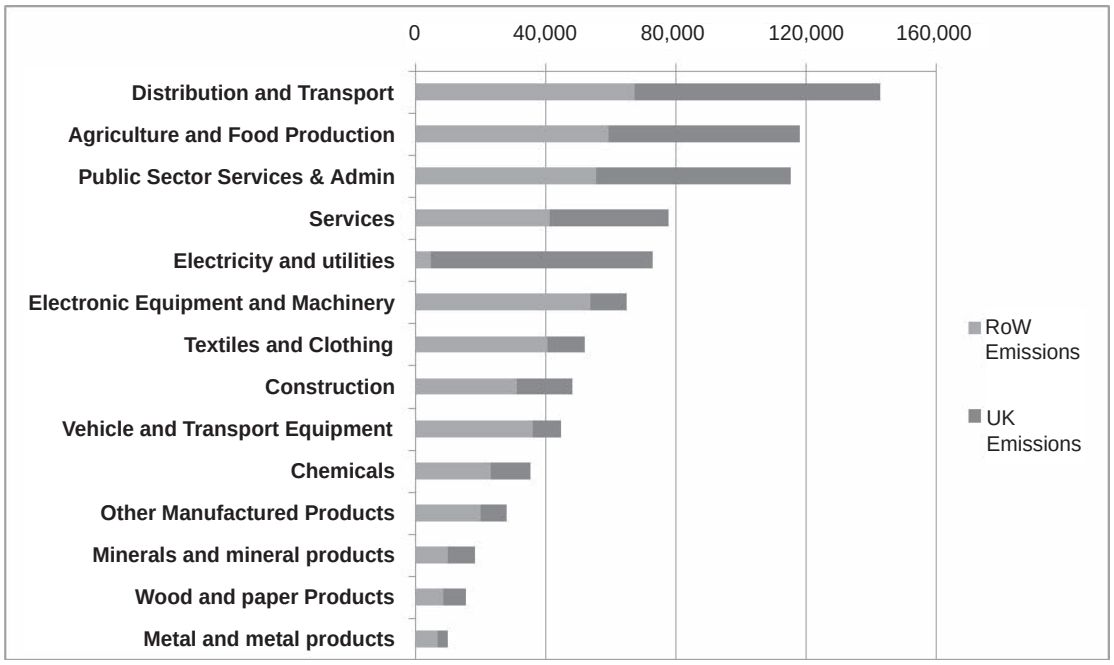
Source: Centre for Sustainable Accounting, office of National Statistics

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.



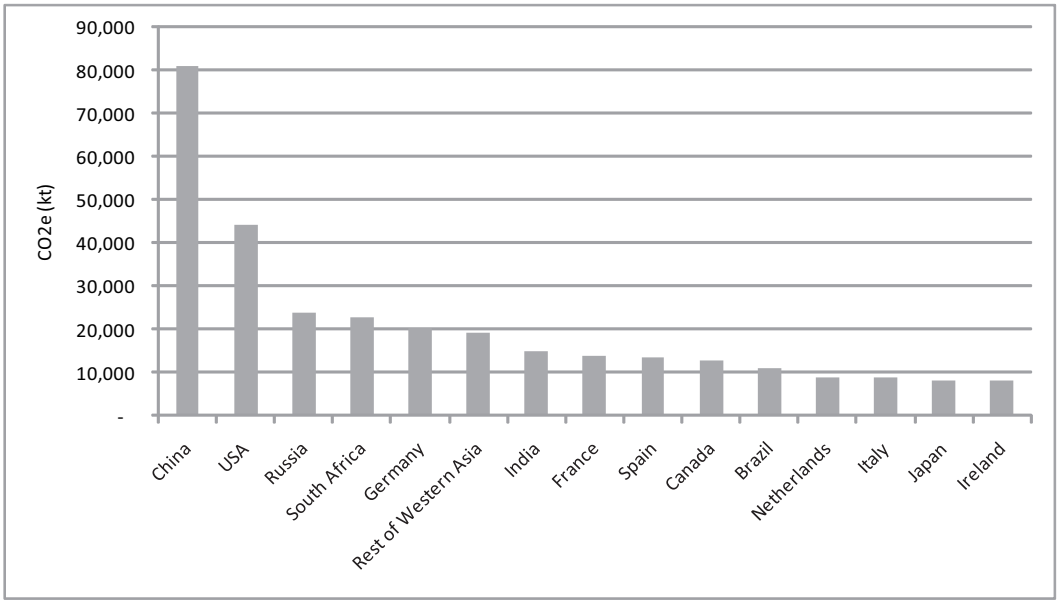
1.6 *Distribution by sector:* The latest research data also indicates which products and sectors had the highest proportion of embedded carbon emissions in 2004. For products such as electronic equipment and clothing,

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 2011–16.[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:

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 ie 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 (eg 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 (eg 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 (ie 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 (eg 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 and 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.

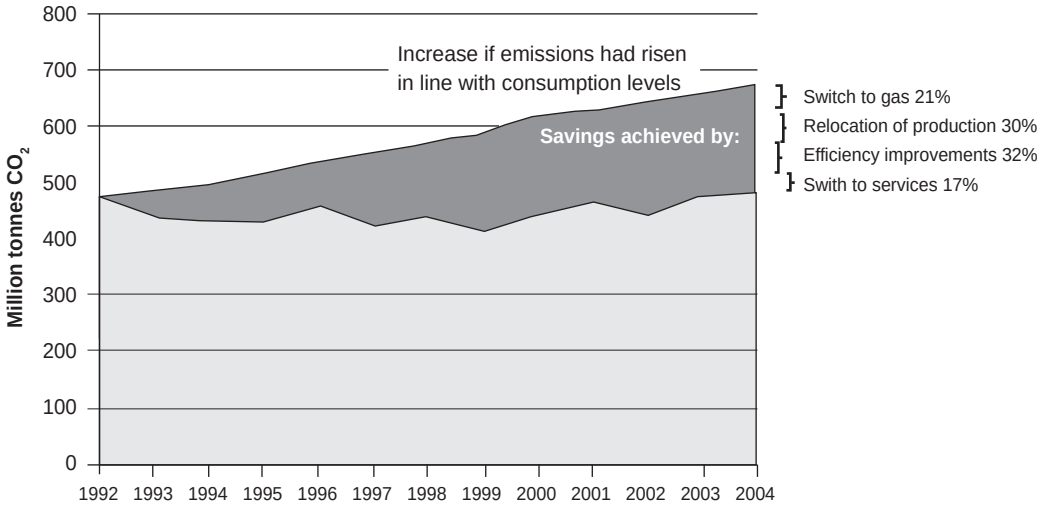
4.4 Concerns around carbon leakage arise as industries that are subject to international competition may not be able to fully pass on the costs of carbon to consumers, thus making them unviable. Empirical analysis has suggested that the majority of industrial sectors, including those with high trade 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 (eg 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?*

Not applicable.

October 2011

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Memorandum submitted by Small World Consulting Ltd.

EXECUTIVE SUMMARY

1. Small World Consulting has a sophisticated understanding of the issues pertaining to this inquiry, based on a wealth of experience of developing and using consumption-based greenhouse gas metrics.

2. The greenhouse gas emissions embodied in international trade are highly significant and are not covered by current production-based carbon metrics. Their omission creates a seriously distorted perspective and perverse incentive for harmful policy measures.

3. The adoption of consumption-based carbon metrics is practical. By using well established techniques and existing data sets the resources required will be modest. Further improvements will also be possible and practical over time.

4. There is growing awareness among local governments, businesses and the public of the need for the UK to adopt consumption-based metrics.

5. The benefits include:

- dramatically improved ability to track the UK's progress towards a low carbon economy;
- significantly improved information to guide national policy;
- encouraging and enabling local governments, businesses and others to develop consumption-based metrics and budgets and relate these to national context; and
- making visible the environmental case for increased UK procurement of many goods and services, with potential benefits for the UK economy.

All of the above will better enable the UK's movement towards an efficient, resilient and low carbon economy.

6. Adopting a robust yet practical approach will entail being transparent over the relatively high uncertainty that is inherent in consumption-based metrics.

7. Production-based metrics will still have their place alongside consumption-based measures.

Our Experience of Consumption-Based Greenhouse Gas Accounting

8. Small World Consulting has a wealth of experience in delivering consumption-based greenhouse gas metrics to organisations and helping them use this to develop value-adding carbon mitigation measures. It is clear from our work with diverse organisations that consumption-based greenhouse gas metrics are (a) practical, (b) increasingly widely seen to be important and (c) are an essential metric for informing climate change strategy.

9. Organisations we have delivered consumption-based greenhouse gas metrics for include Manchester City Council (the "total footprint" of residents and industry in Greater Manchester), West Sussex County Council (the "total footprint" of residents, industry and the County Council itself), the Lake District National Park Authority (residents and visitors), E.H Booths (The footprint of operations and foods for this supermarket chain), Taylor Wimpey (operations and supply chains for this major UK house builder), The National Trust, the London Science Museum (the footprint of an Exhibition project), over 100 SMEs. With most of these organisations we are engaged in the development of carbon mitigation strategy. We have also delivered household consumption-based metrics for several community climate challenge projects, and developed the numbers behind such online calculators as My 1010, "Show me the Carbon" (Eden Project), and the Guardian on-line. We conduct research with Lancaster University and independently into consumption-based greenhouse gas metric methodologies and their practical application. We therefore have a sophisticated understanding of the issues pertaining to this inquiry.

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

10. Current production-based carbon metrics do not take account of net emissions embodied in international trade. This is highly significant, especially since the trend in the UK has been to import an increasing proportion of goods that have high embodied energy and carbon.

11. Very often when we import goods rather than producing them in the UK, we not only remove the embodied carbon from the UK's production-based carbon account, but we also increase the total level of global emissions. This is because we often import from countries that have significantly more carbon intensive energy and significantly less energy efficient industries. To give one simple illustration of how this comes about, Chinese primary energy has roughly three times the carbon per monetary unit as UK primary energy (coal being both a cheaper and a more carbon-intensive form of energy than oil, gas, nuclear or renewable energy).

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?

12. It is considerably more difficult to make accurate estimates of carbon on a consumption basis than on a production basis. It will be important to be clear about the inherent uncertainties involved in consumption-based metrics. However, the uncertainty is more than compensated for by the improved relevance of the measure as a surrogate for UK climate change impacts.

13. Adequate techniques and data exist to make it both realistic and very practical to create usable consumption-based metrics. Several models already exist, (including one developed by Small World Consulting with Lancaster University, based upon UK government statistics).[i] Despite small methodological differences, each of these models offers a dramatically better surrogate measure of the climate change impact of the UK economy and society than can be achieved through production-based measures.

14. The central technique of environmentally extended input-output analysis that is used for this is well established. At its simplest, even using only UK data and applying the basic approximation that the global economy has the same structure as the UK economy, it is possible to generate a dramatically more realistic assessment of the climate change impact of UK activities and policy options than can be achieved through purely production-based carbon metrics.

15. It is also possible to do much better than this. Credible models already exist that use international data sets to quantify international carbon flows.[ii] Various projects are underway to develop this work further and these will be even better able to reflect the impacts of net imports from different countries and regions.

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

16. Consumption-based carbon metrics, even based only on UK data, provide a dramatically better surrogate measure of the climate change impact of activities on every scale, from the individual and business unit to the UK as a whole.

17. Small World Consulting has first hand evidence that this is increasingly understood by a people, by businesses and by local governments.

18. As evidence of local government understanding of the importance of consumption-based metrics, Small World Consulting has been commissioned to provide consumption-based carbon metrics for Manchester City Council (covering Greater Manchester residents and industry), by West Sussex County Council (covering residents, industry and, within that, the council itself), and by the Lake District National Park Authority (covering residents and visitors).[iii] These metrics have led to or are leading to the adoption of consumption-based local carbon budgets and these in turn contribute to the UK's efforts to build an efficient, resilient and low carbon economy.

19. Increasingly widespread understanding among businesses of the importance of a consumption-based approach is reflected, for example, in our corporate work, including for Booths Supermarkets, Taylor Wimpey Plc and many others. Our client base represents only a small part of the momentum gathering throughout UK industry for consumption-based metrics. For many businesses, the vast majority of emissions are embedded in their supply chains, and their inclusion in carbon analysis dramatically open up the scope for mitigation action, including supply chain management, sustainable procurement and resource efficiency.

20. At an individual level, the public has an instinctive understanding of the need to attribute indirect carbon to activities, items and lifestyles. One strand of evidence for this has come to me personally through the ample feedback on my book "How Bad Are Bananas? The Carbon Footprint of Everything",[iv] and through numerous public speaking events. It is clear from this that the concept of consumption-based accounting is almost universally accepted. In fact it is instinctive to include both direct and embodied emissions when considering carbon footprints. Three examples of the many organisations that actively reinforce this perspective are the Eden Project, the Guardian and 10:10.[v] It is also clear that the inadequacies of the UK's production-based carbon account as a measure of the UK's climate change impact are increasingly popularly understood.

21. As the UK takes increasing steps to reduce its carbon emissions, production-based metrics, used on their own, will provide an increasingly perverse incentive to off-shore our impacts and in doing so, we both hide them and often multiply them.

22. There is a strong environmental case for more local sourcing of many goods and services, compared to existing importing arrangements. Consumption-based metrics make this case visible and make the environmental case for increased UK sourcing easier to defend. This has potential to bring significant benefits for the UK economy.

23. UK consumption-based metrics will help to provide a coherent framework into which businesses, local government and others can position their own emerging consumption-based carbon metrics. Even individuals will be better placed to understand how their lives fit into the national and global picture. The adoption of national consumption-based metrics will, therefore, assist carbon literacy and carbon management at every scale.

24. Production-based metrics are still useful for some purposes and it will be useful to continue these alongside production-based approaches.

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References

[i] Other examples include those developed by Tim Jackson at the University of Surrey and by the Stockholm Environment Institute.

[ii] "The Supply Chain of CO_2 Emissions", 2011, Steven J Davis, Glen P Peters, Ken Caldeira, Proceedings of the National Academy of Sciences (PNAS),
http://supplychainco2.stanford.edu/
The study was conducted by researchers at the Department of Global Ecology, Carnegie Institution of

Washington, Stanford, USA and the Center for International Climate and Environmental Research—Oslo (CICERO).
Contact: Glen P Peters, Center for International Climate and Environmental Research—Oslo (CICERO), Norway; Mobile: +47 9289 1638, E-mail: <glen.peters@cicero.uio.no
Also: Carbon Trust: Global Flows
http://www.carbontrust.co.uk/policy-legislation/international-carbon-flows/global-flows/Pages/global-flows.aspx
Also "Growth in emission transfers via international trade from 1990 to 2008", 2011, Glen P. Peters, Jan C Minx, Christopher L. Weber and Ottmar Edenhofer, PNAS early edition.
www.pnas.org/cgi/10.1073/pnas.10063888108

[iii] A Carbon Budget for the Lake District National Park, 2010, Lake District National Park Authority
http://www.lakedistrict.gov.uk/a_carbon_budget_for_the_ldnp_v2.pdf

[iv] Available and reviewed at, for example,
http://www.amazon.co.uk/How-Bad-Are-Bananas-everything/dp/1846688914

[v] As part of their message, these organisations all have on-line tools that promote consumption based accounting for individuals: Eden Project
http://www.edenproject.com/whats-it-all-about/climate-and-environment/show-me-the-carbon.php
The Guardian
http://www.guardian.co.uk/environment/interactive/2009/oct/20/guardian-quick-carbon-calculator
10:10: http://www.1010global.org/uk/people/carboncalculator

Memorandum submitted by the Lake District National Park Authority

1. Summary

- The Lake District National Park aims to be a leader in responding to climate change, and is working in partnership to develop and manage a consumption-based carbon budget for the local area—the first of its kind.
- We have found that consumption-based measures give a much more comprehensive picture of emissions. They include the emissions embedded in imports and supply chains and provide an easily understandable picture of impacts.
- With the help of Small World Consulting, we have developed a methodology for estimating emissions on a consumption basis, which has now been used by a number of local areas.
- Consumption-based reporting has significant benefits: it gives a comprehensive picture of emissions; developing a "carbon budget" gives people a clear understanding about how much carbon can be "spent"; emissions are attributed to understandable units (such as "food and drink"); indirect emissions associated with behaviour and lifestyles are much better explained through the lens of consumption.
- The main drawbacks are that the measurement is more complex, with greater uncertainties; and it makes comparisons between different areas difficult, if different methodologies are used.
- On the basis of our experience, we believe that local areas should adopt emissions reduction targets and management strategies based on consumption rather than production. It would also be useful to have national-level consumption-based carbon accounting.

2. About the Lake District National Park Authority

The Lake District National Park Authority (LDNPA) looks after the Lake District, the largest of the UK's 15 National Parks. We aim to be an inspirational example of sustainable development in action, with a prosperous economy, world class visitor experiences, vibrant communities and a spectacular landscape. The National Park is managed with the help of the Lake District National Park Partnership,a group of 24 organisations[1] from the public, private and voluntary sector, who collectively own the Vision and Plan for the Lake District.

3. Our Approach to Climate Change

Sixteen million people a year visit the Lake District. Like generations before them, they are inspired by the spectacular landscape of fells and lakes. Yet climate change could alter the Lake District considerably, as weather patterns, agricultural practices and local economies change and adapt. We want to inspire our visitors, residents and businesses to take action. Tackling climate change—through promoting renewable energy,

[1] Partnership members include: Action with Communities in Cumbria (ACT); Environment Agency;Allerdale Borough Council; Forestry Commission; Copeland Borough Council; Friends of the Lake District; Country Land and Business Association; Government Office North West; Cumbria Association of Local Councils; Lake District National Park Authority; Cumbria County Council; National Farmers' Union; Cumbria Tourism; National Trust; Cumbria Vision; Natural England; Cumbria Wildlife Trust; North West Development Agency; Eden District Council; RSPB; English Heritage; South Lakeland District Council; Nurture Lakeland.

offering sustainable transport alternatives, and encouraging low-carbon tourism—brings economic and social benefits as well as carbon reductions.

In recognition of this, the Low-Carbon Lake District Initiative was established in 2008. Since then, we have:

- Secured commitment from the Lake District National Park Partnership to develop and implement a consumption-based carbon budget for the Lake District (see below);
- Won a £5 million grant from the Department for Transport to develop a sustainable, low-carbon transport network for the Lake District;
- Worked with local tourism organisations to promote low-carbon tourism options;
- Participated in the Cumbria Warm Homes Project to offer home energy checks and energy efficiency improvements to local residents;
- Worked with partners to promote renewable energy options, particularly small-scale technologies such as hydro and solar PV;
- Collaborated with land managers and the farming community to measure and manage carbon storage in the landscape; and
- Put initiatives in place to reduce our own emissions by 25%, including energy efficiency improvements, biomass heating and encouraging staff behavior change.

4. The Carbon Budget and Consumption-Based Emissions Reporting

The Lake District is one of the first local areas in the UK to set itself a carbon budget. In 2010 The Lake District National Park Partnership agreed to establish and manage a carbon budget for the National Park as a whole. The process worked as follows:

- We commissioned research from Small World Consulting to estimate the carbon emissions from the Lake District National Park, using a consumption-based approach. This showed that the Lake District is responsible for 2.3 million tonnes CO_2e (the full report is available at www.lakedistrict.gov.uk/lowcarbonlakedistrict) This figure includes travel to and from the Lake District, but does not count business emissions unless goods and services are consumed in the area.
- The Lake District National Park Partnership agreed a target to reduce this footprint by 1% per year in line with national statutory carbon budgets as enshrined in the Climate Change Act. This amounts to a reduction of 23,000 tonnes in the first year.
- The Partnership developed an Action Plan detailing initiatives put in place to reduce emissions of carbon and other greenhouse gases (such as those described above). Different organisations are leading on emissions reduction in transport, tourism, buildings and so on.
- The carbon reductions arising from these actions were assessed, again using a consumption-based approach, to measure progress towards the annual target. The latest assessment shows that, in the first full year of the budget, we have identified carbon savings amounting to between 0.3% and 0.5%, falling short of the 1% reduction target.
- The Carbon Budget is used to communicate with a wide range of organisations, including local businesses, to explain how the Lake District is managing its carbon emissions.

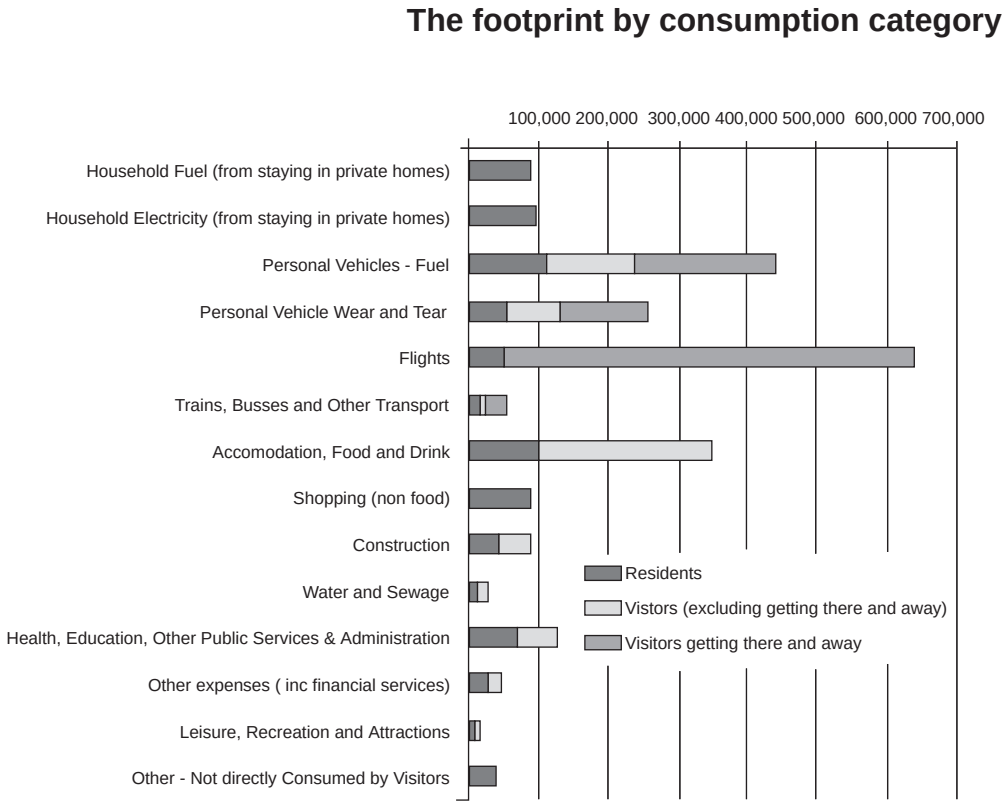
In this way, the Partnership intends continue to measure, manage and co-ordinate its response to climate change.

Given this experience, the LDNPA offers the following views on the issues being considered by the Committee.

5. *How do assessments of greenhouse gas emissions differ when measured on a consumption rather than a production basis?*

Consumption-based measures give a much more accurate picture of emissions from the Lake District National Park. There are several reasons for this. Firstly, it includes the emissions embodied in imports and supply chains. Secondly, a consumption-based approach is a better way of measuring the impact of the tourism industry, which is a "consumption based" industry—ie measuring the carbon associated with visitors' use of accommodation, cafes, restaurants, shops and transport services. Third, consumption-based measurement gives a more understandable picture of impacts. It is easier to explain to different groups, such as tourism providers, what the climate change impacts of their actions is, and what they can do to mitigate it.

The table below shows the carbon footprint of the Lake District National Park, measured on a consumption basis.



A clear picture emerges from this data, which differs from a production-based analysis, and offers much better guidance about mitigation strategies. The main differences are as follows:

— Household energy use (the top two bars) is a less significant source of emissions than if measured using a production-based approach.

— Transport (particularly aviation) is a very significant impact. In terms of guiding action, this means that serious consideration should be given to initiatives that influence how people travel to and from the Lake District. For example, efforts should be made to encourage UK holidaymakers to holiday at home.

— Accommodation, food and drink is another significant source of emissions. This is due to the importance of the tourism industry in the Lakes. This points to the importance of encouraging locally sourced, seasonal food, which can have significant carbon benefits. This analysis has led to an increase in work to promote local food.

6. *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?*

The process that we have undertaken (see description above) is a straightforward, practical way of measuring emissions from consumption. The complexity of measuring emissions in this way means that it will only ever be an estimate. However we have found that people value information presented in this way, and understand the inherent uncertainties. They would prefer an estimate of the whole picture of emissions, rather than precision about things that can be measured and disregard of anything that cannot be measured.

Developing clear protocols for measuring consumption-based emissions would help greatly, by allowing comparison between different local areas, companies or countries.

7. *What are the benefits of consumption-based reporting?*

We have found the following benefits to our approach described above:

— It gives a comprehensive picture of emissions, because it includes imports and supply chains.

— Using a "carbon budget" framework, based on consumption figures, is helpful because it can be explained in a similar way to a financial budget. Given that there is only a certain amount of carbon that can be "spent", this approach stimulates discussion on what the carbon should be "spent" on, and how the budget can be managed.

— Communication is helped by emissions being attributed to understandable units, such as "food and drink", or "accommodation", rather than units of fuel, heat or electricity. This helps to prioritise mitigation actions.

— A consumption-based approach is particularly useful for local areas. Local government has less control over, or responsibility for, large sources of direct emissions (such as energy generation plant and manufacturing industry) and more opportunity to influence indirect emissions through behaviour and lifestyles. The latter is better understood through the lens of consumption.

8. *What are the disadvantages of consumption-based reporting?*

Our experience shows the following disadvantages:

— Measuring consumption is more complex, and will only ever provide an estimate of the picture—see discussion above. Nevertheless it provides a more comprehensive picture.

— It is difficult to compare with other areas who have used different methodologies. For example, we cannot compare our emissions per capita with areas who have measured their impact using standard production-based techniques. Consumption-based analyses will nearly always (in the UK) result in higher figures for emissions per capita, due to the inclusion of imported goods.

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

We believe that local areas should adopt emissions reduction targets based on consumption rather than production. As described above, this is a much better measure of the impact of a local area. Since the Lake District National Park defined its carbon budget last year, two other local areas—West Sussex and Greater Manchester—have followed suit.

It would also be useful to have national-level consumption-based carbon accounting, as well as clear protocols for local areas, individual businesses and others who would like to use consumption-based approaches, to enable comparisons.

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Memorandum submitted by West Sussex County Council

West Sussex County Council welcomes the Energy and Climate Change Committee's current inquiry regarding the case for consumption-based greenhouse gas emissions reporting, and is grateful for the opportunity to comment on two of the specific issues that it has chosen to examine based upon our experience.

1. *Executive Summary*

— The consumption footprint is around twice the scale of the production measure in West Sussex.

— The nature of the consumption measure better reflects people's intuitive understanding of their footprint, so is more meaningful for residents.

— The consumption approach enables place-based local leadership more than the production measure and lends itself to useful political narratives about taking responsibility for our actions.

— By linking the footprint to behaviours, we have found consumption metrics useful for policy assessment and evaluation, making it more practical to mainstream activity on carbon.

— In practice, consumption-based metrics highlight the need for changes in consumption patterns and lifestyle, and also provide tools to help make this possible. This would be more powerful still if it were part of a nation-wide approach.

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

2.1 In 2010 West Sussex County Council commissioned research to establish a baseline consumption-based carbon footprint for County residents and a consumption-based carbon footprint for the County Council. The residents' footprint was based on the emissions generated from all the products and services that they use and buy. The Council's footprint included direct emissions resulting from electricity and water consumption, and emissions in the supply chains of procured goods and services, and commuting. The CO_{2e} for the residents was estimated as 13.7 million tonnes CO_{2e} and the *per capita* figure as 17.3 tonnes.

2.2 The consumption-based carbon footprint for the County's residents allowed the emissions, arising from the products and services that residents use and buy, to be broken down into sixteen segments (Figure 1).[1] By contrast, the data on carbon emissions provided by the Department of Energy and Climate Change (DECC) is broken down into only three segments based upon data related to electricity, gas and vehicle fuel use (Figure 2).[2] In the latter data, the County Council's emissions are included in the Industry and Commercial segment. According to the DECC data total CO_2 emissions in the County are estimated as 4.9 million tonnes; that is

almost 9 million tonnes less than the consumption-based estimate. The *per capita* figure is 6.2 tonnes, less than half the amount calculated in the consumption-based footprint. The consumption footprint is around twice the scale of the production-based measure in West Sussex.

2.3 The consumption-based breakdown is easier to understand because it provides a much richer and more action-oriented breakdown than production metrics ever have for local government. It also provides a more comprehensive representation of the source of emissions, and is thus better for informing local policy on tackling climate change.

Figure 1: Breakdown of the carbon footprint of West Sussex residents' by source (Mike Berners-Lee)

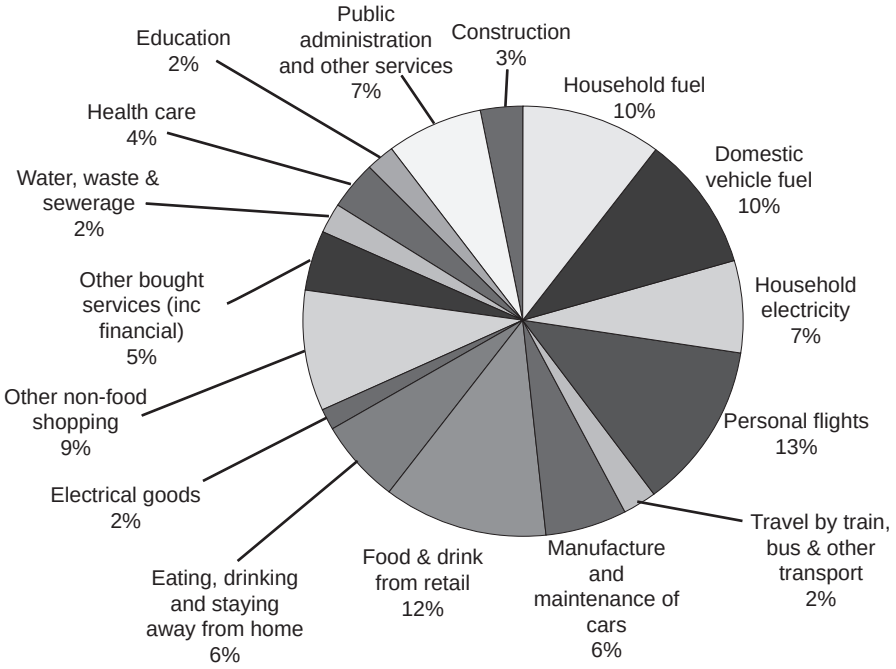
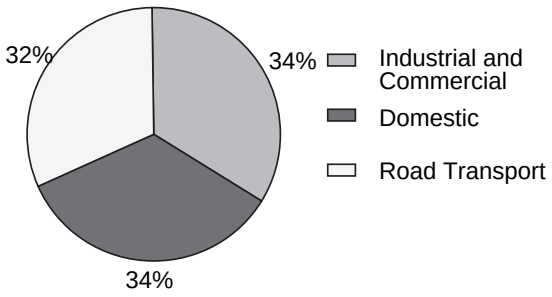


Figure 2: Local CO2 emission estimates



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. Because a consumption-based model allows a carbon footprint to be broken down into more than the three very broad segments used in the production data, we have found that it is a more comprehensive representation of the source of emissions, and thus better for informing policy. Also, this way of representing the data better reflects people's instinctive understanding of their carbon footprint, so will be more meaningful than production measurements. WSCC is one of the first Council's in the UK to set a carbon budget; the comprehensive nature of the consumption footprint benefits this approach because it includes imports and supply chains.

3.2. The consumption approach is appropriate for place-based approaches, which focus attention on geographic and community settings. Place-based approaches will be important in reducing carbon as they provide a means to grasp complex connections and to address challenges and opportunities where the impacts are directly felt. As place-based approaches help us understand individuals' carbon impact, they will be an important stepping-stone towards helping our communities to understand and take responsibility for reducing

their carbon impact. The latter is critical as one of the main challenges in addressing climate change is about lifestyles and consumption.

3.3. According to Professor Tim Jackson of Surrey University, the essential shifts required in the scale and pattern of consumption to achieve the Government's climate change targets relies on being able to influence the expectations, choices, behaviours and lifestyles of consumers.[3] We have found that using consumption data provides a clearer indication of the behaviour changes that will be required. For example, instead of always buying new goods people will need to maintain, as well as, recycle goods in order to reduce the 9% of the consumption footprint that is down to "other non-food shopping" (Figure 1). Rather than impacting negatively on the economy this example could bring economic and social benefits to the local community by a growth in the second hand, repair and refurbish industries.

3.4. Understanding the County Council's consumption-based footprint also allows the Council to address its wider indirect carbon impact, covering emissions from procurement of goods and services and commissioning (scope 3 emissions). This enables us to measure, monitor and manage actual carbon emissions and set carbon budgets for all our services, which are managed alongside financial budgets. We believe that the method used in West Sussex (Fig 1) provided "good enough" data on an affordable basis for policy-making.

3.5. WSCC believes that a consumption-based approach is important if we are going to tackle climate change in an honest way that does not shift responsibility for our carbon emissions, from the goods and services that we buy, to other countries. Consumption-based accounting should be focused on the consumer as the driver of emissions. Domestic emissions can be reduced by relocating production abroad, and/or by substitution of domestically produced goods with imports. WSCC, therefore, believes that it is desirable for the UK to adopt emissions reduction targets on a consumption rather than production basis. This will ensure that we send the right signals to consumers about behaviours and lifestyle choices that will support government policies on climate change.

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References

[1] Small World Consulting Ltd, 2010. A local carbon budget for West Sussex: Managing greenhouse gas emissions from consumption by residents, industries and the County Council.

[2] Department of Energy and Climate Change, 2009. Local and regional CO2 emissions estimates for 2005–09—Full dataset.

[3] Tim Jackson, 2006. Challenges for Sustainable Consumption Policy in Sustainable Consumption, edited by Tim Jackson, Earthscan, London.

Memorandum submitted by the Mineral Products Association

1. Introduction

1.1. The Mineral Products Association (MPA) is the trade association for the aggregates, asphalt, cement, concrete, lime, mortar and silica sand industries. With the addition of The British Precast Concrete Federation (BPCF), it has a growing membership of 418 companies and is the sectoral voice for mineral products. MPA membership is made up of the vast majority of independent SME companies throughout the UK, as well as the nine major international and global companies. It covers 100% of GB cement production, 90% of aggregates production and 95% of asphalt and ready-mixed concrete production and 70% of precast concrete production. Each year the industry supplies in excess of £5 billion of materials to the £110 billion construction and other sectors. Industry production represents the largest materials flow in the UK economy and is also one of the largest manufacturing sectors.

1.2. This response to the inquiry on consumption based GHG reporting draws on the experiences on MPA Cement which is part of the Mineral Products Association.

Specific Inquiry Questions

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

2.1. Research[2, 3] suggests that the consumption based calculation of the UK's GHG emissions shows quite a different picture to the inventory of emissions originating from UK based sources and that the problem is not unique to the UK.[4]

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[2] Carbon Trust 2011—*International Carbon Flows.*

[3] Policy Exchange 2010—Carbon Omissions Consumption-based accounting for international carbon emissions. Andrew Brinkley & Dr Simon Less.

[4] Glen P. Peters, Jan C. Minx, Christopher L. Weber, and Ottmar Edenhofer. *Growth in emission transfers via international trade from 1990 to 2008*. Proceedings of the National Academy of Sciences of the United States of America. May 24, 2011 vol 108 no 21 8903–8908.

2.2. It is important that the UK begins to look seriously at consumption based emissions reporting. The pressure from globally unequal carbon pricing is increasing on UK manufacturing installations and "carbon leakage" threatens to increase the rate of manufacturing loss from the UK. *Annex I* shows the cumulative burden of carbon taxation on UK cement manufacture in 2013 when the UK's Carbon Price Floor is introduced.

2.3. Over the period 2001 to 2010 sales of cement have decreased by 26% but imports by non GB manufactures have increased by 10%. As a result the market share of non GB manufacturer imports has risen from only 3% in 2001 to 13% in 2010 (*Annex II*). At present the UK GHG statistics would translate this into a reduction of emissions.[5] Clearly this would misrepresent the UK's GHG "footprint" emissions and lead to potentially false claims about the UK's contribution to the mitigation of climate change.

3. *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?*

3.1. In the UK, verified data is available on cement manufacturer and the emissions associated with its production emissions. It would not be too difficult to estimate the emissions from imported product as the product is produced to tight specifications, placed on the market only when complying with a harmonized European standard. Cement product types are therefore relatively homogenous, especially for the emissions intensive intermediate product, clinker.[6]

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

4.1. The benefits are clear in that consumption based emissions reporting will more closely reflect the carbon footprint of the UK. It will encourage locally based manufacture and help secure UK manufacturing jobs. It will improve security of supply for strategically important materials such as cement used for construction and lime used for drinking water treatment and steel manufacture. It will help to prevent the migration of skills outside of the UK.

4.2. The principle disadvantage to a consumption based approach is that in the short term it will not be as accurate as production based accounting.

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

5.1. Most of the UK cement producers are owned by global companies with head offices outside of the UK. These companies have closed plants in the UK in recent years and issued announcements[7] that investment is being put on hold because of increased pressure from carbon taxation. This is at the same time that imports of cement are increasingly made up from companies that do not manufacture in GB. The amount of cement imported by companies that do not have cement manufacture in GB has increased dramatically over the period 2001–10, as illustrated in *Annex III.*

5.2. Moreover, it is important that investors are not given the signals that it is acceptable to invest in less carbon constrained nations and import goods into the UK. At a time when economic growth is vital to the UK economy the signals for investors are of paramount importance.

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

6.1. (a) It is certainly desirable, primarily for those companies that are vulnerable to carbon leakage and that operate in the EU Emissions Trading Scheme. It is desirable because it would show that in many cases the climate change impacts of material consumption are increased by adding the transport emissions when the products are imported.

6.2. Furthermore it is desirable so that purchasers and specifiers of material use in the UK are aware of the additional carbon impact of transport and are encouraged to buy locally produced goods.

6.3. (b) At the macro level it is practical to adopt emission reduction targets based on consumption rather than production. Initially the data will not be as accurate but will still provide a truer picture of the UK's climate change impact.

7. *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?*

7.1. There is no reason why consumption based emissions accounting should create any negative implications at the international level. It will not create a barrier to trade but will make trade more sustainable with increased transparency.

[5] If we consider sales and production to be the same for the purposes of this example.

[6] Portland Cement clinker is ground into a fine powder with added gypsum to form the cement product. Clinker can also be ground with other "cement-like" by-products and waste to produce other cement types.

[7] 14 Feb 2008. Lafarge announce 1 billion investment hold in Europe citing carbon taxation as an uncertainty.

7.2. International GHG accounting would have to remain on a production basis at the country level to ensure that there is no double counting.

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

8.1. Consumption based emissions reporting will build understanding of the UK's carbon footprint and allow carbon leakage of UK operations to less carbon constrained economies to be more closely monitored. It may also facilitate carbon based border tax mechanisms to address such distortions.

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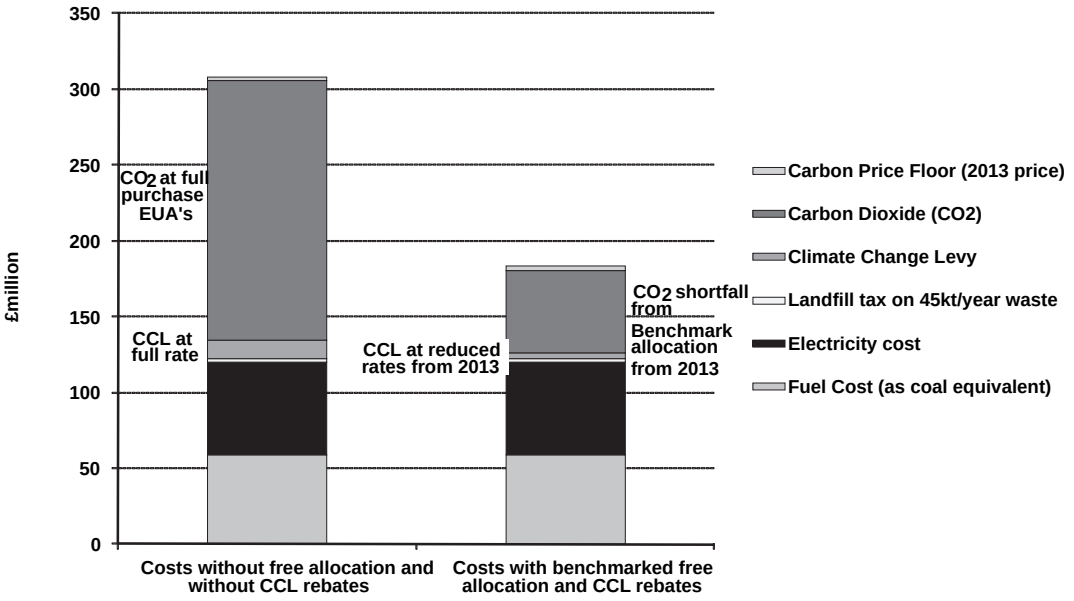
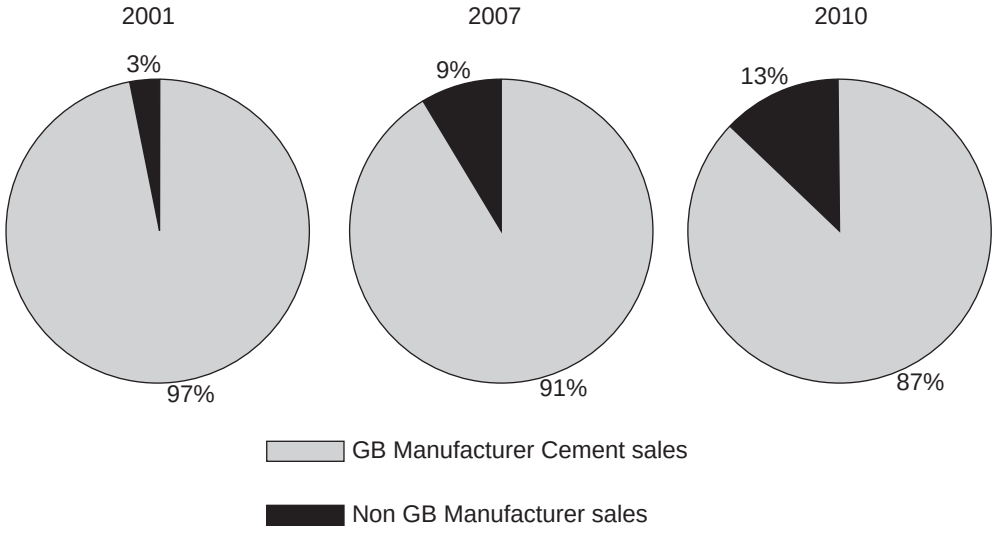
Annex I

2013 Estimated energy costs and environmental taxation for the manufacture of circa 7.5 million tonnes of cement using 2009 energy data



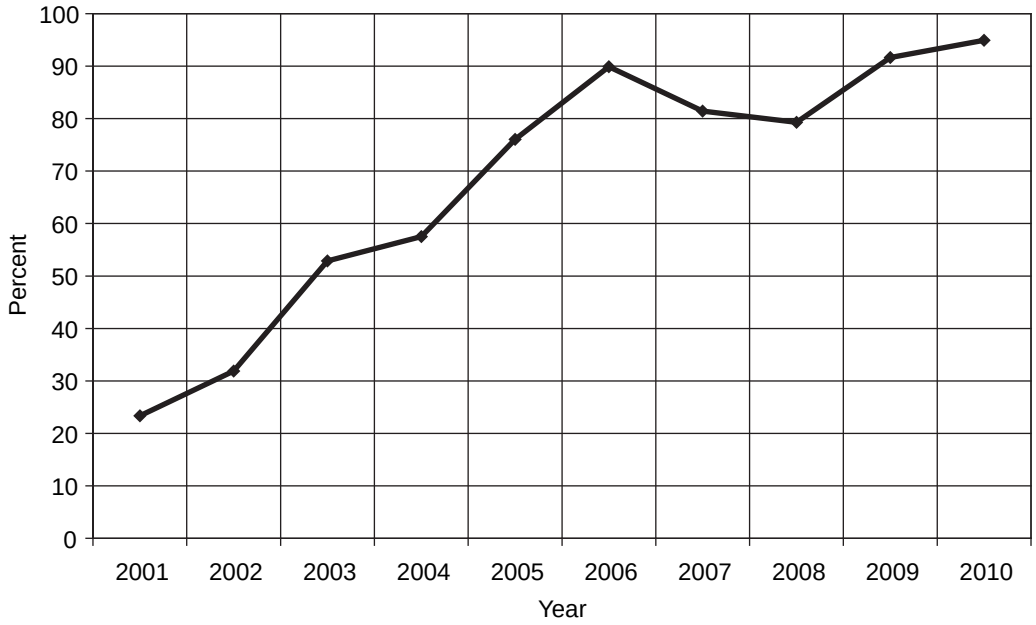
Annex II

Market Share of GB Cement Sales (2001, 2007 and 2010)



Annex III

Percentage of GB Cement Total Imports by Non-Manufacturers 2001-2010



Memorandum submitted WWF-UK

SUMMARY OF WWF-UK POSITION ON CONSUMPTION-BASED EMISSIONS REPORTING

1. WWF-UK welcomes this inquiry into consumption-based emissions reporting, an issue that we have been promoting awareness of for many years. We don't believe it is credible for the UK to claim progress towards a sustainable, green economy unless we address the impact of *both* UK production *and* UK consumption. The UK's production emissions are on a downward trajectory, although still at a much slower pace than necessary to meet carbon budgets or to play our fair share in averting dangerous climate change. However, the carbon footprint of our lifestyles increased by almost 20% between 1990 and 2008, mainly due to increased consumption of goods imported from overseas.[1]

2. For WWF-UK, this is not an either/or issue, as implied by the framing of the questions of this inquiry. The conventional production-based approach to emissions accounting and regulation is a well-established and powerful tool to guide the transition to a low, and ultimately zero-carbon, economy in the UK—notably in ensuring that we make a well-managed transition away from fossil fuel dependency. The consumption perspective should be taken into account *alongside* production emissions in a comprehensive strategy to minimise the UK's overall contribution to climate change.

3. WWF-UK recommends that the well-established international framework for regulating and accounting for greenhouse gas emissions should continue to be focused on production rather than consumption data. However, consumption emissions could be one useful metric to feed into discussions on equity, along with existing principles such as historical responsibility and development status.

4. Recommendations:

4.1 The Government should commit to reporting on consumption emissions data annually in the National Greenhouse Gas Inventory, alongside production emissions, as is the case in Scotland and Wales.

4.2 The Government should commit to reducing emissions from UK consumption, and take into account the impact of policies on consumption emissions in policy appraisal.

4.3 The Government should mandate the Committee on Climate Change (CCC) to provide analysis of consumption emissions and take impact on consumption emissions into account when making policy recommendations.

4.4 The Government should step up support for efforts to reduce emissions in developing countries, including producer countries which provide goods for UK consumption. This includes provision of additional, new finance to support efforts to reduce deforestation and to promote clean technologies. The Government should redouble its efforts to secure innovative, secure sources of finance such as levies on international transportation and a well-designed financial transaction tax. Action to promote technology transfer and leverage private finance to support low-carbon development must also be a priority.

4.5 The Government should confirm the inclusion of international aviation and shipping emissions in UK carbon budgets, and tighten budgets accordingly, when this issue is reviewed in 2012; and promote a global framework for reducing emissions from international aviation and shipping.

Responses to the Inquiry Questions

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

5. There are three main ways of reporting greenhouse gas emissions:

- *Territorial emissions*: emissions from UK production reported as per the Kyoto framework, which excludes the UK's contribution to international aviation and shipping emissions.
- *Production emissions*: emissions from UK production including international aviation and shipping emissions.
- *Consumption emissions*: emissions from goods and services consumed in the UK, including those embedded in imports, plus aviation and shipping emissions, but excluding emissions from goods exported from the UK.

6. According to the latest figures published by the Department for Environment, Food and Rural Affairs (Defra), consumption greenhouse gas emissions increased by almost 20% between 1990 and 2008, while production emissions decreased by 14% over the same period.[2] According to the Department of Energy and Climate Change figures, territorial emissions decreased by 20% between 1990 and 2008.

7. The figures for 2008 greenhouse gas emissions were as follows:

- Territorial emissions: 623.8 million tonnes of CO_2 equivalent ($mtCO_2e$).
- Production emissions: 700 $mtCO_2e$.
- Consumption emissions: 1076 $mtCO_2e$.

8. These figures demonstrate that the UK's contribution to climate change extends much further than the territorial emissions included in the Kyoto framework. The stark difference in trends since 1990, with significant increases in consumption emissions, demonstrates that UK lifestyles are becoming increasingly carbon-intensive and unsustainable.

9. Aviation and shipping emissions account for about 17% of the difference between territorial and consumption emissions. The main factor in the difference is increasing reliance on imported goods, mainly from non-OECD countries.[3]

10. During this period, structural dynamics in the world economy have resulted in a shift towards service sectors and away from manufacturing in the UK economy. According to a 2009 report commissioned by Defra:

> "The consumption perspective suggests that [territorial emissions reductions] should be mainly regarded as changes in the international division of labour (ie shifts in the allocation of production processes across the globe and changes in regional/national specialisation in the production of goods and services), where the UK increasingly specialises on the provision of services."[4]

Hence broad dynamics of globalisation were the main driver, rather than environmental, climate or social policies implemented in the UK.

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?

11. Methodologies for measuring consumption emissions are improving to the extent that they can now be meaningfully monitored. The UK Government (through Defra) is confident enough in its methodology to publish consumption emissions data, though they are not included in the UK's National Greenhouse Gas Inventory.[5] Reports and data have been published relating to Scotland's consumption emissions,[6] and those of local authorities in Scotland[7] and the UK as a whole.[8] Furthermore, the governments in Scotland and Wales have both committed to publishing consumption emissions data alongside production emissions.[9]

12. The best methodology that WWF-UK is aware of is Multi-regional Input-Output (MRIO) modelling. WWF-UK is not an expert on methodology, but we have worked with the following and can recommend their authority on this subject:

- John Barrett, University of Leeds.
- Edgar Hertwhich, Norwegian University of Science and Technology (NTNU).
- Glen Peters, Centre for International Climate and Environmental Research (Cicero).

13. Software tools for policy makers are available, based on MRIO, such as the Resource and Energy Analysis Programme (REAP). WWF-UK has led a consortium of European partners to develop a new version of REAP for EU national and regional policy makers (EUREAPA) which will be launched in November 2011, see
http://www.oneplaneteconomynetwork.org/index.html.

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

14. As mentioned in our summary, we do not recommend that a consumption-based approach to emissions accounting is adopted *rather than* a production-based approach. Consumption emissions should be accounted for *alongside* production emissions.

15. It is critical that the UK retains its current strong focus on production emissions, as enshrined in the Climate Change Act and carbon budgets. It is in the UK's national interest to decarbonise as swiftly as possible. This will improve our energy security, reduce reliance on imported and costly fossil fuels, and create opportunities for new green jobs and industries. The production-based approach also has considerable merits in that the levers to address these emissions are clearly within the direct control and mandate of UK policymakers.

16. Strong action to reduce the UK's emissions, including the Government's acceptance of the fourth carbon budget, is important in demonstrating commitment and promoting an international effort to minimise the impacts of climate change. Indeed, it is encouraging to see that many countries are now looking to the UK Climate Change Act as a model to guide their own transition to a low-carbon economy, with Denmark and Australia recently confirming that they intend to introduce similar national legislation.

17. We also believe it is critical to address emissions arising from UK consumption for the following reasons:

- The UK has a moral responsibility to minimise the impact of its footprint on people and nature around the world.
- The UK has a strategic interest in the transition to a low footprint, low carbon society to ensure food, energy and economic security.
- Action in the UK inspires action in other countries towards a global effort. Conversely, inaction in the UK undermines our credibility when urging other countries to act.

18. Parallel reporting on the UK's consumption-based emissions can help to identify any risk of perverse consequences arising from a sole focus on production-based emissions. Any accounting methodology can lead to perverse consequences if applied unthinkingly. For example, the convention that bioenergy is zero-carbon at the point of combustion ignores the sometimes large emissions arising during production of the fuel, with the risk that climate change policies could incentivise net increases in global emissions. Recognising these risks, and taking compensating policy action, is vital.

19. Consumption based accounting can also help to identify areas for specific additional policy interventions to reduce the UK's consumption footprint. It is a particularly useful tool for companies, notably in the food sector, to examine emissions along the full length of their supply chain.

20. We note that the Government has one early opportunity to address part of the disparity between consumption and territorial emissions. Emissions from international aviation and shipping are growing rapidly, but are not accounted for under the existing Kyoto framework. Under the Climate Change Act, the Government must include the UK's share of international aviation and shipping emissions within the carbon budgets by the end of 2012, or give a clear justification for failing to do so. WWF-UK believes that the Government should clearly include the UK's share of international transport emissions within the carbon budgets, and ensure that targets for the rest of the economy are tightened accordingly. The UK must also redouble its efforts to secure an international agreement to address emissions from aviation and shipping, and also to raise finance from these sectors to support climate action in developing countries.[10]

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

21. WWF-UK is not aware of evidence that UK climate change policy has had a significant effect on industry relocating from the UK. It is clear that previous claims that business is being driven overseas by carbon regulation, including the EU Emissions Trading Scheme, have been shown to be greatly exaggerated or even groundless. In terms of future impact, the Carbon Trust estimates that "implementing the current EU ETS Phase III targets to 2020 without any free allocation of allowances or protection would drive less than 2% of emissions abroad."[11] In practice, there is significant free allocation to manufacturing industry, and the Carbon Trust concludes that the risks of carbon leakage are largely confined to certain sub-sectors.

22. However, some industry bodies are now expressing strong concern about the impact of future policies. Several industry bodies and companies in sectors such as steel manufacturing have lobbied strongly against policies that could increase electricity prices, notably the carbon floor price, and also the fourth carbon budget. WWF-UK notes that many of the same bodies are also lobbying strongly against any increase in the EU emissions target—in striking contrast to a growing body of more progressive business voices.[12]

23. Heavy industry faces two main issues: the carbon price under the ETS; and any increase in electricity prices as a result of climate change policies. On the former, it is worth noting that manufacturing sectors have received extremely generous allocations under the EU ETS, and may continue to do so going forward.[13] Analysis by Sandbag shows that Tata Steel's UK operations have so far received more than 71 million surplus allowances, representing a windfall of some Euros 335 million. On the issue of carbon and electricity prices, it is also worth noting that the carbon floor price does nothing new. The original EU climate package of 2008

foresaw a 2020 carbon price of Euros 30 per tonne. In 2010, this expectation dropped to 16 EUR/tonne by 2020. The carbon floor price essentially recalibrates climate action to be consistent with the level of ambition planned in 2008.

24. Potential impacts on manufacturing industry must be taken seriously, but numerous independent analyses suggest that the risks of "carbon leakage" have been significantly over-stated and that only a few sectors face genuine issues. It is also very important to ensure that any continuation of longstanding trends in the restructuring of manufacturing industry is not unfairly attributed to climate policy. WWF-UK looks forward to the Government's forthcoming policy to address these issues, but thinks it essential that the overall ambition of climate change policies should not be diluted. We are not convinced that a wholesale move to consumption-based reporting or targets would be an appropriate response to address the specific concerns. If genuine risks are found to exist, then more tailored policies to correct any distortions in particular sectors would be more effective.

25. WWF-UK also believes that it is important to recognise that many countries—including in the developing world—have now pledged emission reduction goals for 2020. These include countries such as Brazil, China and Indonesia that are significant exporters of goods that are consumed in the UK. The collective ambition of pledges put forward by all parties falls far short of what is needed to put the world on a pathway to stay below 2°C warming[14]—quite simply, all major economies need to raise their ambition. This clearly includes the EU, which has so far failed to increase its emissions pledge for 2020 from a 20% reduction below 1990 levels which is now little more than business as usual. It also includes the UK, which has rejected the recommendations from the Committee on Climate Change to increase the ambition of the first three carbon budgets and remains pegged to low levels of EU ambition. While the fourth carbon budget is better aligned with what is necessary, it is subject to a review in 2014, and again has been linked to EU progress.

26. However, WWF-UK rejects the simplistic view which implies that manufacturing industry may leave the UK or EU because developing countries are not pulling their weight. A recent analysis by the Stockholm Environment Institute found that the developing countries have pledged to reduce emissions by considerably more than developed economies.[15] Similarly, analysis of country pledges by Climate Action Tracker shows that most developed country pledges—including the EU's 20% target for 2020—are "inadequate" when set against the 2°C objective.[16] In general, most developing country pledges are seen as more ambitious, although Climate Action Tracker recently downgraded its assessment of China's pledge. Of course, any comparison of developed and developing country action must also take full account of differences in development status, capacity to act, per capita emissions and historical responsibility, as enshrined in the principle of common but differentiated responsibilities and capabilities under the UN Framework Convention on Climate Change (UNFCCC).

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

27. WWF-UK would in principle support the adoption of a consumption emissions target in the UK, *as well as* the production based target. At the very least the Government should report on consumption emissions and commit to putting them on a downward trajectory. This should not be at the expense of the current strong focus to reduce production emissions, where WWF-UK sees a strong case to set more ambitious targets and to greatly improve the policy framework to ensure they are met. As a minimum, the Government should urgently adopt the "intended" first, second and third carbon budgets, as recommended by the Committee on Climate Change (CCC). Without this there is a strong risk that meeting the fourth carbon budget will require an implausible step change. WWF-UK also strongly endorses the CCC's call for a near decarbonisation of the power sector by 2030, and its warnings that a "step change" in policy ambition and credibility is needed to deliver on our targets under the Climate Change Act.

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?

28. The current Kyoto framework is based on production emissions. It is extremely well-established, and based on good quality data sets and monitoring protocols. WWF-UK strongly recommends that the UK and all parties to the UNFCCC should continue to work clearly within this framework.

29. The UK should not promote a shift to an international policy framework based on consumption emissions. This proposal would have very little support internationally and would threaten the emergence of a new binding global deal. It would raise difficult issues of sovereignty over control of emissions within national borders. It could also soak up much negotiating time and effort, so distracting governments and negotiators from the urgent task of agreeing an early peak in global emissions and a legally binding framework to deliver this. The priority must be to secure more ambitious action, and to close loopholes, within the existing framework.

30. However, it is important that levels of effort agreed by nations are informed by clear equity-based principles to ensure that any global agreement is fair. Consideration of the dynamics of global trade, and the use of consumption emissions data, could usefully contribute to discussions on equity in the global framework.

This criterion would be taken into account alongside established principles such as historical responsibility, per capita emissions and development status.

October 2011

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[1] Defra 2011, see: http://www.defra.gov.uk/statistics/environment/green-economy/scptb01-ems/

[2] See: http://www.defra.gov.uk/statistics/environment/green-economy/scptb01-ems/

[3] Minx, J C, Baiocchi, G, Wiedmann, T and Barrett, J, 2009, Understanding Changes in UK CO_2 Emissions 1992–2004: A Structural Decomposition Analysis, Report to Defra by Stockholm Environment Institute.

[4] Ibid, p 34.

[5] Defra 2010, Measuring Progress, Sustainable Development Indicators.

[6] Stockholm Environment Institute, 2009, Production of a Time Series of Scotland's Ecological and Greenhouse Gas Footprints.

[7] WWF-UK, SEI and Sustainable Scotland Network 2009, Carbon footprinting for Scottish local authorities: http://www.sustainable-scotland.net/documents/WWF-UKScotlandFullReportARTForWeb.pdf

[8] WWF-UK and SEI 2006, Counting Consumption: http://www.WWF-UK.org.uk/filelibrary/pdf/countingconsumption.pdf

[9] See Scottish Climate Change Act 2009 and Welsh Climate Change Strategy 2010.

[10] See, for example, Out of the Bunker: Time for a Fair Deal on Shipping Emissions, a recent WWF-UK/ Oxfam briefing paper on http://assets.WWF-UK.org.uk/downloads/bn_out_of_the_bunker.pdf

[11] Carbon Trust 2010, Tackling Carbon Leakage.

[12] http://www.theclimategroup.org/_assets/files/JointBusinessDeclaration-June-3.pdf

[13] http://www.sandbag.org.uk/site_media/pdfs/press_releases/PR_EUETS_dataUKrelease_1April2011.pdf

[14] See The Emissions Gap Report: Are the Copenhagen Accord Pledges Sufficient to Limit Global Warming to 2C or 1.5C?, UNEP November 2010, http://www.unep.org/publications/ebooks/emissionsgapreport/

[15] Comparison of Annex 1 and non-Annex 1 pledges under the Cancun Agreements, Sivan Kartha and Peter Erickson, Stockholm Environment Institute, Working Paper WP-US-1107, on http://sei-international.org/mediamanager/documents/Publications/Climate/sei-workingpaperus-1107.pdf

[16] See data on http://www.climateactiontracker.org/country.php

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Memorandum submitted by EEF/UK Steel

About EEF

EEF, the manufacturers' organisation is the representative voice of UK manufacturing, with offices in London, Brussels, every English region and Wales. We are a not for profit organisation with a growing membership of almost 6,000 companies of all sizes, employing some 900,000 people from every sector of the engineering, manufacturing and technology based industries. UK Steel, a division of EEF, is the trade association for the UK steel industry. It represents all the country's steelmakers and a large number of downstream steel processers.

Response

EEF/UK Steel's submission examines the issues only in the context of manufactured goods. Although EEF/ UK Steel support a long-term development of consumption based emissions monitoring, it would require a robust international agreement supported by an agreed international methodology. For this reason we do not feel that it would be either desirable, or practical for the UK *unilaterally* to adopt targets based on a different currency from the rest of the world in the short term. We recommend that the UK Government work with international partners to deliver a common approach in the medium term and assess the value of consumption emissions monitoring in the long term.

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

The shift of manufacturing activity out of the UK to cheaper locations, particularly for labour-intensive operation, is a well-documented long term trend. The emissions arising from those operations are currently accounted to the country in which they take place, not the country that is ultimately responsible for the emissions as a result of buying and consuming the goods in question.

Taking steel as an example (and ignoring the distortive impact of the recession), the total amount of steel consumed by the UK economy has continued to rise. We estimate this "underlying" consumption level at 26.9 million tonnes in 2007—the last full year not affected by the recession—compared with 21.1 million tonnes in 1997: an increase of 27%.

However, within that, over the same period the steel consumed in the form of imported finished goods (such as cars, washing machines, components etc) rose by 91%: from 6.6 million tonnes in 1997 to 12.6 million tonnes in 2007.

The following table demonstrates how the production of the steel consumed in the UK economy, and of course the emissions associated with that production, have shifted offshore:

Table 1

	1997	*2007*	*2007 over 1997*	*2010*	*2010 over 2007*
	Million tonnes			*Million tonnes*	
UK steel mills' deliveries to the UK market	8.6	6.5	−24%	4.8	−26%
Imports of steel mill products	5.9	7.8	32%	5.1	−35%
Steel contained in imported finished products	6.6	12.6	91%	9.6	−24%
Total steel consumed in the UK economy	21.1	26.9	27%	15.6	−28%

NB—The above table does not take account of the movement of scrap steel

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?

Whilst a consumption based reporting mechanism would set out the true GHG impact of our economy and thus better inform UK policy development, the complexity of international supply chains means that the issues involved in measuring consumption-based emissions would be challenging. The basic methodology would be to calculate the embedded carbon in all products traded across the UK's borders. The carbon values of exports would be deducted from the UK's direct emissions, while the values of imports would be added. However:

1. In the case of primary products such as semi-finished steel, it would be relatively simple to model the embedded carbon in UK exports, by tracing the products back to the producer, whose emissions in any given year will be known precisely.
2. Even for primary products however, calculating the actual embedded carbon in imports would be challenging. It would require firstly traceability of all imported primary products back to their producer, and secondly a comprehensive database of the actual emissions performance of all primary producers in the world.
3. In the case of steel there is a further problem. Steel is produced in two fundamentally different processes. The blast furnace/basic oxygen converter (BF/BOS) process uses virgin raw materials and is inherently carbon intensive. The electric arc furnace (EAF) route uses electricity to recycle old steel. This process is inherently far less carbon intensive. However, this recycling process depends on steel produced in the past for its feedstock. Even though scrap steel recovery is largely a mature market, there is insufficient steel scrap available in the world to enable this process alone to be used—EAFs could not exist without BF/BOS companies continuing to produce virgin steel. Steels produced using the two routes are indistinguishable from each other.
4. Further downstream the problems become massively more problematic. A primary product produced on one country might be further processed in a different country, then used in a component in another country and incorporated in a finished product in a fourth country. Without a globally-agreed comprehensive system of carbon certification, supported by robust verification, accompanying every single trans-frontier movement of goods it would be impossible to calculate the actual embedded carbon in imports and exports of most products. It is debatable if such a system could ever be agreed, and it would be immensely costly to business.

However, estimates of embedded carbon in traded goods could be made by using industry-agreed average values. This would not of course give precise values, but would give a reasonable indication of consumption-based emissions.

One further problem remains: how to account for emissions from the generation of electricity used in the manufacture of goods. This could only be done on the basis of each country's grid average, or ignored.

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

The main benefit of a system based on average embedded carbon values would be that the extent of carbon leakage would become more transparent.

A carbon certificate based system of calculating actual embedded carbon values as outlined above would have the additional benefit of enabling consumer choice based on embedded carbon, thus for example encouraging the use of EU steel over say Russian steel. However, because of the complexity and costs involved and the need for a comprehensive international agreement, EEF does not advocate the adoption of such a system in the medium term.

Unfortunately, for the foreseeable future, production-based emissions accounting will be the only accurate methodology. EEF therefore does not believe that consumption-based accounting can, for the time being, replace production-based accounting; but it can complement it by giving policy-makers better information on the complex causes of shifts in emissions patterns.

Whilst these difficulties will be challenging to overcome in the medium term, the current method of applying a production based target in the UK, in the absence of an international agreement, arguably achieves little in terms of global progress to reducing GHG.

A US study published in the Proceedings of the National Academy of Sciences journal claims that rich countries, including the UK, are importing a third of their carbon dioxide emissions.[8] Yet there appears to be little acknowledgement of this within UK climate change policy. Here lies the problem, whilst we acknowledge the extreme difficulties in moving to a consumption based reporting system, government policy (based on production based reporting) blindly ignores the global picture at the expense of the UK manufacturing sector.

Consumption reporting could conceivably result in UK climate change policy actually encouraging more manufacturing to take place in the UK, unlike the current production-based system, which will only lead to a further demise of the sector if our competitors are not subject to the same costs and burdens.

This is because production-based accounting results in an absolute cap on emissions from the country. As the cap tightens, the implications for carbon intensive sectors required to purchase allowances could become severe and lead to reduced levels of output. Consumption-based accounting on the other hand would shift the focus to the relative production efficiency of competing companies as the government sought to incentivise the consumption of products with the lowest relative carbon footprint.

If we accept that climate change is a global problem and GHG are largely global in nature, then producing more manufactured goods in the UK more efficiently than elsewhere would achieve more to tackle the issue than the current isolated and fragmented action.

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

EEF and UK Steel have consistently maintained that carbon leakage will initially manifest itself not through the relocation of industry (ie the closure of a UK plant and the opening of a new plant overseas to service the same market), but by the loss of market share to imports as UK competitiveness is gradually eroded. The loss to imports of the UK steel industry's market share is shown in Table 1 above.

Another early manifestation of carbon leakage, for plants that are part of international groups, will be seen in decisions on where to invest for the future. If multinational groups find the investment environment in the UK more hostile than in other countries, they are likely to place their investments in countries where they expect to obtain the best returns. EEF has maintained for some time that the costliness, complexity and uncertainty of the UK's energy and climate change policy scene is making the UK's investment climate less welcoming to manufacturing.

Investment decisions are complex and take into account a multitude of different and often conflicting considerations. Energy and climate change policy is one factor among many. Clearly the more energy intensive an activity, the greater prominence this factor attains.

Decisions to close manufacturing facilities are similarly complex and are not taken lightly. They tend to occur either as a result of bankruptcy or because a judgement is reached that a facility is no longer able to make a reasonable return.

In the specific case of the steel industry:

1. The most critical climate change policy for the BF/BOS sector is the EU Emissions Trading System (EU ETS). With the free issuance of allowances in Phases 1 and 2, carbon leakage specifically caused by the EU ETS has not so far arisen. However, the sector across Europe will be seriously short of allowances in Phase 3. There is a very real risk that output will be reduced (and capacity cut back) as allowances run out towards the end of the decade.
2. The EAF sector is primarily affected by the impact of climate change policies on electricity prices. The combined effects of the renewables incentive schemes (primarily the Renewables Obligation), the pass-through of EU ETS carbon pricing in electricity prices and the Carbon Price Floor threaten seriously to erode UK competitiveness. It is the recognition of this risk that has led the government to announce a potential package of measures to assist energy

[8] Davis S J and Calderia K (2010) Consumption-based accounting of CO2 emissions, PNAS http://www.pnas.org/search?fulltext=Steven+Davis&submit=yes&go.x=14&go.y=4

intensive industries. We reserve judgement on whether this package will be adequate to meet our concerns.

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

Although EEF/UK Steel support a long-term development of consumption based emissions monitoring, it would be neither desirable, nor practical for the UK unilaterally to adopt targets based on a different currency from the rest of the world. Essential pre-conditions for a move to consumption-based targets are:

1. Global agreement on a robust methodology involving a scheme such as carbon content certificates (see above); and
2. An agreed recalibration of all countries' targets onto a consumption basis.

One clear objection to a unilateral move to consumption based targets would be that the UK is unable to affect the carbon intensity of production processes in other countries. Adoption of consumption based targets could therefore have little tangible environmental outcome within other countries unless they led to some form of border measure (for example, by applying taxes related to carbon content). The UK however has no power to apply border measures (this is an EU prerogative).

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?

As previously stated, adoption of consumption based targets would require renegotiation of all internationally-agreed targets. It would be pointless otherwise.

It is possible that emerging economies such as China might support such a move, but it is likely that developed nations who are major importers of manufactured goods (eg the USA) would oppose the move. EEF is not able to assess whether a UK proposal to place targets onto a different currency would kick-start or over-complicate the stalled UNFCCC renegotiations.

October 2011

Memorandum submitted by the Carbon Trust

Thank you for this opportunity to submit evidence to the Energy and Climate Change Committee's inquiry into consumption-based emissions reporting. The Carbon Trust has an extensive history of domestic and international activities that are directly relevant to this issue, including:

— PAS 2050: the Carbon Trust authored the world's first product carbon footprinting standard, with accompanying accreditation programme.

— Footprinting: the Carbon Trust has worked with a range of companies to provide product-level carbon footprinting and labelling services.

— International Carbon Flows: our recently published study on global and sectoral flows of emissions embodied in trade.

— Low Carbon Living: our programme of work on options for reducing the emissions intensity of every-day activities.

Enclosed with this letter is our recent analysis of international carbon flows embodied in international trade, and the importance of these flows at a national and sectoral level. This International Carbon Flows (ICF) analysis is referenced in our response to the Committee's questions below.

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

The UK's GHG emissions are significantly larger when viewed from a consumption, rather than production basis. Analysis by the Carbon Trust, drawing on models developed by the Stockholm Environment Institute, shows that in 2004 the UK's consumption CO_2 emissions were 34% greater than (the usually reported) production emissions (see Figure 1).

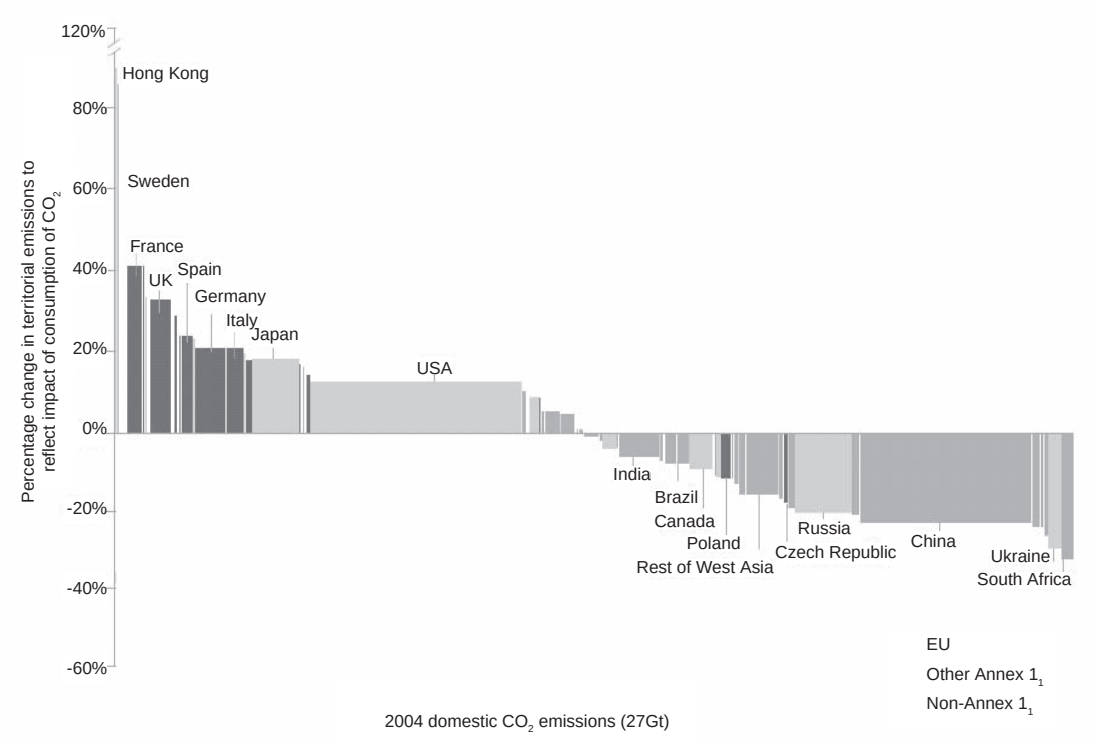
The majority of the net emissions imports into the UK were in the form of final goods for consumption. Our analysis shows that the importance of imported emissions in the UK has grown markedly between 1992 and 2004, and our modelling suggests that within 15 years more than half of the emissions arising from consumption in the UK will be occurring overseas. (Further details, and a full analysis of UK emissions from a consumption perspective, are available in the ICF chapter on Global emissions, pages 11 to 18.)

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?*

Not only is modelling consumption-based emissions possible, but it is being successfully carried out by a number of research institutes and government organisations. There are difficulties in determining the uncertainty associated with specific model results, and research has been conducted on this very point: however, in terms of informing policy development, any real or perceived uncertainty in the modelling approaches should not be used as a basis for inaction.

Figure 1

THE IMPACT OF A CONSUMPTION-BASED VIEW ON EMISSIONS BY COUNTRY



1 Annex 1 to UNFCC.

Note 1: Includes CO_2 emissions from production, process, transport and household sources only (27Gt in 2004): excludes non-CO_2 emissions due to land-use-change.

Note 2: Based on an MRIO (multi-region input/output) model allocating emissions to regions of consumption.

Source: Carbon Trust Analysis; CICERO/SEI/CMU GTAP7 MRIO Model (2004).

At a national level, approaches such as multi-regional input-output models (MRIO—the type of modelling behind our ICF publication) are suitable for country and sector-level estimates of consumption-based emissions (eg Figure 1). At a product level, life cycle assessment approaches such as those behind the PAS 2050 standard, and the recently published WRI/WBCSD Product GHG Protocol, provide a bottom up assessment of life cycle emissions. Both levels of analysis are important, and relevant at different scales: MRIO approaches inform overall targets and goals at a country level, while specific policies and consumer information programmes could leverage the product-level standards that are available.

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

It is not necessary to choose one approach to emissions assessment over another, as emissions assessments from both production and consumption perspectives are valuable. Consumption-based approaches offer additional insights and approaches to the current production-based view, and should not be viewed as a substitute.

The benefits of including a consumption-based view of GHG emissions are multi-fold: correct accounting for national responsibility for emissions; identification of the opportunities for new policies to support environmental action; and identification of new levers for business and consumers to drive lower carbon consumption. Specific examples of how a consumption-based view of emissions would be relevant include:

— EU Emissions Trading System: the EU ETS operates on a production emissions basis, yet for some sectors the consumption view of emissions is dominated by embodied emissions imported in trade. For example, two-thirds of the emissions arising from aluminium consumption in Europe arise outside of the EU ETS (see the ICF chapter on Aluminium, page 11).

— Performance standards: current EU approaches to vehicle emissions focus on use-phase efficiency, while a consumption perspective reveals that within a decade most emissions in the life cycle of vehicles could arise from manufacturing and disposal (see ICF Automotive: page 14).

— Need for investment: with demand forecast to increase at the same time that emissions need to fall in sectors such as steel, there is a need for far greater innovation investment to unlock a step-change in emissions reductions through the commercialisation of new technologies (see the ICF chapter on Steel, page 19).

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

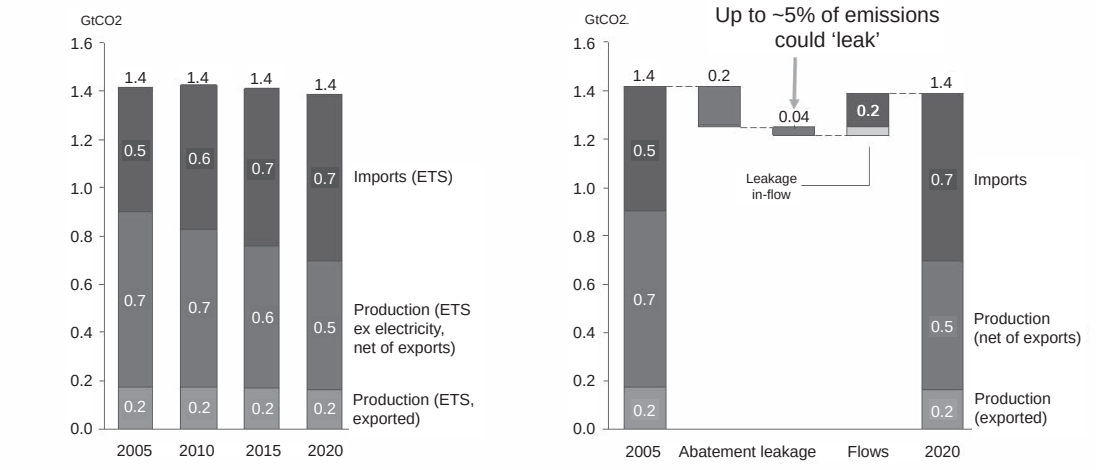
The Carbon Trust has previously published research on the impact of leakage arising from emissions pricing under the EU ETS. This research suggested that the scale of leakage from carbon pricing is expected to be small, and the risks tend to be focussed in specific sectors. This earlier finding is supported by more recent work by the Carbon Trust, which showed that:

(a) the projected growth in importance of "imported" emissions arises from greater consumption in Europe rather than from carbon leakage (see Figure 2), and

(b) the relative cost advantages enjoyed by other regions (compared to the EU) for the development of new production facilities in some sectors such as aluminium and steel exist irrespective of EU ETS emissions pricing (eg see ICF Aluminium: page 8).

Figure 2

WITHIN THE EU ETS, GROWTH IN EMBODIED CARBON IMPORTS ARE FIVE TIMES LARGER THAN ESTIMATES OF UNMITIGATED "CARBON LEAKAGE"



Note 1: Declining production emissions based on expected contribution from non-electricity sectors to declining ETS cap (CASE II Model)
Note 2: Growth in imported emissions based on continuation of historic growth in gross imports, and varying degrees of decarbonisation in the exporting countries. In the displayed scenario, it is assumed that the emissions intensity of exports from Brazil, Russia, India and China (BRIC nations) decline in line with 50% of the targets noted in the Copenhagen Accord (2009), that exports from the EU and other Annex I nations decline in line with the EU's target to reduce emissions by 20% from 1990-2020, and that exports from the rest of the world achieve decarbonisation of the order of half thata acheived in the BRIC countries.
Source: Carbon Trust Analysis based on data from: Addressing leakage in the EU ETS: Results from Case II Model (Climate Strategies, 2009); CICERO/ CMU/ SEI/ GTAP 7 MRIO/ EEBT Model (2004); Cutting Carbon in Europe: The 2020 plan and the future of the EU ETS, Carbon Trust (CTC734,2008)

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

We believe that this question should be viewed the other way around: how is it possible for the UK to genuinely demonstrate that its policies are achieving lower emissions unless it considers all emissions that arise to support our standard of living in the UK? This does not mean the immediate replacement of current policies; however, an informed debate about the costs and impacts of emissions mitigation policies cannot be had if a significant part of those emissions are not being accounted for.

The second stage in this process could be setting emissions reduction targets on a consumption basis. This would involve measuring emissions from a consumption basis, identifying opportunities to reduce the emissions intensity of consumption, the policies and actions that might enable these, and potentially setting targets on a consumption basis.

The practicality of supply chain emissions assessment has already been demonstrated at a product level (product carbon footprinting and labelling), and work is continuing to improve these processes and make them lower cost.

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?*

It is important to be clear on what "adopting" means in this context. In relation to question 5, the international implications of the UK adopting a consumption-based measurement and reporting approach are low, as it would essentially act as a parallel reporting mechanism alongside the conventional production-based accounts. However, were the UK to adopt consumption-based targets, and policies that limited consumption emissions, then there would be potential for wide-ranging international implications. Further work would be beneficial in understanding the impacts arising from different policy responses to consumption-based accounting.

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

In our experience, most discussions around consumption-based approaches to emissions policies, and in particular consumption-based emissions pricing, quickly gravitate towards the advantages and disadvantages of border adjustment measures. While this is a potential policy route, it is important for the Committee to keep in mind that there are a wide variety of approaches that could be adopted to support consumption-based action on emissions mitigation. For example, generating value in the consumers' mind over the desirability of lower emissions products could embed consumption and supply chain based thinking in a wide range of consumer products, from foods to clothing and electronics.

October 2011

Memorandum submitted by Manchester City Council

Manchester City Council commissioned independent consultants, Small World Consulting, to undertake a consumption based approach to reporting emissions for the ten local authority areas within Greater Manchester (Bolton, Bury, Manchester City, Oldham, Rochdale, Salford City, Stockport, Tameside Trafford, Wigan). A "footprint" was produced for residents and industry within the region. This research was funded as part of the DECCs Low Carbon Frameworks Pilot.

This work was communicated with a number of stakeholders in the production of the Greater Manchester Climate Change Strategy, setting the sub-region a 48% direct carbon reduction emissions target. Stakeholders across the region have discussed how to start considering and implementing a consumption based approach into policy within Greater Manchester. This work has informed our approach and thinking in response to questions below.

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

Carbon emissions as a result of aviation/shipping can be assigned to consumer/residents purchasing and activity. This prevents carbon emissions for infrastructure such as airports, being assigned to the local authority within which they reside. This is a fairer way of attributing airplane/airport emissions, which serve a much larger region that which they sit within. This approach would sit better with the decision to use DECC Full Data Set or Local Authority emissions statistics (previously National Indicator 186). It is Manchester City Council's view that for direct emissions, the full data set should be used. Adding a consumption based approach to this, would give a much clearer indication of the UK's impact on worldwide emissions.

Nationally assigned emissions are currently measured in carbon dioxide and not all greenhouse gases (GHGs). Movement to recording all GHGs is also an important and positive step.

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?

Greater Manchester believes that this is feasible to create on a national scale, having created a consumption based footprint for the whole of Greater Manchester (as detailed above), for both industry and residents of each of the 10 local authorities within Greater Manchester.

Clear communication is essential to convey that this is not an exact science like production based methodology and there are many assumptions that need to be made when a national set of accounts is derived.

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

It can help focus policy intervention in a number of areas that aren't necessarily linked directly to climate change. Considering the results produced for the Greater Manchester study, a large footprint comes from food and waste. With up to a third of food purchased by households being sent to landfill, policy intervention and education could help reduce waste and help the poorest in society.

The UK can lead the way in developing this kind of accounting and it may lead to stronger global consensus in trying to reduce carbon emissions as emissions are not simply just put on those countries (eg China) who produce the majority of the products that we consume.

Climate change doesn't respect political/geographical boundaries; emissions produced elsewhere in the globe will have an impact here in the UK.

Worldwide approach to reducing emissions, greater potential for local (UK) sourcing therefore jobs and investment in local economy. Production and consumption need to be considered.

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

Rising labour costs are more likely to be implications in countries relocating rather than climate change specific policies, however simply reporting on production based emissions is likely to further encourage more industry to move abroad as the UK strives to solely meet targets set out in the UK Climate Change Act 2008.

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

Statistics to create a national carbon inventory are all already available, through channels including Office of National Statistics.

It would give individuals and organisations greater ownership of their carbon footprint. This would in turn allow them to be more resource efficient and thus reduce emissions.

For companies of all sizes this would create ability to identify carbon hotspots within their supply chain. This may open up further opportunities for the local UK economies, as organisations realise that local purchasing can be more cost effective as well as reducing carbon.

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?

Practically, if the UK took the lead in developing a national approach to consumption based emissions, this could give greater credence to negotiations with other countries in establishing emissions reductions as part of Kyoto protocols.

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

Consumption based reporting enables individuals and organisations to identify "carbon hotspots" within their supply chains. As energy security becomes weaker and the cost of energy increases, opportunities for local, low carbon production may come to the fore. More local sourcing further enables the "just in time" principal to be further enacted with more efficiency and lower carbon.

Companies, particularly SMEs, due to financial constrains often do not take on tackling direct carbon impact with projects that have a longer payback than three years. With nationally produced and audited accounts, companies (as well as residents) would be able identify patterns to reduce their carbon with no monetary outlay.

October 2011

Memorandum submitted by the Public Interest Research Centre

About PIRC

The Public Interest Research Centre (PIRC) is an independent charity, whose work is aimed towards building a sustainable society. Through research and advocacy, we press for the structural changes needed to effectively tackle climate change and ecological degradation.

Declaration of Interests

Established in 1971, the Public Interest Research Centre is an independent charity (Registered No 266446). Our funding is provided by charitable foundations and individual donations. We do not receive any corporate or government funding.

Summary

— UK emissions measured on a consumption basis have grown by 20% since 1990 (2008 figures)—in contrast to official territorial emissions reporting, which records that UK emissions have dropped by 14%. Our total emissions are set to grow further, despite anticipated cuts domestically.

— In 2004, the UK evaded at least £4 billion of carbon clean-up costs thanks to this emissions loophole. Currently, the UK does not pay the full ecological costs for its consumption.

— Methodologies for consumption-based emissions reporting are now robust enough for Defra to be already accounting in this way, and several governments have committed to consumption-based reporting.

— Taking a consumption approach would be a more truthful, equitable and intelligent way of accounting for our emissions, ensuring the UK takes full responsibility for its impacts—but also helping protect the UK against carbon risk in our supply chains.

— We know of no evidence that industry has relocated from the UK specifically as a result of climate policy, and consider this concern to have unfairly overshadowed the far bigger problem of emissions being outsourced due to wider trends in globalisation.

— We feel the Committee on Climate Change should be tasked with recommending the most appropriate means of mitigating outsourced emissions, and whether this leads to revised carbon budgets, separate targets, or ancillary actions.

— Taking a consumption approach could aid progress at the UN climate talks and inform negotiations on what agreement takes shape after Kyoto's first commitment period expires.

— Much more attention should be paid to demand-side mitigation measures.

RECOMMENDATIONS

— Government should adopt consumption-based emissions reporting and publish figures annually alongside territorial emissions.

— Government should mandate the Committee on Climate Change to investigate consumption-based emissions reporting and what additional targets or policies should be adopted to tackle outsourced emissions.

— We suggest the Energy and Climate Change Committee seek oral evidence from the Committee on Climate Change to inform this inquiry.

SUBMISSION

1. *Definition of terms used*

In this submission, "consumption-based emissions reporting" refers to the practice of measuring a country's total carbon emissions, including those emissions embedded in imports.

We occasionally use the phrases "outsourced emissions" and "embedded emissions" to refer to emissions embedded in UK imports (net of exports), and to signify that they remain the UK's responsibility, despite having been effectively outsourced overseas.

2. *Before proceeding, we wish to suggest that the inquiry's questions set up a false dichotomy between production-based and consumption-based emissions reporting*

Reporting on the UK's consumption emissions does not need to mean getting rid of current territorial reporting methods or negotiating a change in international reporting requirements. Rather, consumption-based reporting should be a natural and complementary extension of existing practices—reflecting more accurately the UK's true contribution to climate change and enabling more intelligent policy.

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

On a consumption basis, UK emissions rose 20% between 1990 and 2008.[1] This is in contrast to a 14% decline in territorial emissions over the same time period, as current official reporting methods record.[2]

Research by the Carbon Trust suggests the UK's total emissions are set to rise still further. Their calculations show that, on a consumption basis, UK emissions stood at 844MtCO_2 in 2010. By 2025, total UK emissions will at best sum to 803MtCO_2, and in the worse case, are anticipated to increase to 908MtCO_2.[3] This is forecast to occur even if legally-binding domestic emissions reduction targets are met. In other words, Britain's contribution to global warming will remain almost constant, or even increase, if our consumption remains so carbon-dependent.

PIRC calculates that in 2004 the UK evaded at least £4 billion of carbon clean-up costs thanks to this emissions loophole.[4] Currently, the UK does not pay the full ecological costs for its consumption. We are benefitting from natural carbon sinks and cheap manufacturing processes in other countries, but not paying the price for cleaning up the resulting pollution or repairing failing carbon sinks.

The Chancellor, George Osborne, has recently hinted that he does not think the UK should continue to lead the world in cutting emissions, given that "Britain makes up less than 2% of the world's carbon emissions to China and America's 40%."[5] A consumption perspective would show such complacency to be misplaced:

Britain's consumption patterns are helping boost Chinese emissions—from whom we import many carbon-intensive goods[6]—and our contribution to global emissions is increasing. Any attempt to "go slow" in reducing our emissions would be badly misplaced.

4. *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?*

Yes—and in fact the UK Government already measures emissions on a consumption basis. Defra commissioned research from Stockholm Environment Institute in 2008 to look at the UK's carbon emissions on a consumption basis for the years 1990–2004.[7] Subsequent Defra-sponsored research has updated this through to 2008,[8] and carried out structural decomposition analysis to break down the emissions profile by sector and product category.[9] This data has been verified by the Office for National Statistics, is now included in the ONS Sustainable Development Indicators,[10] and is displayed graphically on the Defra website.[11] However, DECC continue to publish only territorial emissions data on their website.[12] In our opinion, if statistics are robust enough for Defra and the ONS, they are robust enough for DECC to publish.

Going further, Defra have recently tendered a contract to Leeds University to carry out consumption-based emissions accounting for the UK for the next five years, covering the years 2009–13.[13] However, at this stage it is unclear whether they will be published on the DECC website alongside territorial emissions, or treated as directly comparable "official statistics". In our opinion, they should be.

Academics working in this field have continued to improve the robustness of the methodologies used, making great strides even in the past few years.[14] Recent academic papers on the subject include studies by the Universities of Stanford,[15] Oxford,[16] and Surrey;[17] by Stockholm Environment Institute;[18] and by researchers collaborating between institutions.[19] NGOs and think tanks who have produced analysis of outsourced emissions include Policy Exchange,[20] Green Alliance,[21] WWF,[22] and the New Economics Foundation.[23] If there are remaining weaknesses in measuring emissions on a consumption basis, the problem lies in data collection, not methodology: something that the Government might help address by providing support for greater international collaboration in data-sharing.

The robustness of the consumption-based approach is also attested to in the precedents set by other countries. In Scotland, the government is obliged under the Climate Change (Scotland) Act 2009 to "lay before the Scottish Parliament a report in respect of each year in the period 2010–50… set[ting] out the emissions of greenhouse gases (whether in Scotland or elsewhere) which are produced or otherwise associated with the consumption and use of goods and services in Scotland during that year."[24] The Scottish Government has commissioned research into Scotland's historic emissions from a consumption basis, and will update this in 2012.[25] The Welsh Government has also committed to reporting on Wales' emissions on a consumption basis.[26] In Sweden, meanwhile, the Government's Environmental Objectives Bill of March 2010 was introduced with the goal of "hand[ing] over to the next generation a society in which the major environmental problems in Sweden have been solved, and that this should be done *without increasing environmental and health problems outside Sweden's borders* [emphasis added]." Since the passage of the Bill, Sweden has developed a series of environmental indicators which all take into account a consumption perspective, including greenhouse gas emissions.[27]

Whatever remaining uncertainties may exist in measuring them, it is clear that the problem of outsourced emissions is too important to be ignored any longer. The Chief Scientific Advisors (CSA) at both DECC and Defra have signalled their concerns about emissions from consumption in the recent past. Prof Bob Watson, Defra CSA, confirmed in an interview in September 2010 that total UK emissions had risen and declared: "We've got to be more open about this".[28] Prof David MacKay, DECC CSA, has similar concerns.[29] If Government still considers the methodologies for consumption-based reporting to be insufficiently robust, it should find the resource to improve them.

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

The key benefits of taking a consumption-based approach to emissions reporting include:

- Giving a more truthful and accurate representation of the UK's contribution to global emissions, and aiding decisions at a national and international level about how to fairly allocate the mitigation burden.
- Enabling policy to be more informed and better targeted. Around 75% of a UK household's carbon footprint is a result of the products and services we consume; yet DECC policy is focused overwhelmingly on the other 25% of direct emissions from the energy we use in our homes and transport.[30] A consumption perspective would help to broaden this focus and better align DECC's work with that being undertaken in Defra and BIS.
- Ensuring the UK remains a leader in climate policy, and is being honest in taking responsibility for its full environmental impact.

— Protecting against carbon risk in UK supply chains. Even without progress at the UN climate talks, international moves towards carbon being priced appear inexorable and inevitable: in China, for example, clean energy policies mean a carbon price of £5/tCO_2 is already reflected in Chinese electricity costs. Understanding our consumption footprint will aid the UK in insulating itself against future price rises by moving towards lower-carbon, resource-efficient imports.

A potential key disadvantage of consumption-based emissions reporting would be if it gave the impression that climate policy to date has not been at all successful. This is not the case: it has simply been limited. UK emissions would have been still higher were it not for successes in domestic emissions cuts. Clear communication of this will be important, but pretending total emissions have not risen is no longer tenable.

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

We are not aware of any evidence of this occurring to date, despite this being alleged by various commentators and industry spokespeople in recent months—sometimes with the aim of discrediting all climate change legislation.[31]

It is important to differentiate between what is often termed "carbon leakage" and the far larger problem of outsourced emissions. Carbon leakage usually refers to emissions being driven overseas *as a direct consequence* of stringent climate change policies, where businesses seek to avoid the additional cost of abating emissions by moving their operations to a lower-compliance regime. Research by the Carbon Trust shows that this could affect only a very small number of sectors and a tiny percentage of UK emissions: it is calculated that implementing the current EU Emissions Trading System (EU ETS) Phase III targets to 2020 without any free allocation of allowances or protection would drive less than 2% of emissions abroad.[32]

We accept that certain strategic energy-intensive sectors—such as steel, aluminium and cement manufacture—could be affected disproportionately by climate policies. It would be ironic and detrimental to the building of a green economy if industries dedicated to the manufacture of wind turbines or electric cars, for example, were driven overseas or discouraged from locating themselves in the UK. However, we would urge caution that the Government not overreact to such fears and cave into what may, in some cases, simply be specious pleading by industry. Research suggests that too many industrial sectors are already likely to benefit from compensatory free allowances under Phase III of the EU ETS.[33] We urge the Government to consult publicly on its awaited package of measures for energy-intensive industries before it subsidises them from the public purse.[34]

Moreover, we are concerned that concerted lobbying on this relatively small matter risks obscuring—and confusing—the far larger problem of UK emissions being outsourced overseas *regardless* of the shape of existing British climate policy. The quickest glance at data on outsourced emissions over the last 20 years shows that this process has not been driven by climate policy to date, but rather is a long-established negative trend driven by globalisation and the flight of capital and labour from UK industry to predominantly Asian countries. Environmental legislation plays only a small part in determining overall costs for most businesses, whereas labour costs tend to be far more important.

Indeed, progressive business in the UK would seem to prefer tougher action on outsourced emissions, rather than a dilution of existing climate policy. For example, the UK Corporate Leaders' Group on Climate Change recently called on Government to mandate an enquiry into outsourced emissions by the Committee on Climate Change;[35] whilst the Aldersgate Group have called for "more transparency about the UK's carbon footprint… UK demand for imported goods is responsible for more GHG emissions abroad than any other European country, and is third worldwide, behind only the US and Japan. This does not justify weakening climate change policy. It does, however, put greater responsibility on an increasingly service-based economy to help developing countries reduce their GHG emissions."[36]

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

We feel that it should be for the Committee on Climate Change (CCC) to consider whether UK climate policies should be strengthened to take account of rising emissions from consumption. One can envisage this leading to a variety of approaches, some more practicable than others:

— Existing UK emissions targets *could* be recalculated to incorporate consumption emissions. Whilst this would be the simplest solution and be more comprehensive and equitable than the current targets, the new targets would of course be more challenging to meet, reflecting the UK's reduced jurisdiction over (if not culpability for) emissions originating overseas.

— An alternative approach would be to ignore trying to reduce outsourced emissions directly, but rather take compensatory action domestically, by tightening up existing carbon budgets.

— Government could adopt a separate target, outside the existing carbon budgets, to influence reductions in outsourced emissions. It would enshrine a commitment to reducing the UK's total carbon footprint, not just our territorial emissions, and lend greater impetus to *demand-side* measures seeking to shift consumption patterns in the UK.

— A consumption-based approach to emissions could inform international negotiations going forward beyond Durban, such as through the brokering of a second commitment period for the Kyoto Protocol, bilateral deals, or trade talks incorporating carbon border adjustment mechanisms.

— Even if not used to set new targets, a consumption approach could be adopted as a "shadow" accounting system for appraising policy against, to ensure that domestic action does not result in perverse outcomes (eg increasing use of imported biofuels because of lower tailpipe emissions, but boosting emissions overseas through deforestation).

8. *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?*

It should be made clear that there is no need to renegotiate the entire UN emissions reporting process for a parallel set of consumption emissions accounts to be assembled. This would clearly take time and delay an already vexed set of negotiations.

However, were the UK to begin reporting its emissions on a consumption basis (in common with Sweden, Scotland, Wales and other early-adopters), this could in fact start to untangle the UNFCCC deadlock. China's reluctance to adopt tougher emissions policies in part stems from feeling blamed for emissions that ultimately fuel Western consumption patterns. As China's Foreign Ministry spokesman Qin Gang has said: "The developed countries move a lot of manufacturing industry into China. A lot of the things you wear, you use, you eat are produced in China. On the one hand, you shall increase the production in China, on the other hand you criticize China on the emission reduction issue."[37] Officially acknowledging this to be the case could build trust and ease negotiations.

Furthermore, a consumption approach should inform negotiations on what international agreement takes shape after Kyoto's first commitment period expires. The Kyoto Protocol as it stands was designed at a time when international flows of carbon were much smaller: emissions embedded in trade have grown from 4.3 $GtCO_2$ in 1990 to 7.8 $GtCO_2$ in 2008.[38] Moreover, the net emissions transfers via international trade from developing to developed countries increased from 0.4 $GtCO_2$ in 1990 to 1.6 $GtCO_2$ in 2008, exceeding emissions reductions under the Kyoto Protocol.[39] Much debate under the UNFCCC concerns the West's historical responsibility for emissions, but a consumption approach shows that Western contributions to climate change continue to be disproportionate.

Indeed, if COP-17 at Durban fails to deliver a fair, ambitious and legally-binding climate treaty, a consumption approach might prove useful in rebuilding climate policy architecture subsequently. For example, it could inform bottom-up bilateral climate deals between willing nations or blocs (eg EU-China), in which carbon flows embedded in trade between the two regions are explicitly addressed through border adjustment measures. Compared to a global deal, this is clearly a "plan B"; but it is also far preferable to no action at all post-2012.

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

The biggest obstacle to consumption-based emissions reporting being adopted officially in the UK is no longer uncertainty in accounting methodologies; it is the Government's fear that they will lose face for having presided over a rise in carbon pollution, and that there is little they can do to reduce outsourced emissions.

But this is simply not the case. There are multiple policy options for cutting the emissions we currently outsource, but the impetus to pursue them is not yet there. We may not have direct jurisdiction over emissions from Chinese factories, but our consumption choices clearly influence what is produced on our behalf.

Adopting a serious commitment to tackling our total carbon footprint would, for example, open out options for demand-side measures to alter consumption patterns—a large policy area currently being given much less attention than supply-side mitigation efforts (such as greener electricity production or more fuel-efficient cars). This could range from work already begun by Defra to reduce food waste, through to incentivising the purchase of products with longer lifetimes,[40] and encouraging dietary change. As research by WRAP has shown, many of these options offer larger emissions savings than supply-side measures alone, and will help reduce emissions wherever in the world they occur.[41]

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[2] UK Greenhouse Gas Inventory, 1990–2008, http://ghgi.decc.gov.uk/

[3] Carbon Trust, *International Carbon Flows*, May 2011, http://www.carbontrust.co.uk/policy-legislation/international-carbon-flows/pages/default.aspx

[4] The figure of at least £4 billion was arrived at through the following calculation. Net emissions flows into the UK from non-EU Annex I countries & non-Annex I countries totalled 186MtCO_2 in 2004 (Carbon Trust, *International Carbon Flows*, ibid). This excludes net carbon flows from EU countries as they are assumed to have an inbuilt carbon price, owing to the EU ETS and EU climate targets. DECC's low figure for the price of carbon in the non-traded sector for 2008, the earliest year available, is £25/tCO_2 (http://www.decc.gov.uk/en/content/cms/emissions/valuation/valuation.aspx). We chose this low figure to reflect the uncertainty in costing mitigation efforts in multiple overseas locations, but consider it to be a conservative estimate. 186MtCO_2 x £25/tCO_2 = £4.6 billion.

[5] Chancellor of the Exchequer, George Osborne, speech to Conservative Party Conference, 3 October 2011. Viewable online at http://www.bbc.co.uk/news/uk-politics-15152909

[6] The emissions embedded in goods imported to the UK from China in 2004 totalled some 64MtCO_2, a higher figure than for any other country from which the UK imports goods. See Carbon Trust, *International Carbon Flows*, May 2011, ibid.

[7] Stockholm Environment Institute, *Development of an Embedded Emissions Indicator*, report for Defra, July 2008.

[8] The full breakdown of these updated figures has not yet been released, but is viewable on the Defra website, http://www.defra.gov.uk/statistics/environment/green-economy/scptb01-ems/

[9] Minx, J, Baiocchi, G, Wiedmann, T, and Barrett, J (2009), Understanding changes in UK CO_2 Emissions from Consumption, 1992–2004: A Structural Decomposition Approach. Report to Defra by Stockholm Environment Institute at the University of York and the University of Durham. See also Barrett, J, Owen, A, Sakai, M (2011) UK Consumption Emissions by Sector and Origin. Report to Defra by University of Leeds.

[10] Defra and ONS, *Measuring Progress: Sustainable development indicators 2010*, p 15.

[11] See Defra website, http://www.defra.gov.uk/statistics/environment/green-economy/scptb01-ems/

[12] See DECC website, http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/uk_emissions.aspx. PIRC contacted DECC Climate Change Statistics in July 2011 to enquire whether the department would consider publishing the data commissioned by Defra and verified by the ONS, and were told: "We are reviewing the content of the DECC climate change statistics webpages over the next month and we will consider making your suggested amendments. I apologise I cannot give you a firm decision on any action at this stage." As of October 2011, nothing on the DECC website has changed.

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[14] Confirmed by PIRC through various personal conversations with researchers at the Universities of Leeds and Surrey, June—October 2011.

[15] Steven J Davis and Ken Caldeira, Carnegie Insitution for Science (Stanford University), "Consumption-based accounting of CO_2 emissions", Proceedings of National Academy of Sciences, vol 107, no 12, March 2010.

[16] Dieter Helm, Oxford University, *Too Good to Be True? The UK's Climate Change Record*, December 2007.

[17] Angela Druckman and Tim Jackson, University of Surrey, "The carbon footprint of UK households 1990–2004: A socio-economically disaggregated, quasi-multi-regional input-output model", *Ecological Economics* 68, 2009, pp 2066–2077.

[18] Stockholm Environment Institute, *Development of an Embedded Emissions Indicator*, report for Defra, July 2008.

[19] For example, Glen Peters, Jan Minx *et al*, "Growth in emission transfers via international trade from 1990 to 2008Q", *Proceedings of the National Academy of Sciences*, vol 108 no 21, pp 8903–8908, March 2011.

[20] Andrew Brinkley & Simon Less, Policy Exchange, *Carbon Omissions: consumption-based accounting for international carbon emissions*, October 2010.

[21] Green Alliance, *A Pathway to Greener Products: Recommendations from Green Alliance's Designing Out Waste Consortium*, September 2010.

[22] WWF and Stockholm Environment Institute, *Counting Consumption: CO_2 emissions, material flows and Ecological Footprint of the UK by region and devolved country,* 2006.

[23] New Economics Foundation, *Chinadependence: The* 2nd *UK interdependence report*, 2007. http://www.neweconomics.org/publications/chinadependence.

[24] Climate Change (Scotland) Act 2009, para 37, pp 21–22; see also http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact/reporting

[25] Scottish Government, "Production of a time series of Scotland's Ecological and Greenhouse Gas Footprints", 2009, and PIRC correspondence with Daniel Hinze, Senior Economist in the Environmental Analysis Unit, Scottish Government, August 2011.

[26] Welsh Government, *Climate Change Strategy for Wales*, October 2010, p 40. http://wales.gov.uk/docs/desh/publications/101006ccstratfinalen.pdf

[27] Swedish Environmental Protection Agency, *The Climate Impacts of Swedish Consumption*, January 2010; *Swedish Consumption and the Global Environment*, 2011.

[28] Press Association, "UK urged to be more open about greenhouse gas emissions", 3 September 2010, http://www.guardian.co.uk/environment/2010/sep/03/uk-greenhouse-gas-emissions-bob-watson

[29] See interview with David MacKay by Roger Harrabin, "Britons creating 'more emissions'", BBC News website, 30 September 2009, http://news.bbc.co.uk/1/hi/sci/tech/8283909.stm

[30] Green Alliance, *A Pathway to Greener Products: Recommendations from Green Alliance's Designing Out Waste Consortium*, Sept 2010, p 7.

[31] For example, Matthew Sinclair of the TaxPayers' Alliance argues in his recent book *Let Them Eat Carbon* (Sept 2011) that "the problem of exporting emissions is likely to mount in the coming years as climate change policies really bite and a higher carbon price drives high emitting industries abroad. That calls into question the whole point of the ambitious unilateral targets and caps that developed countries are putting on their emissions." (p 197). Sinclair is right to draw attention to the problem, but his diagnosis is flawed, and his proposed remedy plain wrong.

[32] Carbon Trust, *Tackling carbon leakage: sector-specific solutions for a world of unequal carbon prices*, March 2010.

[33] Grantham Institute—Imperial College London, London School of Economics, & Carlos III University in Madrid, "Policy brief: Still time to reclaim the European Union Emissions Trading System for the European tax payer", May 2010, http://cep.lse.ac.uk/pubs/download/pa010.pdf

[34] The Government has stated it will announce such a package of measures in Autumn 2011—see for example HM Government, *Enabling the Transition to a Green Economy: Government and business working together,* August 2011.

[35] UK Corporate Leaders' Group on Climate Change, *Seize the Day,* June 2010.

[36] Aldersgate Group, submission to Environmental Audit Committee inquiry into carbon budgets, 3 June 2011, available online at http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenvaud/1080/1080vw07.htm

[37] Associated Press, "China rejects criticism of its carbon emissions", The New York Times, 21 June 2007, http://www.nytimes.com/2007/06/21/business/worldbusiness/21iht-emit.4.6262722.html

[38] Peters, G *et al*, "Growth in emission transfers via international trade from 1990 to 2008", Proceedings of the National Academy of Sciences, vol 108 no 21, pp 8903–8908, March 2011.

[39] Peters, G, 2011, ibid.

[40] See for example research commissioned by Defra from ERM, *Longer Product Lifetimes*, February 2011.

[41] WRAP, *Meeting the UK climate change challenge: The contribution of resource efficiency*, 2009. WRAP Project EVA128. Report prepared by Stockholm Environment Institute and University of Durham Business School.

Memorandum submitted by Tyndall Manchester, Sustainable Consumption Institute and Stockholm Environment Institute

Please find enclosed a submission by a selection of researchers from the Sustainable Consumption Institute and the Tyndall Centre, University of Manchester, and from the Stockholm Environment Institute, University of York. All views contained within are attributable to the authors and do not necessarily reflect those of researchers from the wider Sustainable Consumption Institute, Tyndall Centre, Stockholm Environment Institute or University of Manchester.

— Dr Elena Dawkins, Stockholm Environment Institute, University of York.

— Dr Ruth Wood, Sustainable Consumption Institute & Tyndall Centre, School of Mechanical, Civil and Aerospace Engineering, University of Manchester.

— Dr Alice Bows, Sustainable Consumption Institute, School of Mechanical, Civil and Aerospace Engineering, University of Manchester.

— Dr Mirjam Roeder, Sustainable Consumption Institute, School of Mechanical, Civil and Aerospace Engineering, University of Manchester.

— Dr Paul Gilbert, Tyndall Centre, School of Mechanical, Civil and Aerospace Engineering, University of Manchester.

— Dr Conor Walsh, Sustainable Consumption Institute and Tyndall Centre, School of Mechanical, Civil and Aerospace Engineering, University of Manchester.

Executive Summary

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

Analyses show UK GHG emissions measured on a consumption basis are consistently higher than those on a production basis. Furthermore, this gap is widening as consumption emissions are increasing, despite territorial emission reductions.

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?*

Whilst it is possible to develop a robust methodology for measuring emissions on a consumption basis, consumption-based accounts have a higher uncertainty than territorial accounts.

Current consumption-based emissions estimates use various different national and international economic and environmental datasets from a range of sources and these require data processing to combine into an appropriate framework. The necessary harmonization of differing datasets can generate uncertainties, developing a standardised harmonization and data validation and verification process is the main challenge.

The challenges presented by consumption-based accounting fall into two areas; the underlying challenges of the modelling approach in terms of complexity, time requirements or uncertainties; and the challenges posed by the data limitations and restrictions.

There are two main methodologies that are suitable for estimating consumption emissions at a national level; a multi regional input-output model (MRIO) and an "emissions embodied in trade" method. The results from these methods will vary depending on the model used, the underlying datasets and how the model is structured.

Peters (2008) highlights that calculating emissions embodied in trade is less complicated than developing global EEIO models (the multi-regional input-output approach), but only deals with bilateral trade flows at the country level and therefore not as suitable as MRIO for looking at the full supply chain impacts of the final consumer.

According to Wiedmann *et al* (2010), there are key challenges associated with MRIO including:

— collection of and access to environmental data at a high level of sectoral and source detail;

— sectoral detail of national accounts;

— country coverage; and

— the support of national and international statistical authorities and agencies who provide the input data.

Wiedmann *et al* (2010) note that whilst most of the major MRIO projects are supported through public funding and consequently made publically available, there is further scope for producing more open source data and increasing transparency of data transformations and assumptions made within the models and the reproducibility of the methods.

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

National perspective

Consumption-based emissions accounting provides a complementary perspective to production-based or territorial emissions accounts. It is particularly relevant linking trade and climate policy due to its inclusion of imports; a valuable indicator for countries where emissions mitigation targets are met domestically, but an increasing level of consumption continues by importing emissions intensive goods from elsewhere. This becomes even more relevant for climate change policy if those goods are imported from countries without any binding targets for emissions reductions themselves.

If a multi-regional input output (MRIO) method is used for consumption-based emissions accounting, it can be applied to any level of consumption because all supply chain emissions are allocated to the final consumer. This has the benefit of engaging individuals or communities in their personal contribution to emissions, and could be useful for mitigation efforts to change behaviours or practices domestically.[9] It can also demonstrate the different responsibilities for components of a carbon footprint; with the possibility to explore both the contribution of a producer or industry and the consumer (individually) or level of consumption (nationally). At the national scale, for higher level consumption emission inventories, methods such as emissions embodied in trade or time series with trade (Peters *et al*, 2011) would demonstrate the emissions associated with trade, which production-based accounts currently do not show.

Combining both production and consumption-based accounts is useful for climate change mitigation policy and decisions. Experience of organisations such as Stockholm Environment Institute (SEI) and the Sustainable Consumption Institute suggest that both consumption and production accounts should be maintained and published regularly as opposed to one or the other; especially as estimates for production-based emissions are required as an input to consumption-based accounts anyway.

Sector perspective

With particular reference to the agricultural sector, using both a consumption and production-based approach helps to classify the source and end-user of emissions. Production in some regions where demand is increasing is projected to be limited by climate change impacts and a greater number of countries may rely on a few main producers. With this outlook producers in the "favoured" regions need to maximise their yields and land-use efficiency to maintain global food supply. However, this will necessitate a higher use of agrochemicals, particularly nitrogenous fertilisers, increasing greenhouse gas emissions within those territories. The result of this may be a disincentive to increase production in these countries if the production-based accounting remains without being informed by the consumption-based approach. This would be counterproductive to global food security aims and poverty reduction.

With particular reference to the international transport sectors, under the producer-based approach, international shipping (and aviation) emissions are excluded, as the majority of emissions are released in international waters (and airspace). Nonetheless, the amount of bunker fuel sold by a nation is reported to the UNFCCC by Annex 1 nations as a memo item. This current method of reporting was described by the Environmental Audit Committee as being inadequate to represent the UK's actual share of international shipping emissions (EAC, 2009). By taking a consumption-based approach, the emissions released from international shipping (and aviation) would be automatically included in the emission accounts. The international shipping (and aviation) emissions would then constitute part of the embedded emissions that are released along the goods or services supply chain. It should be noted however, that shipping is not well represented in existing MRIO-related databases, and this would need to be addressed.

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

(a) Desirable

It would bring together climate policy and trade, which would tackle the common critique of production-based accounting for not including the emissions associated with imported goods. Under production-based targets the consumption of imports and their associated embedded emissions can continue to increase without any monitoring, but a consumption-based target would include these emissions.

The consumption approach can demonstrate the role that consumption plays in counteracting emissions mitigation efforts, if growing consumption outweighs the efficiency improvements domestically or from imports then this would be evident from the consumption-based accounts.

The consumption-based approach would mean the UK taking more responsibility globally for the emissions that are generated to support growing levels of domestic consumption. This would increase the share of global emissions over which the UK has influence, and therefore broaden its reach over the climate outcome of an increase in emissions (Bows and Barrett, 2010).

[9] See for example REAP Petite—a community footprint calculator: http://www.reap-petite.com/

(b) Practicable

Nationally, work would need to be done to collect and publish the necessary datasets more frequently in order to produce timely and robust consumption-based emissions estimates for regular accounting and monitoring. It may not be possible to use a full MRIO approach for measuring against targets as it is reliant on global trade data and models, which are not produced annually due to their data intensive production process. Alternative methods such as emissions embodied in trade (see Peters, 2008) or time series with trade (see Peters *et al*, 2011) could be used to generate annual consumption-based accounts, but this is also likely to require additional work to publish the necessary input datasets more regularly. As Peters, 2008 notes, MRIO is most useful for product or consumption specific studies and a method such as emissions embodied in trade would be more useful for national emissions inventories limited to bilateral trade flows. Solely consumption-based national emissions inventories would suffer from higher complexity and uncertainty and lower transparency than production-based accounts.

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

This is outside our sphere of research.

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?*

If the UK were to adopt consumption-based accounting alongside production-based accounting then this would demonstrate internationally that the UK is taking into account the emissions impacts arising from trade. If the model used to calculate the consumption-based emissions can provide the necessary detail then it could also be used to identify potential carbon leakage from countries with binding targets to those without, demonstrating the UK's understanding of the importance of making progress towards emissions reductions on a global scale.

If the UK adopted a solely consumption-based approach to emissions accounting then the UK would have to work closely with other countries to encourage mitigation efforts abroad to reduce the impact of any imported goods to the UK.

Detailed Consultation Response

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

Background

1.1 Production-based greenhouse gas (GHG) emissions accounts include the emissions released within a national territory. Exact inclusions or exclusions vary depending on the reporting framework, but in general they include GHGs released from burning fuel and chemical processes in industry or households (and sometimes removals) taking place within a national boundary. Consumption-based GHG emissions accounts include the emissions embedded along the supply chain of goods and services that people in a particular country consume, regardless of where those goods and services are produced and the emissions released. A significant difference between the two approaches is how they treat trade, with production-based accounts including emissions associated with goods and services for export, but excluding imports, and consumption-based accounts including imports, but allocating export emissions to their country of destination.

1.2 There have been a number of consumption emissions studies completed for the UK. Accounts, such as those produced by REAP (Resources and Energy Analysis Programme) at Stockholm Environment Institute (SEI), University of York, or those published in academic literature by J. C. Minx *et al* (2009), Druckman and Jackson (2009), Wiedmann *et al* (2010) and Peters *et al* (2011) have found that consumption-based emissions are consistently higher than production-based estimates. All of these models apply an environmentally extended input-output approach in some form to estimate the consumption-based emissions for the UK, but vary in the datasets and methods that they use (the differences between accounting methods are described in the following sections).

1.3 Examples of specific reports on consumption-based emissions accounts or calculations of emissions embodied in trade for other countries include: Munksgaard and Pedersen (2001)—Denmark; Machado, Schaeffer, and Worrell (2001)—Brazil; Peters and Hertwich (2006)—Norway; Bang *et al* (2008)—Europe; Yunfeng and Laike (2010)—China; Z M Chen and Chen (2011)—G7 and BRIC; Berglund (2011)—Sweden; Whilst this list is by no means exhaustive it gives an indication of the work internationally on consumption-based accounting. This list also excludes the larger projects such as EXIOPOL or OPEN:EU at the European level which have generated consumption-based accounts for a large number of countries simultaneously using environmentally extended multi-regional input-output models. These projects are also explained in more detail in the following sections.

Emissions Comparison

1.4 The REAP model generates consumption-based footprint estimates for the UK and disaggregates this data to local authority level. The data from REAP for 2006 are shown in Table 1 and compared to nationally published production-based GHG statistics for the same year. For each of the data sources the measure of GHGs includes the following pollutants: CO_2, CH_4 and N_2O and HFCs, PFCs and SF6. The production-based emissions accounts vary depending on the reporting requirements—with UNFCCC[10] data taken from Environmental Accounts, but excluding bunker fuels, CO_2 emissions from biomass, adjustments for tourism abroad and including crown dependencies and land use change.

Table 1

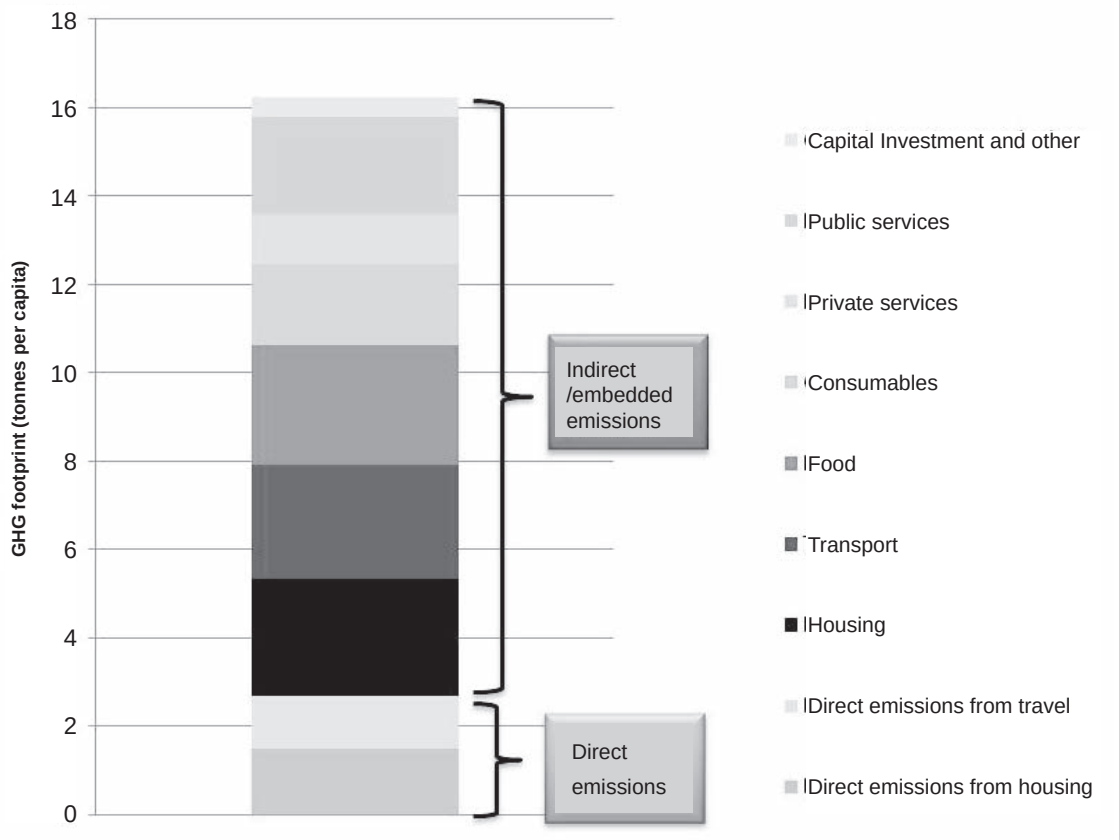
A COMPARISON OF EMISSIONS DATASETS

REAP Data 2006— ***Consumption Emissions***		*DECC archive of annual statistics[11] 2006—UNFCCC reported* ***Production Emissions***	*Office of National Statistics Environmental Accounts 2008—****Production Emissions***
Total Carbon Footprint (Mt CO_2)	Total GHG Footprint (Mt CO_2 eq)	Kyoto greenhouse gas basket, (Mt CO2 eq)	Greenhouse Gas, atmospheric emissions, 2006 (Mt CO2 eq)
733.08	983.94	652.3	724.46

Figure 1below shows the REAP breakdown of the GHG footprint by theme for 2006.

Figure 1

DIRECT AND INDIRECT EMISSIONS BREAKDOWN OF THE UK PER CAPITA FOOTPRINT, BY THEME, 2006



1.5 The REAP dataset also includes a time series of consumption-based emissions from 1992–2006, this is compared to UNFCCC reported figures for territorial emissions[12] from the same time period in Figure 2. This demonstrates the increasing difference between consumption and territorial emissions accounts over time.

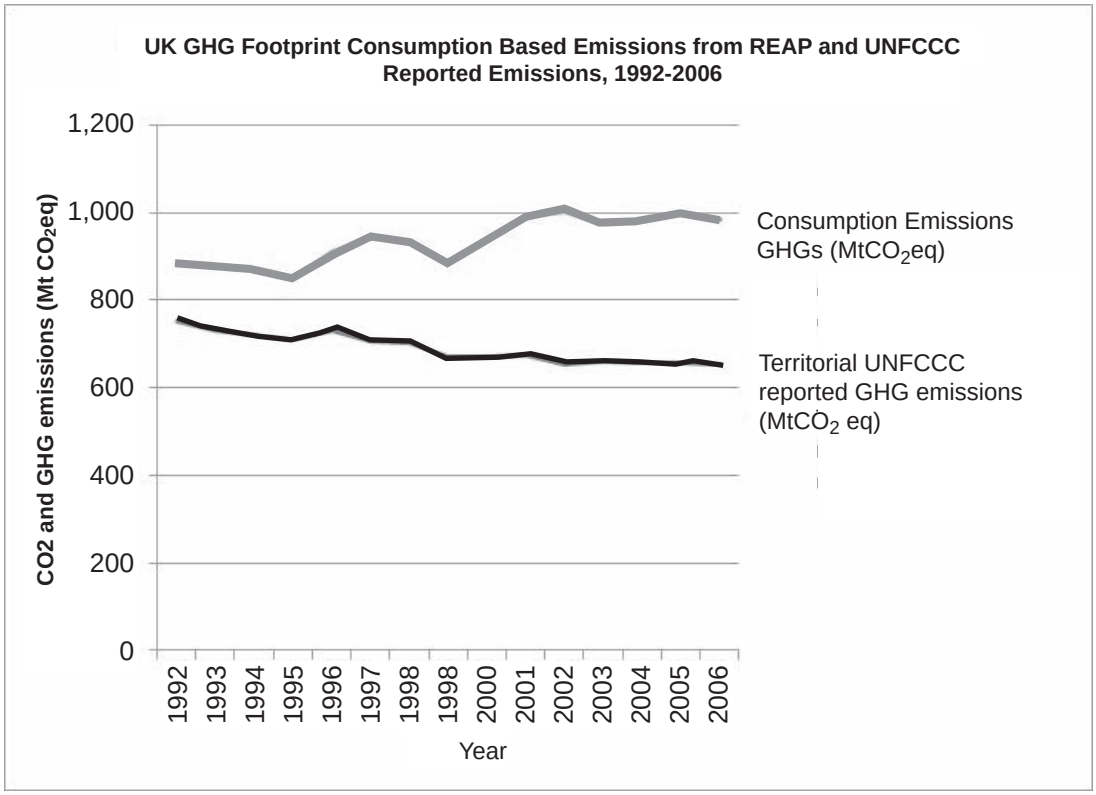
[10] United Nations Framework Convention on Climate Change.

[11] http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/archive/archive.aspx

[12] Taken from the Department of Energy and Climate Change (DECC): http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/archive/archive.aspx

Figure 2

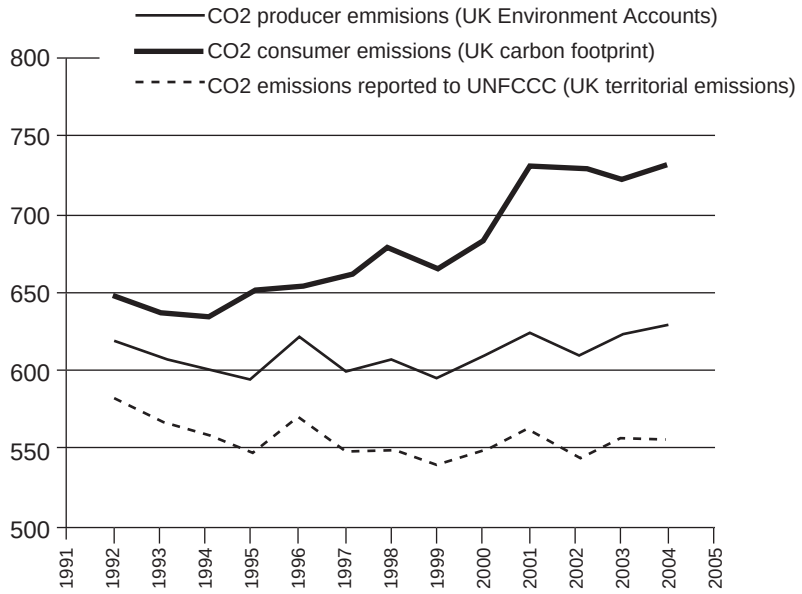
A TIME SERIES OF GHG CONSUMPTION EMISSIONS AND UNFCCC REPORTED EMISSIONS 1992–2006



1.6 Wiedmann *et al* (2010) has produced a time series consumption emissions dataset for CO_2 alone (Figure 2 shows both CO_2 and non-CO_2 greenhouse gases) from 1992–2004 and this is shown in Figure 3 below, with a comparison to production emissions from the UNFCCC submission and UK Environmental Accounts from the Office of National Statistics. This study also found that there has been an increase in UK consumer emissions over time and a widening gap between producer and consumer emissions. Net CO_2 emissions embedded in UK imports increased from 4.3% of producer emissions in 1992 to a maximum of 20% in 2002.

Figure 3

THE CO_2 EMISSIONS FROM 1992–2004 ACCORDING TO DIFFERENT ACCOUNTING PRINCIPLES (WIEDMANN *ET AL* 2010)



Note: the vertical scale does not start at zero.

1.7 Peters *et al* (2011) have also produced a time series of consumption-based emissions which, due to a difference in methodological approach (explained in more detail below) gives another set of consumption emission estimates for the UK. However, despite the differences in methodology and total values, the conclusions are similar to the studies mentioned above—with a widening gap between territorial and consumption emissions between 1990 and 2008 in the UK.

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 Whilst it is possible to develop a robust methodology for measuring emissions on a consumption basis, consumption-based accounts have a higher uncertainty than territorial accounts. As Peters (2008) states, "production-based inventories are much closer to the statistical source than consumption-based inventories and therefore have lower uncertainty". Consumption-based accounts generate an increased level of uncertainty from the reallocation of emissions from technologies to sectors and the inclusion of import data. In terms of challenges, these factors are inherent in the accounting approach, rather than a challenge to overcome.

2.2 Accepting the increased uncertainty of the consumption-based approach as a whole, the data availability and modelling approach used to calculate the emissions can also vary between studies, giving differing national consumption-based inventory results depending on the method employed.

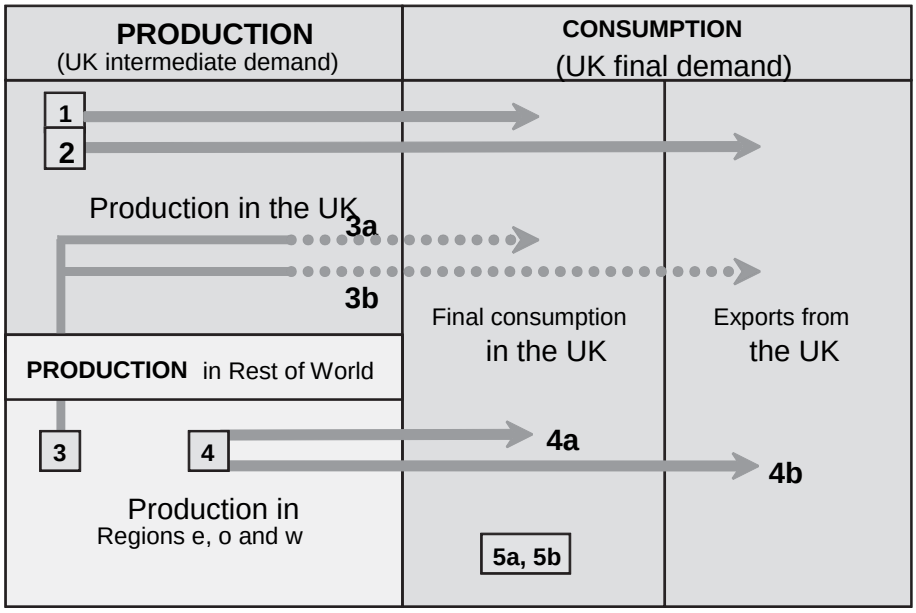
Background

2.3 The diagram in Figure 4, taken from Wiedmann *et al* (2010), shows the data requirements for consumption and production-based indicators. The exact numerical difference between territorial and emissions accounts depend on the methodology employed to estimate the emissions associated with each number in the diagram. To calculate the full supply chain emissions associated with consumption, carbon emitted during the production of goods or services must be reallocated from the point of release to the final product that is consumed. To do this the emissions associated with different goods and services must be tracked along supply chains, which are often complex involving numerous industries and processes. One method for tracking emissions along supply chains throughout an economy is environmentally-extended input-output (EEIO) analysis,[13] which is the method behind the data presented in response to question 1 above. EEIO is a form of life cycle analysis (LCA), but using a top-down macro-economic approach, as opposed to bottom-up or process LCA which looks at products individually.[14]

[13] Environmentally extended input-output (EEIO) analysis is well documented in the literature, see Miller and blair (2009).
[14] For a full guide to input-output analysis see Miller and Blair (2009); Leontief (1970); Leontief (1986).

Figure 4

EMISSIONS ACCOUNTING DIAGRAM BASED ON WIEDMANN *ET AL* (2010)



Arrows should be read as **"Emissions generated by** [*beginning of arrow*] **attributed to** [*end of arrow*]**"**

Territorial Emissions (production - based indicator): 1 + 2 + 5a + 5b

Consumer Emissions (consumption - based indicator): 1 + 3a + 4a + 5a + 5b

2.4 EEIO analysis uses a number of different national and international economic and environmental datasets from a range of sources and these require a certain level of data processing to combine into an EEIO framework. The necessary harmonization of differing datasets can generate uncertainties.

Modelling framework

Input-output tables

2.5 The economic input-output tables (IOTs) that represent the interactions between industries' (supply chains) are used as part of the EEIO framework and they can vary in level of industry detail and countries that they include. If symmetric input-output tables (SIOT) are not available for the year of interest then estimates have to be made based on economic supply and use tables (SUT).

2.6 To generate a full consumption account the framework must include emissions associated with traded goods (imports and exports). This data can be incorporated in a number of ways, with different methods producing different emissions results. Single region models would just represent the interactions between sectors in one country, with the assumption that any imported goods have the same emissions intensity as those produced domestically (domestic technology assumption).

2.7 Multi-region input-output (MRIO) models represent interactions between numbers of countries, including both international and domestic supply chains. EEIO models with different regions (total numbers and the actual countries included) will give different consumption emissions figures for the country of interest. In addition, the emissions datasets available for those regions and the data that describes how they interact with consumers and industry in the country of interest may also differ between models.

Input-output data sources

2.8 Across the world, modelling frameworks for consumption-based emissions accounting tend to use either nationally published input-output (IO) or "supply and use" tables combined with environmental accounts and import data in single region models with domestic technology assumptions, or MRIO models with larger numbers of regions, based on international datasets such as the Global Trade Analysis Programme[15] (GTAP) or EXIOPOL.[16] The consumption-based emissions estimates will be different depending on the IO tables and model used. In some cases, global models are used as a starting point and then aggregated to regions of interest; this again produces a variation in results.

2.9 Generating a global set of IO tables for use in MRIO requires considerable data processing and has become available through specific projects or work by individuals such as Hertwich and Peters (2010) for the

[15] https://www.gtap.agecon.purdue.edu/
[16] http://www.feem-project.net/exiopol/

One Planet Economy Network in the EU (OPEN:EU). The method for generating the environmentally-extended input-output model for 113 regions is described in the OPEN:EU technical document and is based on GTAP data which was converted to a full MRIO model.[17] The consumption account data for 45 countries (including the UK) will shortly be published in the EUREAPA tool which is an output of this project.[18]

2.10 Tukker *et al* (2009) document the steps they took for producing the EXIOPOL environmentally-extended MRIO model, firstly identifying the limitations with existing data sources and then presenting their method to overcome these and deliver the model. They noted that the current data sources at the time provided only supply and use tables and input-output tables for single countries, without trade links. In addition, the sectoral and product detail was limited and environmental extensions were either lacking or limited in scope. They stated that a key difficulty was the lack of harmonization of data across countries and this is one of the reasons that any MRIO modelling work will inevitably include data harmonization and manipulation. They conclude by stating that trade-linked tables are essential for analysing the effects of sustainability measures taken in Europe on Europe's economic competitiveness and, they believe that, from a theoretical viewpoint, the environmentally-extended MRIO approach is best way of taking trade into account. However, they also state that existing studies tend to be aggregated at sector and regional level and to focus on a fairly small number of environmental extensions.

2.11 Wiedmann *et al* (2010) identify five projects that have or are about to complete MRIO databases, with full trade matrices between all countries:

- The Asian International Input-Output Table by IDE/JETRO: symmetric input-output tables with nine Asian countries, plus the USA with 76 sectors.
- The Eora database by the University of Sydney: a global MRIO time series with 130 countries.
- The EU funded EXIOPOL database with supply and use tables for 27 EU countries and 16 non-EU countries and 130 sectors (as described above).
- GTAP data; covering 113 countries/world regions and 57 sectors. It does not include full trade matrices between all countries in the database itself, but can be converted to do so as completed for the OPEN:EU project described above.
- The World Input-Output Database Project (WIOD) from the University of Groningen which aims to create a time series of supply and use tables and symmetric IO tables from 1995–2006 for 27 EU countries and 13 other countries, with 35 industries and 59 product sectors.

Key uncertainties in EEIO modelling—challenges to overcome

2.12 Andrew, Peters, and Lennox (2009) use an MRIO model based on GTAP data to quantify the errors introduced by various approximations of the full MRIO model and found that the frequently used domestic technology assumption (DTA) inaccurately estimates the carbon footprint for many countries. The errors are due to globally unrepresentative emission intensities and/or production technologies. They recommend that when applying the DTA, domestic emission intensities should be carefully validated against global estimates, especially for commodities with large import volumes.

2.13 There are advantages of using a full MRIO model, but they also require a significant amount of data from a variety of sources, which raises the level of uncertainty of the consumption-based accounts which are calculated using this method. Several practical issues arise in the data manipulation phase for MRIO modelling and a number of assumptions must be made. These are discussed in more detail in Hertwich and Peters (2010), but in summary they are as follows:

- The trade interactions: Trade can be either uni-directional, where the domestic country trades with all countries or multi-directional where the domestic country trades with all countries and they trade between each other. Alternatively, imports could be assumed to be produced with the domestic production technology. This greatly reduces the data requirements, but may lead to large errors.
- Regional groupings: it may be necessary to aggregate some regions for data handling purposes or to fill in missing IO data for some areas.
- Trade flows to final demand and trade flows to industry data may not be available for all countries and therefore may have to be estimated.
- Exchange rate variation: models could use either Purchasing Power Parity or Market Exchange Rates, but some method must be used to run the model in a common currency.
- Inflation: the data for different countries is often available at different time periods, which means that adjustments must be made to the data to generate a base year. Methods such as the Consumer Prices Index are usually available in each country, but this can generate errors when applied on aggregate to sectors with different price changes and it can also vary depending on the base year and the method of indexing applied.

[17] http://www.oneplaneteconomynetwork.org/resources/programme-documents/WP1_MRIO_Technical_Document.pdf
[18] More details are available from: http://www.oneplaneteconomynetwork.org/eureapa.html

— Product or industry classifications: the matrices which hold the industry and final demand data for countries can be classified by products or industries, with industry emissions data usually classified by industry and final demand by product. Additional matrices are therefore usually required to map between the two classifications.

— Classification of IO data: this can vary between countries and the analysis requires mapping to a consistent classification system.

— Data aggregation: it is beneficial to keep sectoral data at the highest detail available to reduce errors, but to generate consistency across countries some aggregation of data is usually required.

— Valuation: IO data can come at different levels of valuation—basic, producer or purchasers (retail) prices. For consistency is it most appropriate to use the IO data in basic prices where possible, this often requires some translation of datasets from one form to another.

Generating a time series

2.14 The possibility of generating a consistent time series is limited by the data availability. For example, national symmetric input-output tables or analytical tables may not be produced annually. GTAP data is usually published every three or four years, with data available for 1997, 2001 and 2004.The environmental data available, particularly in the larger global models may also be inconsistent across countries and years. Additionally, many of the data manipulation issues mentioned above are relevant when attempting to generate a consistent time series of data.

Methods for incorporating trade data—comparing models

2.15 Despite the level of data manipulation required and the complexity of the approach, a number of studies have employed global MRIO models or national accounting frameworks for EEIO to calculate emissions associated with domestic consumption for different countries and the first section of this document demonstrates that they can draw similar conclusions. In order to gauge the extent to which the limitations, assumptions and uncertainties influence the overall consumption-based accounts it is useful to compare the results from different models and studies. SEI recently completed a comparison of consumption emissions for Sweden from three different EEIO studies, and found similar results across models.[19]

2.16 On a larger scale, Peters *et al* (2011) have explored the possible modelling variations and uncertainties by comparing the results from two different calculation methods using a global 113 world region EEIO model, producing data for 95 countries. They compare a method called emissions embodied in trade (EEBT) (Peters 2008) with multi-regional input-output analysis (MRIO) for three years (1997, 2001 and 2004) and use trade data to construct a time series of consumption emissions for 95 countries between 1990 and 2008 named time series with trade (TSTRD). All three methods (TSTRD, EEBT and MRIO) calculate the emissions embedded in supply chains to produce consumed goods and services, but EEBT and MRIO are more accurate and cover either domestic supply chains (EEBT) or global supply chains (MRIO). They note that the uncertainty of their modelling does increase as the results become more disaggregated, but the TSTRD method is still stable for countries and sectors.

2.17 Peters *et al* (2011) conclude that EEBT is more suitable for analysing bilateral trade and MRIO is more appropriate for studies at the sub-national level or comparisons of final consumption between countries. Neither method is right or wrong, but they allocate emissions differently and can answer different questions. The EEBT method correlates directly with bilateral trade statistics (in proportion to domestic emission intensity) and the MRIO method correlates directly with final consumption (in proportion to global emission intensity).

2.18 In terms of application, the inclusion of the full supply chain in the MRIO method makes it more appropriate for disaggregation to localities, because the supply chain emissions are allocated to the final consumer and can therefore be applied to any level of consumption. Other methods like the EEBT may not be as suitable for disaggregation as MRIO, but their reduced complexity and more readily available data make them more appropriate for national time series analysis (Peters *et al* 2011).

2.19 Whilst there can be variations in the models and data Wiedmann (2009) provides an overview of use of environmentally-extended input-output models across the world, highlighting that MRIO is a sound and relevant methodology for accounting for trade-related impacts from a consumption perspective:

> "The SKEP-ERA network of funding institutions in Europe initiated two projects in 2008 aimed at identifying and describing a suitable methodology to assess trans-national environmental impacts. The aim was to bring together existing knowledge and ongoing research on the assessment of global environmental impacts of traded goods and services, to review past and current accounting methodologies and to identify, specify and describe a suitable integrated approach. The project completed at the time of writing, EIPOT, came to the conclusion that multi-region input–output (MRIO) analysis is a sound and relevant methodology for accounting for trade-related impacts from a consumption perspective. Whilst MRIO cannot cover all policy and research questions in this area on its own, it forms a robust basis upon which more specific methods, using various forms of hybrid modelling, can be built (Wiedmann *et al* 2009)."

[19] For further details please contact the author—Elena Dawkins: elena.dawkins@sei-international.org

In this paper Wiedmann (2009) also assesses the literature and studies on the uncertainty of MRIO analysis, highlighting the general uncertainties associated with input-output modelling. He notes that both single region input-output analysis and multi-region input-output analysis will generate uncertainty from their source (survey) data, imputation and balancing, allocation, assuming proportionality and homogeneity, aggregation, temporal discrepancies, model inputs, and multipliers. Still, in his further paper (Wiedmann *et al* 2010) he emphasises that MRIO is emerging as a particularly comprehensive, versatile and compatible approach.

Overcoming Challenges

2.20 Some of the major methodological, data and computational challenges for producing EEIO models are mentioned above, but there are also more practical challenges such as costs, time commitments and timeliness of the publication of statistical data. The majority of the methodological and data challenges can or have been tackled across various research groups and published across the academic literature, with some studies exploring the levels of uncertainty in models and comparisons of the results from differing methods (see M Lenzen, Wood, and Wiedmann, 2010 and Peters *et al* 2011).

2.21 Wiedmann *et al* (2010) put forward a number of points for the requirements for MRIO development and research; better collection and access to environmental data; improved sectoral detail; limiting the data manipulations required to maintain the original data within models as far as possible; improving country coverage and the support of national and international statistical authorities and agencies who provide the input data. They note that whilst most of the major MRIO projects are supported through public funding and consequently made publically available there is further scope for producing more open source data and increasing transparency of data transformations and assumptions made within the models and the reproducibility of the methods. They also make suggestions for how to improve the infrastructure and implementation of MRIO research and how to deliver and use the results within policy making.

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

National perspective

3.1 Consumption-based emissions accounting provides an alternative and complementary perspective to production-based or territorial emissions accounts. It provides a different view of responsibility for emissions and can be useful to inform the policy debate on climate change mitigation. It is particularly relevant linking trade and climate policy due to its inclusion of imports; a valuable indicator for countries where emissions mitigation targets are met domestically, but consumption levels are maintained by importing emissions intensive goods from elsewhere. This becomes even more relevant for climate change policy if those goods are imported from countries without any binding targets for emissions reductions.

3.2 The MRIO method for consumption emissions accounting can be applied to any level of consumption because all supply chain emissions are allocated to the final consumer. This has the benefit of engaging individuals or communities in their personal contribution to emissions, and could be useful for mitigation efforts to change behaviours or practices domestically.[20] It can also demonstrate the different responsibilities for components of a carbon footprint; with the possibility to explore both the contribution of a producer or industry and the consumer (individually) or level of consumption (nationally).

3.3 There is a broad consensus in the academic literature that both production and consumption-based accounts are useful and relevant to climate change mitigation policy and decisions. Peters (2008) identifies the following benefits to generating a national consumption-based emissions inventory:

- eliminating carbon leakage through imports;
- covering more global emissions with limited participation;
- consistency between consumption and environmental impacts;
- increasing mitigation options; and
- making policies such as Clean Development Mechanism (CDM) a natural part of the inventory.

3.4 There are also potential disadvantages of taking a solely consumption-based approach to emissions accounting. Firstly, consumption accounts require more complex calculations and assumptions than production accounts, which increase the level of uncertainty. Secondly, it might result a loss of ownership and responsibility for production-based emissions domestically. This wouldn't be so much of a problem in countries where many of the goods produced domestically are consumed domestically, as this would appear in their consumption accounts. However, in those countries where export levels are high and consumption-based emissions remain comparatively small, the incentive to reduce emissions domestically might be lower than when they focus on reducing their production-based emissions.

3.5 In a paper on production and consumption-based emissions inventories Peters (2008) concludes that given the lower uncertainty, established reporting, consistency with political and environmental boundaries, and already wide-spread use, it is likely that production-based inventories will remain dominant. He then goes on to mention that consumption-based inventories provide considerable insight into climate policy and

[20] See for example REAP Petite—a community footprint calculator: http://www.reap-petite.com/

mitigation. Experience of organisations such as SEI and others suggests that both consumption and production accounts should be maintained and published regularly as opposed to one or the other; especially as producer-based emissions are required as an input to consumption-based accounts, prior to the reallocation along supply chains and inclusion of imports. There are also methods to weight production-based and consumption-based inventories together, which as mentioned by Peters (2008) could be useful for building on the shared-responsibility for climate change mitigation literature.

Sector specific

3.6 Research of the Sustainable Consumption Institute at the University of Manchester highlights the importance of incorporating both consumption and production-based accounts when considering emissions from agriculture and the food system (Roeder *et al* 2011). With increasing climate change impacts, agricultural production in some world regions is likely to be favoured while others might be significantly disadvantaged. This will be particularly challenging in regions with a high rise in demand for food and where production is projected to be limited by increasing temperatures. This may result in a greater number of countries relying on a few main producers.

3.7 With this in mind, producers in the less severely affected regions will need to maximise their yields and land-use efficiency to maintain global food supply. To facilitate this, a higher use of agrochemicals, particularly nitrogenous fertilisers is likely to be necessary. This will in turn increase the greenhouse gas burden associated with increased nitrogen fertiliser production and usage, resulting in substantial increases in the national emissions inventory in key producer countries under the existing accounting framework. This could be a disincentive to increase production in these countries and as a result counterproductive to improving global food security and poverty reduction. Using both a consumption and production-based approach would help to classify the source and end-user of emissions and allow production for export in favourable regions without penalising them for increasing their emission to support global food consumption.

3.8 With particular reference to the international transport sectors, under the producer-based greenhouse gas emissions accounting, international shipping (and aviation) emissions are currently excluded, as the majority of emissions are released in international waters (and airspace). Nonetheless, the amount of bunker fuel sold by a nation is reported to the UNFCCC by Annex 1 nations as a memo item. This current method of reporting was described by the Environmental Audit Committee as being inadequate to represent the UK's actual share of international shipping emissions (EAC, 2009). By taking a consumption-based approach, the emissions released from international shipping (and aviation) would be automatically included in the emission accounts. The international shipping (and aviation) emissions would then constitute part of the embedded emissions that are released along the goods or services supply chain.

3.9 In the absence of a global agreement to control the release of greenhouse gas emissions from international shipping or aviation, the consumption-based approach would place responsibility on the consumer to monitor and mitigate its share of shipping emissions over time (Gilbert *et al*, 2010). It should be noted however, that shipping is not well represented in existing MRIO-related databases, and this would need to be addressed.

3.10 To report international shipping emissions under a consumption-based approach would require a clearly defined methodology. The main practicality issue is devising the methodology to apportion the emissions released on a shipping journey between the different consumer's goods or services that are being shipped. This would be most problematic for containerised vessels and vessels that call at multiple ports. However, if the shipping journey was to facilitate the movement of a single good or service, such as coal, then the emissions of that journey would be reported as part of its embedded supply chain emissions.

3.11 Given the island-nature of the UK and increasing demand for consumer goods produced in geographically disparate regions, the use of consumption-based reporting approach could increase the UK's share of international shipping emissions from an estimated 7 $MtCO_2$ to 42 $MtCO_2$ (Gilbert *et al*, 2010). These numbers assume that the current reporting approach is the amount of bunker fuel sold by the UK and the consumption-based estimate involves a top-down emissions accounting approach based on the total goods imported into the UK.

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

4.1 This is outside our sphere of research.

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

(a) Desirable

5.1 The desirable effects would be the UK taking more responsibility globally for the emissions that are generated to support growing levels of domestic consumption. This would increase the share of global emissions over which the UK has influence, and therefore broaden its reach over the climate outcome of an increase in emissions (Bows and Barrett, 2010).

5.2 It could give priority to both decarbonising industry domestically and the avoidance of carbon emissions generated in the supply of goods and services being transferred abroad. It would bring together climate policy and trade, which would tackle the common critique of production-based accounting for not including the emissions associated with imported goods. Under only production-based targets, the consumption of imports and their associated embedded emissions can continue to increase without any monitoring, but a consumption-based target would include these emissions.

5.3 The consumption approach can demonstrate the role that consumption plays in counteracting emissions mitigation efforts, if growing consumption outweighs the efficiency improvements domestically or from imports then this would be evident from the consumption-based accounts. Consumption-based accounts can be used alongside other indicators to consider alternative mitigation options with a more global focus, along with a new perspective for sharing of climate change mitigation commitments and responsibilities across the world.

(b) Practicable

5.4 This can be separated into two parts; whether it is practical to generate the accounts in a consistent manner appropriate for measuring against targets and whether it would be practical or possible to meet any targets set on a consumption basis.

5.5 The sections above detail the methods available for generating the accounts and whether this would be considered a robust method for targeting is dependent to some extent on the method chosen and the data and financial provision for generating and maintaining consumption-based accounts. Nationally, work would need to be done to collect and publish the necessary datasets more frequently in order to produce timely and robust consumption-based emissions estimates for regular accounting and monitoring. It may not be possible to use a full MRIO approach for measuring against targets as it is reliant on global trade data and models, which are not produced annually due to their data intensive production process. Alternative methods such as emissions embodied in trade (see Peters, 2008) or time series with trade (see Peters *et al*, 2011) could be used to generate annual consumption-based accounts, but this is also likely to require additional work to publish the necessary input datasets more regularly. As Peters, 2008 notes, MRIO is most useful for product or consumption specific studies and a method such as emissions embodied in trade would be more useful for national emissions inventories limited to bilateral trade flows. Solely consumption-based national emissions inventories would suffer from higher complexity and uncertainty and lower transparency than production-based accounts.

5.4 In terms of meeting targets the UK would not have political jurisdiction over all the regions that contribute to its emissions targets in a consumption-based account, as the accounts would include emissions occurring during the production of imported goods and services anywhere in the world. Targets would have to take trade into consideration and in order to meet any targets it may be necessary to take measures to either reduce consumption from certain emission-intensive countries or to help deliver and encourage emissions reductions within those countries. The political economy of climate mitigation may shift to reflect the new accounting approach, but practically, due to the global nature of supply chains and the aggregate nature of the models and accounts, it may be difficult to identify specific countries, or industries within those countries, to target for mitigation efforts. In addition, the time lag between the publication of underlying data and the publication of consumption-based accounts would also make monitoring the account against national targets more difficult.

5.5 Peters (2008) notes that a number of authors have argued that production-based and consumption-based inventories represent two extremes and it would be beneficial to generate a method for shared-responsibility. A number of proposals such as Greenhouse Development Rights framework, Baer *et al* (2008)[21] advocate a type of shared responsibility for mitigation between consumers and producers and Peters (2008) extends the shared responsibility concept specifically to production-based and consumption-based national emissions inventories.

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 If the UK were to adopt consumption-based accounting alongside production-based accounting then this would demonstrate internationally that the UK is taking into account the emissions impacts arising from trade. If the model used to calculate the consumption-based emissions can provide the necessary detail then it could also be used to identify potential carbon leakage from countries with binding targets to those without, demonstrating the UK's understanding of the importance of making progress towards emissions reductions on a global scale.

6.2 If the UK adopted a solely consumption-based approach to emissions accounting then the UK would have to work closely with other countries to encourage mitigation efforts abroad to reduce the impact of any imported goods to the UK. However, if successful, it would gain greater influence over future climate impacts than is currently the case.

[21] http://www.sei-us.org/projects/id/124 and http://gdrights.org/

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

7.1 Consumption-type approaches can also take a more bottom-up perspective and consider the life-cycle emissions of products consumed. In the example below, the consumption of beef is used to highlight how current production-based emission inventories may significantly underestimate the full greenhouse gas impact of beef consumption.

7.2 The 2008 UK emission inventory report estimates that 353.33 Gg of methane are released by the non-dairy cattle herd through enteric fermentation (McCarthy *et al* 2010). To illustrate how even just the direct component of emissions (ie excluding emissions associated with feed for cattle) would change if applying a consumption-type framework, a simple method from Walsh *et al* (2009) can be used. Within this method, the methane embodied in traded beef commodities is required. This can be estimated by considering the direct enteric fermentation emissions throughout each cow's lifetime associated with the total amount of meat product traded. Including the imports of traded beef, but excluding exports leads to a national consumption-based estimate of 437.32 Gg CH_4—an increase of 24% compared with the existing production-based emission. This is particularly significant given methane's global warming potential of 25, effectively increasing the production-based estimate by over 2099 Gg CO_2 eq. (Conor Walsh).

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Memorandum submitted by Aldersgate Group

The Energy and Climate Change (ECC) Committee is launching an inquiry to investigate the case for consumption-based greenhouse gas (GHG) emissions reporting in the UK. The Committee has invited responses addressing some or all of the following questions:

- How do assessments of the UK's GHG 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 GHG 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 GHG emissions accounting?
- Are there any other issues relating to consumption-based emissions reporting that you think the Committee should be aware of?

Aldersgate Group (AG)

The AG is an alliance of leaders from business, politics and society that drives action for a sustainable economy. The views expressed in this document can only be attributed to the AG and not individual members. The AG held a roundtable in October 2011 with business representatives to help inform our response to this inquiry.

Summary

Assessment and Methodologies

- A number of studies demonstrate that the UK's consumption emissions are significantly higher than its production emissions and this gap is likely to grow considerably.
- Potentially, the UK could import as much carbon as it produces by 2025.
- The lack of confidence in the data gathered for consumption-based emissions reporting (CBER) from some external sources is a major cause for concern.

Benefits and Disadvantages

- The AG believes that more transparency for the UK's full carbon footprint is required for a system of domestic carbon budgets effectively to address an international challenge such as climate change.
- The UK should be a pioneer in CBER—in line with the UK's aspiration to be an international leader in addressing climate change.
- The AG believes it is too early to mandate scope 3 reporting at either a national or business level. However, it should be strongly encouraged to help drive good decision making with better and more sustainable outcomes.
- A roadmap for scope 3 emissions reporting should be as follows:
    1. Start measuring it, engage suppliers and identify "hot spots".
    2. Use it to make better procurement decisions.
    3. Use it to improve performance and/or implement better policy.
    4. Ultimately report metrics, targets, actions and achievements.

International Implications

- A consumption-based approach would put greater responsibility on an increasingly service-based economy such as the UK to help developing countries reduce their GHG emissions. It would also emphasise the importance of securing a just international climate change treaty.

— A further implication is that international targets for carbon emission reductions would have to be renegotiated.

Carbon Leakage

— To date, there is no evidence of industry relocating from the UK solely as a result of climate change policy.

— While, in a limited number of industries, carbon costs can be significant and must be addressed by policy makers, often they are exaggerated and the potential economic benefits ignored.

— When most businesses decide on a production location, environmental costs tend to be low relative to considerations of the cost of capital, fiscal regime, wage costs, workforce skills, exchange rate fluctuations, infrastructure and proximity to the market.

— The Committee on Climate Change should investigate issues and methodologies relating to CBER in their upcoming inquiry into carbon leakage.

Business Implications

— Similarly to national reporting, the AG believes that there should be greater focus on lifecycle reporting at the corporate level.

— Full lifecycle analysis in targeted sectors will allow policy makers and consumers to focus on a "magic metric"—a metric associated with the biggest impact across the full value chain. This single piece of data would help to galvanise legislation to create a level playing field that promotes strong competition and innovation to redesign products to reduce their environmental footprint.

— This would lead to more informed decisions, help to eliminate greenwash and should be used to shape legislation.

— For example, carbon transparency in the automotive sector is measured on a product basis (which focuses on tailpipe emissions, where there is the greatest carbon impact) rather than at the company level (operations and manufacturing).

— CBER should not be undertaken solely as an accounting exercise but seek to drive transformative change.

AG Response

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

1. The UK formally reports its GHG emission and carbon budgets on a production basis, as consistent with the Intergovernmental Panel on Climate Change (IPCC). It does not take into account the emissions that are generated through the consumption of goods and services that have been imported from overseas. On the other hand, it does take into account the emissions from goods and services that are produced domestically but exported elsewhere.

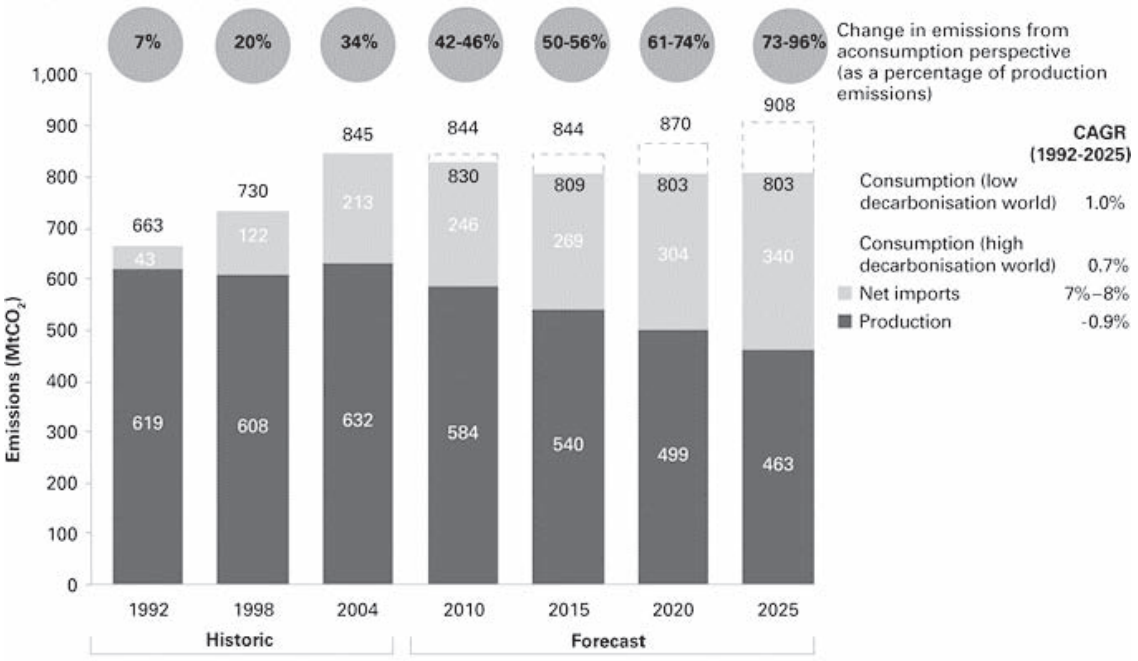
2. A number of studies demonstrate that the UK's consumption emissions are significantly higher than its production emissions. If carbon emissions are calculated on the basis of consumption rather than production (allowing and adjusted for carbon intensive imports and international travel), the UK's performance on carbon emissions between 1990 and 2005 is transformed from a 19% reduction to a 15% increase.[22] Research by the Carnegie Institute of Washington in California finds that UK demand for imported goods is responsible for more GHG emissions abroad than any other European country, and is third worldwide, behind only the US and Japan.[23]

3. What is more, it is highly likely that a growing proportion of the UK's carbon footprint will be imported from oversees as production emissions fall due to domestic climate change policies. Research by the Carbon Trust demonstrates that in 1992, the UK imported an additional net 7% emissions embodied in trade; by 2004, this had grown to 34%. Net UK imports of emissions are projected to continue to grow to 73—96% of production emissions by 2025, the range depending on the carbon intensity of production in other countries, and the anticipated reduction in the UK's production emissions from 2004 to 2025. This will result in the UK potentially importing as much carbon as it produces at home by around 2025, making imported carbon a significant issue.[24]

[22] Dieter Helm, Jonathon Phillips and Robin Smale (2007) *Too good to be true? The UK's climate change record.*

[23] Carnegie Institute of Washington (March 2010). *Reported in the Guardian: UK import emissions are the highest in Europe, figures show (8th March 2010).*

[24] http://www.carbontrust.co.uk/policy-legislation/international-carbon-flows/global-flows/pages/uk.aspx#7



Note 1: Declining UK production emissions based on CO_2 reduction involved in UK achieving 2020 carbon budget for CO_2e reduction of 34% vs 1990 levels (Committee on Climate Change).
Note 2: Growth in imported emissions based on continuation of historic growth in UK trade balance, and varying degrees of decarbonisation in the exporting countries. In the "high world decarbonisation" scenario it is assumed that the emissions intensity of exports from Brazil, Russia, India and China (BRIC nations) declines in line with the targets noted in the Copenhagen Accord (2009), that exports from the EU and other Annex 1 nations decline in line with the EU's target to reduce emissions by 20% from 1990-2020, and that exports from the rest of the world achieve decarbonisation of the order of half that achieve in the BRIC countries. In the "low decarbonisation" scenario it is assumed that the EU hits its targets as stated in the "high decarbonisation scenario", that all other Annex 1 nations and the BRIC nations achieve half the level of decarbonisation as in the "high decarbonisation" scenario, and that the rest of the world does not decarbonise at all.
Source: Carbon Trust Analysis.

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?

4. The lack of confidence in the data gathered for CBER from some external sources is a major cause for caution. GHG emissions generated within the UK are measured by recognised methods, but imported emissions are derived using less robust methods; for example the Global Trade Analysis Project (GTAP) Database data is provided by academics and trade associations on a voluntary basis and is based on a number of approximations.

5. Defra has commissioned research, updated in May 2011, that provides analysis of where GHG emissions associated with UK consumption occur by both sector and country. This traces the embedded GHG emissions of 57 product groups for 2004 across 113 countries and 57 sectors.[25] While this is helpful to inform cost effective climate change mitigation actions and policy development, the data is not sufficiently robust to measure accurately and set targets at this stage.

6. The data analysed for the Defra report is high level: UK exports are excluded, imports and supply chain data taken into account but only by raw products (such as iron, steel, rice, etc). Consumer products (such as a washing machine or hairdryer) are not broken down into their individual components, as this would require lifecycle analysis for each and every product. This level of complexity would be a major barrier to the adoption of full CBER.

7. The Defra report also notes, that "there are a number of uncertainties associated to the GTAP database and to the construction of MRIO models in general. These are related to a number of issues, like manipulation due to calibration, balancing and harmonisation, use of different time periods, currencies, country classifications and levels of disaggregation, inflation, data errors, among others."[26]

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

8. To date, there is no evidence of industry relocating from the UK solely as a result of climate policy. The Government is committed to ensuring that energy intensive industries remain competitive and ensuring that it sends a clear message that the UK is open for business. Before the end of the year, it will announce a package of measures for the energy intensive businesses whose international competitiveness is most affected by our

[25] Sustainability Research Institute, University of Leeds (May 2011) *UK Consumption Emissions by Sector and Origin.*
[26] Ibid.

energy and climate change policies. This is in response to a number of competitive concerns that have been raised from energy intensive industries, such as the potential risk of carbon leakage.

9. While, in a limited number of industries, these costs can be significant and must be addressed, often they are exaggerated and the potential economic benefits ignored. For example, analysis by the Carbon Trust is the "nail in the coffin for the myth that the EU ETS presents a threat to overall business competitiveness", as it finds that carbon costs remain trivial compared to other influences on international competitiveness for more than 90% of UK manufacturing activities.[27] When businesses decide on a production location, environmental costs tend to be low relative to considerations of the cost of capital, fiscal regime, wage costs, workforce skills, exchange rate fluctuations, infrastructure and proximity to the market. Another Carbon Trust study finds that low carbon manufacturing would be severely weakened if all sectors currently deemed at risk of carbon leakage by the European Commission received free allocation of permits.[28]

10. Climate legislation should be globally consistent to counter the risk of carbon leakage, or a "carbon shift". It is evident that the point of production of iron and steel has shifted considerably to developing countries but this has been mainly due to a response to demand shift and cheaper labour.

11. For example, China produces 626 million tonnes of steel per year, compared to the UK's 9.7 million,[29] so production-based targets in the UK or EU ETS can have little impact on the global emissions of the steel sector. While there are a number of challenges to country averages for CBER (such as the disparity of the carbon footprint of steel manufactured from an electric arc furnace or integrated by refining iron ore), more transparency would help to highlight some interesting issues such as the carbon benefits of local recycling.

12. It is welcome that the Committee on Climate Change is launching an inquiry into carbon leakage and competitiveness that is due to report by March 2012. As part of this inquiry, the Committee should investigate issues relating to CBER and examine appropriate methodologies that the UK should adopt.

What are the benefits and disadvantages associated with taking a consumption-based rather than production-based approach to GHG emissions accounting? Would it be (a) desirable and (b) practicable for the UK to adopt emissions reduction targets on a consumption rather than production basis?

13. The AG believes that more transparency about the UK's full carbon footprint is required for a system of domestic carbon budgets to address an international challenge such as climate change effectively. As such, much greater focus needs to be placed on interventions that prompt awareness and action along the supply chain.

14. While moving towards CBER is a laudable goal, it should complement rather than replace production based reporting (even were the data to become more robust). Defra's work in this area provides valuable analysis of carbon emissions from an alternative perspective but should not be used as stand-alone data. AG members are generally of the view that CBER data will be sufficiently robust in 10–15 years time and the UK would be well placed to be a pioneer—in line with the UK's aspiration to be an international leader in addressing climate change.

15. The AG believes it is too early to mandate scope 3 reporting at either a national or business level. However, it should be strongly encouraged to help drive good decision making with better and more sustainable outcomes.

A roadmap for scope 3 emissions reporting should be as follows:

1. Start measuring it, engage suppliers and identify "hot spots".
2. Use it to make better procurement decisions.
3. Use it to improve performance and/or implement better policy.
4. Ultimately report metrics, targets, actions and achievements.

What are the potential implications at the international level of the UK adopting a consumption rather than production-based approach to GHG emissions accounting?

16. A consumption-based approach would put greater responsibility on an increasingly service-based economy such as the UK to help developing countries reduce their GHG emissions. It also emphasises the importance of securing a just international climate change treaty. A further implication is that international targets for carbon emission reductions would have to be renegotiated.

[27] Carbon Trust (January 2008) *Press Release: EU ETS to have marginal impact on competitiveness of EU industry.*
[28] Carbon Trust (March 2010) *Tackling carbon leakage: Sector-specific solutions for a world of unequal carbon prices.*
[29] EEF (2011) *Key Statistics*, p14. http://www.eef.org.uk/eef1/handlers/resource.ashx?http://www.eef.org.uk/NR/rdonlyres/C2F00A49-B277–4015–9EEB-74E3051721D0/19061/KeyStatistics2012.pdf

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

17. While this inquiry is focused on national reporting, the adoption of CBER would have significant implications for businesses. Much like national reporting, companies can report approximations using economic input/output models, or more accurately using lifecycle assessments (which is much more resource intensive to undertake).

18. The Defra carbon reporting guidance for large organisations defines scope 3 emissions as those "that are a consequence of your actions, which occur at sources which you do not own or control and which are not classed as scope 2 emissions. Examples of scope 3 emissions are business travel by means not owned or controlled by your organisation, waste disposal, or purchased materials or fuels."[30]

19. While the guidance states that reporting scopes 1 and 2 emissions is "recommended", it suggests that reporting scope 3 emissions is "discretionary". It states that "for some organisations, emissions within scope 3 may be the largest proportion of total emissions. By calculating your scope 3 emissions, you will get a more complete understanding of your organisation's total impact on climate change. Identifying your organisation's scope 3 emissions will also help increase your awareness of where your organisation sits within the supply chain and enable you to engage with other organisations in the supply chain. However it is acknowledged that it can be difficult to measure and calculate your scope 3 emissions so it is recommended you focus on your "significant" scope 3 emissions."

20. Just as with national reporting, the AG believes that there should be greater focus on lifecycle reporting at the corporate level. For certain businesses, such as those with narrower procurement ranges and operational control of key points in the value chain, this could improve transparency and focus attention towards the greatest impacts rather than solely direct emissions (scopes 1 and 2).

21. A typical product contains a large number of components and materials that are sourced from different locations. There are environmental impacts at each stage of the supply chain, including manufacture, use and disposal. Lifecycle assessment (LCA) to a defined international standard (such as ISO14040 and ISO14044) helps to assess environmental impacts associated with all the stages of a product's life and helps to avoid a narrow outlook.

22. According to the European Commission, "the key aim of Life Cycle Thinking is to avoid 'burden shifting'. This means minimising impacts at one stage of the lifecycle, or in a geographic region, or in a particular impact category, while helping to avoid increases elsewhere. For example, saving energy during the use phase of a product, while not increasing the amount of material needed to provide it."[31]

23. There are some immediate business benefits associated with LCA. For example, according to the Government's Business Link website:

> "If you are serious about reducing the environmental impact of your business, it's essential that you work in close partnership with your suppliers to ensure that they maintain their own high environmental standards. As a supplier, you should also help your customers to meet their environmental targets.[32]
>
> There can be significant cost benefits from being environmentally aware. Reducing energy consumption, raw materials, waste production and waste disposal can all have a major impact on the profit your business makes. By working together with other organisations in your supply chain you can help to ensure that you each operate efficiently and keep your impact on the environment to a minimum."[33]

24. More fundamentally, a shift to full transparency of sustainability performance on a product basis in targeted sectors will allow policy makers and consumers to differentiate products and services in terms of the highest impacts, allowing for more informed decisions and helping to shape behaviour. In many sectors, there should be a focus on a "magic metric"—a metric associated with the biggest impact across the full value chain. This single piece of data would help to galvanise legislation to create a level playing field that promotes strong competition and innovation to redesign products to reduce their environmental footprint. This would help to drive cost-effective emissions reductions and help to eliminate greenwash by reducing the ability of companies to cherry pick the most flattering data. Good quality reporting at a product level also allows legislation to be introduced, which could drive the process more effectively than customer engagement.

25. For example, one of the most significant areas of progress in terms of UK carbon abatement is energy efficiency of cars. New car emissions were 144 gCO_2/km in 2010, compared to an indicator of 156 gCO_2/km and a 2020 indicator (and EU target) of 95 gCO_2/km[34]. In this sector, carbon transparency is measured on a product basis (which focuses on tailpipe emissions,- the "magic metric") rather than at the company level (operations and manufacturing). This allows for market frameworks and regulation to be more effective (such

[30] Defra (September 2009) *Guidance on how to measure and report your GHG emissions.*
[31] http://lct.jrc.ec.europa.eu/
[32] ??????????
[33] http://www.businesslink.gov.uk/bdotg/action/layer?r.i=1079442450&r.l1=1079068363&r.l2=1086021866&r.l3=1079438684&r.t=RESOURCES&topicId=1082899564
[34] Committee on Climate Change (June 2011) *Progress Report.*

as the EU regulation, company tax bands and congestion charging) and ensures greater transparency for consumers who can differentiate between different cars on carbon performance and associated running costs.

26. The following lessons can be learned from this example:[35]

- Develop a common metric based on the full life cycle impact of a product—or at least on its biggest impact.
- Adopt a top-down visionary approach at European level for the performance required in a few years time (or federal level if in the US).
- Regulate to ensure the metric is displayed on all promotional materials.
- Make sure the metric is visible to consumers at point of sale.
- Use national taxes and regulations to reinforce changes brought about by the metric.
- Enable local and city legislation and taxes to reward products with the lowest footprint.
- Encourage companies and public purchasers to make decisions that promote products with smaller footprints.

27. Full product transparency will not be suitable for all products and sectors due to complexity and costs (for example, it would not be feasible for a supermarket to undertake LCAs for all their products). However, more progress should be made in targeted sectors such as energy generation (with labels demonstrating carbon content), transport (including emissions per passenger per km in aviation industry), commercial buildings (Display Energy Certificates) and the services sector (such as banks and law firms).

28. While product footprints are vital in helping a business understand the environmental impacts of its supply chain, it can be complex to make comparisons between competitors across a whole product. While there can be issues surrounding accuracy and a high margin of error regarding assumptions, reporting of scope 3 emissions should be strongly encouraged. Product category rules, such as those drawn up by Defra, can be used to help make informed assumptions, while an industry body can ensure continuity in how those assumptions are made. Fundamentally, a business's goal should be to establish a benchmark and assess performance against it, rather than trying to calculate the minutiae.

29. While CBER is important to demonstrate quantitatively climate change impacts, it should not be undertaken solely as an accounting excise that does not help to drive change. CBER should primarily aim to reduce overall GHG emissions radically by re-designing products and systems or helping drive customer demand for lower emission goods and services. The key leverage is that many products are designed in the West and manufactured by developing countries. Decisions at product design level by a UK product manager could dramatically cut imported GHG emissions (and more importantly, the rest of the world). That design would immediately become a key service that the UK could develop expertise, export and drive competitive advantage by investing in technological breakthroughs.

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[35] InterfaceFlor (November 2011) Transparency in Action: The power of the magic metric.

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