



**THE BARE NECESSITIES: HOW MUCH HOUSEHOLD  
CARBON DO WE REALLY NEED?**

by

**Angela Druckman and Tim Jackson**

**RESOLVE Working Paper 05-09 (revised)**



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**Abstract**

The consumption patterns of Western nations are generally deemed to be unsustainable. Yet there is little attempt to restrain either material throughput or income growth. Nonetheless, in the face of the need to make 'deep' cuts in carbon emissions (for instance), consumption restraint may be a perfectly legitimate response. This paper explores the potential for a Reduced Consumption Scenario in the UK constructed by assuming that households achieve a specific 'minimum income standard' which is deemed to provide a decent life for each household type. The minimum income standards are taken from a recent study for the Joseph Rowntree Foundation and include not only subsistence commodities such as food, warmth and shelter but also the means to participate effectively in society. The Joseph Rowntree Foundation study produced detailed household expenditure budgets for these income standards. The paper uses an environmentally extended quasi-multi-regional input-output model to estimate the greenhouse gases (GHG) emissions required in the production and distribution of all goods and services purchased according to these budgets. Our results show that average household GHG emissions in the UK would be around 37% lower in the Reduced Consumption Scenario than they are currently. We explore several implications of these findings including: the need to change social norms around consumption, the need for investment to improve the thermal performance of homes and the need to develop new transport infrastructures. We also address the potential to reduce emissions below the level achieved in this Scenario and discuss the implications for policy.

**Keywords:** Carbon footprint; Well-being; Lifestyles; Environmental Input-Output; Recession; Scenario.

## Introduction

The underlying premise in this paper is that the consumption patterns that characterise Western societies are unsustainable, both in terms of the resources they require and the emissions they generate. In particular, policy-makers are now struggling to find ways to shift society to lower carbon modes of living. Some believe that technological change will deliver a lower carbon future. Undoubtedly technology will be part of the solution. But it is also clear that this will not be sufficient on its own (HM Government 2005). Behaviours and lifestyles will also need to change (Defra 2008; Jackson 2008; Jackson and Papathanasopoulou 2008; Reay 2006). It is possible that we may even need to restrain consumption levels in richer nations if 'deep' cuts in carbon emissions such as those projected by the Intergovernmental Panel on Climate Change (IPCC) are to be achieved (IPCC 2007).

A key requirement for the success of any such strategy is to ensure that people are still able to live a 'decent' life. That requirement includes people's capabilities not only to provide food and shelter for themselves and their families but also to participate effectively in the life of society (Bradshaw et al. 2008; Jackson 2009; Sen 1984; Townsend 1979).

Accordingly, this paper explores the potential for a Reduced Consumption Scenario in the UK that could deliver this goal. The study builds on some work carried out for the Joseph Rowntree Foundation (JRF) to establish the basket of expenditures deemed necessary to enjoy a decent life (Bradshaw et al. 2008). The goal of the JRF study was to define an acceptable 'minimum income standard' needed to achieve this goal. The study defined a minimum acceptable standard of living to include *'more than just, food, clothes and shelter. It is about having what you need in order to have the opportunities and choices necessary to participate in society.'* (Bradshaw et al. 2008: p1).

This definition is in line with a growing body of research that emphasises the importance of social relations in peoples' ability to flourish (Jackson 2009; Sen 1984; Townsend 1979). Once material needs are met, peoples' ability to flourish is correlated to their *"ability to give and receive love, to enjoy the respect of [their] peers, to contribute useful work, and to have a sense of belonging and trust in the community* (Jackson 2009). The JRF study builds in particular on Townsend's (1979) seminal work on poverty in the UK in which he postulated that incomes and expenditures are not a good guide to poverty. His argument was that poverty is structural: it is produced by the organisation of society rather than by individual failings, and that rather than using monetary measures, poverty should be measured in terms of relative deprivation. Moreover, he theorised poverty not simply in terms of having enough to satisfy material needs for survival, but in terms of the ability to participate in social activities and to have living standards comparable to current norms.

The JRF budgets were drawn up through consensual discussions among ordinary people, informed at successive stages by feedback from experts (Bradshaw et al.

2008). This process established expenditure budgets for 2008 for a variety of different types of representative households in the UK (such as couple parents with two children, and single pensioner households). In accordance with their definition, the budgets provide for more than simply adequate warmth, food and shelter: they include significant resources to “*participate in society and maintain dignity*” (ibid). They do, however, seek to exclude items that may be regarded as “*‘aspirational’ – it is about fulfilling needs and not wants*” (ibid).

In this study, we use the expenditure budgets defined by the JRF work as a basis to answer the following question: what level of GHG emissions are required to support an acceptable standard of living in the UK? To answer this question we estimated the GHGs produced both in the UK and abroad during the production and distribution of all the goods and services purchased by UK households according to the minimum income standard defined by the JRF expenditure budgets. The results from this modelling exercise form our ‘Reduced Consumption Scenario’ which therefore gives us an indication of how much of the carbon that is used in our current consumer lifestyle is necessary for a ‘decent’ life, and how much may be thought of as “discretionary” and could potentially be eliminated.

Of course, the viability of such a shift rests to a certain extent on how acceptable lifestyles in the Reduced Consumption Scenario are deemed to be. It also depends on our ability to shift the infrastructures and systems of provision needed to provide a decent life. In our discussion we explore these questions further. In particular, we explore briefly the extent to which social norms may already have shifted in favour of restraint as a result of the current recession.

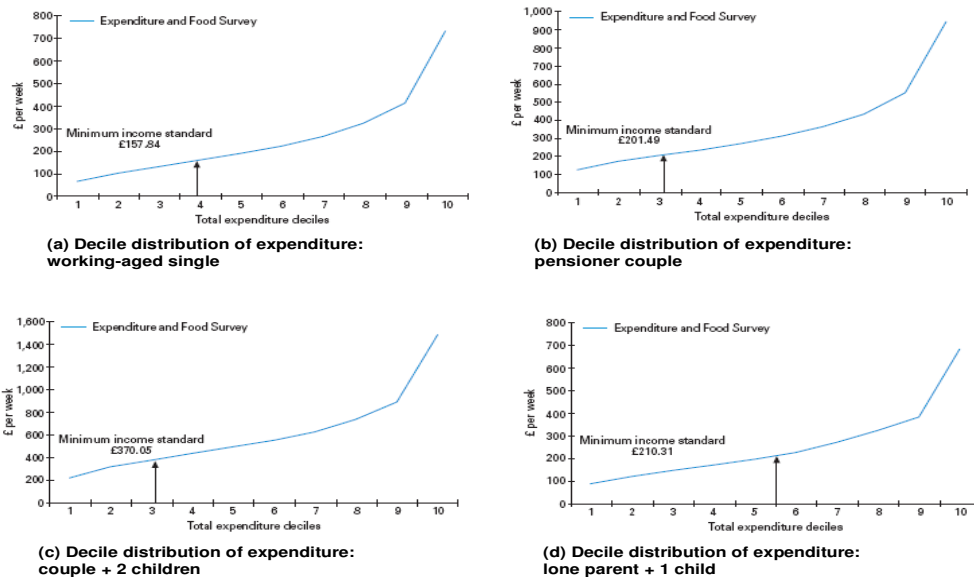
The organisation of this paper is as follows. In the next section we describe briefly the JRF budgets, set out what is included and excluded in them, and compare them to current expenditure levels. Section 3 describes the methodology used to estimate the GHG emissions that would arise in the production and distribution of all the goods and services purchased in the Reduced Consumption Scenario. Section 4 presents the results of the modelling exercise. In Section 5 we address the question of what lifestyles may be like in the Reduced Consumption Scenario, and explore some anecdotal evidence from the current recession in support of the idea that norms of consumption can change in favour of restraint. In Section 6 we summarise what can be learnt from the Reduced Consumption Scenario study and discuss its implications in the context of UK GHG reduction targets.

## **1. A Reduced Consumption Scenario for the UK**

The JRF study produced highly detailed weekly expenditure budgets for eleven types of households. This was done by blending two methodologies that have previously been used to develop budget standards in Britain (Bradshaw et al. 2008). The first is the Family Budget Unit (FBU) approach developed at the University of York. This approach uses documented guidance (such as heating and nutrition standards), expert opinion (for example dieticians) and statistics (concerning, for

example, product lifespans and expenditures) to determine items to be included in the budgets (ibid). The second methodology is the Consensual Budget Standards (CBS) method developed by the Centre for Research and Social Policy at Loughborough University. This is similar to the FBU approach but involves ordinary people instead of panels of experts, and it is a derivative of focus group methodology (ibid). As noted above, Bradshaw et al's 2008 report on the JRF study summarises the resultant methodology used in drawing up the budgets as "holding 'consensual' discussions among ordinary people ...informed at successive stages by feedback from experts" (ibid page 3).

The expenditures determined by the budgets are summarised in Table 1. Figure 1 compares the levels of expenditure in the Reduced Consumption Scenario against estimated expenditures as reported in the Expenditure and Food Survey (EFS)<sup>1</sup>, excluding housing and childcare. This shows that amongst single people of working age about two thirds of families spend more according to the EFS than in the Reduced Consumption Scenario. Similarly, among pensioner couples and couples with two children about three quarters spend more. However, among lone parents over half of families spend less. This indicates that some family types are, in monetary terms, better off on average in the Reduced Consumption Scenario than they are in reality today (Bradshaw et al. 2008).



**Fig. 1:** Comparison of Reduced Consumption Scenario expenditures against the distribution of expenditure as reported in the Expenditure and Food Survey. Source: Bradshaw et al (2008).

<sup>1</sup> In order to undertake this comparison Bradshaw et al (2008) merged five years of data from the from the Expenditure and Food Survey (EFS) (2001/2 – 2005/6) with each year's data being uprated to April 2008 using the commodity price index.

**Table 1: JRF expenditure budgets (summary).** Source Bradshaw et al (2008) and ONS (various years)

	Weekly Expenditure (£)											Reduced Consumption Scenario Mean	Mean UK (actual) <sup>1</sup>
	A	B	C	D	E	F	G	H	I	J	K		
	Single pensioner	Couple Pensioners	Single working age	Couple working age	Single parent, 1 child	Single parent, 2 children	Single parent, 3 children	Couple parents, 1 child	Couple parents, 2 children	Couple parents, 3 children	Couple parents, 4 children		
<b>A food and non-alcoholic beverages</b>	<b>35.98</b>	<b>53.25</b>	<b>40.34</b>	<b>69.30</b>	<b>47.05</b>	<b>65.71</b>	<b>85.72</b>	<b>68.79</b>	<b>97.47</b>	<b>105.09</b>	<b>122.09</b>	<b>60.80</b>	<b>70.50</b>
A1 food	29.73	47.13	28.60	50.33	41.54	59.08	76.40	63.69	90.74	96.12	113.12	51.04	47.84
A2 catering	6.24	6.12	11.74	18.97	5.51	6.63	9.32	5.10	6.73	8.97	8.97	9.75	22.66
<b>B alcohol and tobacco</b>	<b>3.00</b>	<b>7.40</b>	<b>4.38</b>	<b>13.86</b>	<b>3.48</b>	<b>3.48</b>	<b>3.48</b>	<b>6.06</b>	<b>6.06</b>	<b>6.06</b>	<b>6.06</b>	<b>6.74</b>	<b>19.33</b>
B1 alcohol	3.00	7.40	4.38	13.86	3.48	3.48	3.48	6.06	6.06	6.06	6.06	6.74	14.94
B1A alcohol at home	2.64	6.53	4.38	9.39	3.04	3.04	3.04	6.06	6.06	6.06	6.06	5.65	6.66
B1B alcohol away from home	0.36	0.87	0.00	4.46	0.45	0.45	0.45	0.00	0.00	0.00	0.00	1.08	8.28
B2 tobacco and narcotics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.39
<b>C clothing and footwear</b>	<b>4.91</b>	<b>9.93</b>	<b>7.64</b>	<b>15.36</b>	<b>16.41</b>	<b>24.76</b>	<b>38.79</b>	<b>20.92</b>	<b>29.26</b>	<b>43.30</b>	<b>48.64</b>	<b>15.55</b>	<b>23.12</b>
<b>D housing costs</b>	<b>32.13</b>	<b>39.21</b>	<b>31.12</b>	<b>39.35</b>	<b>43.47</b>	<b>45.08</b>	<b>45.67</b>	<b>52.48</b>	<b>33.43</b>	<b>59.15</b>	<b>54.47</b>	<b>40.83</b>	<b>20.67</b>
D2 mortgage interest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D3 water	4.71	5.56	4.71	5.56	7.38	7.76	8.24	7.38	5.45	8.24	8.24	5.70	6.86
D5 household insurances	1.61	1.65	1.79	1.65	1.99	2.23	2.14	2.21	2.23	2.47	2.47	1.86	13.69
D6 fuel	9.63	10.62	9.00	9.95	16.43	17.67	17.74	17.29	18.49	18.86	19.90	12.45	15.45
D7 other housing costs	2.85	3.61	2.29	4.42	2.12	1.87	2.00	4.86	7.26	8.86	3.13	4.02	39.29
<b>E household goods and services</b>	<b>14.69</b>	<b>20.20</b>	<b>19.48</b>	<b>19.66</b>	<b>158.14</b>	<b>215.20</b>	<b>223.31</b>	<b>160.61</b>	<b>217.58</b>	<b>227.86</b>	<b>296.78</b>	<b>78.04</b>	<b>47.65</b>
E1 household goods	9.65	11.12	9.50	10.70	16.37	18.01	23.56	15.84	17.39	23.94	27.04	12.81	28.00
E2 household services	5.04	9.07	9.99	8.96	141.77	197.19	199.76	144.77	200.19	203.92	269.74	65.23	19.65
E2A communication	5.04	9.07	9.99	8.96	6.72	6.72	9.29	9.73	9.73	13.45	13.45	8.68	10.90
E2A1 postage	0.81	0.69	0.35	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.46
E2A2 telephone	4.23	8.38	9.64	8.24	6.72	6.72	9.29	9.73	9.73	13.45	13.45	8.25	10.44
E2B childcare	0.00	0.00	0.00	0.00	135.05	190.47	190.47	135.05	190.47	190.47	256.28	55.83	2.08
E2C other household services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	6.67
<b>F personal goods and services (inc health)</b>	<b>10.72</b>	<b>23.65</b>	<b>8.40</b>	<b>15.43</b>	<b>19.47</b>	<b>20.46</b>	<b>26.92</b>	<b>25.89</b>	<b>27.39</b>	<b>33.71</b>	<b>44.31</b>	<b>18.17</b>	<b>17.34</b>
<b>G transport</b>	<b>4.65</b>	<b>4.65</b>	<b>17.03</b>	<b>21.58</b>	<b>17.16</b>	<b>24.97</b>	<b>36.16</b>	<b>26.16</b>	<b>35.02</b>	<b>46.01</b>	<b>47.18</b>	<b>18.87</b>	<b>60.07</b>
G1 motoring expenditure	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.20
G2 Fares and other travel costs	4.65	4.65	17.03	21.58	17.16	24.97	36.16	26.16	35.02	46.01	47.18	18.87	7.88
<b>H Social and cultural participation</b>	<b>25.91</b>	<b>43.21</b>	<b>29.73</b>	<b>50.49</b>	<b>40.16</b>	<b>70.01</b>	<b>106.87</b>	<b>60.78</b>	<b>90.08</b>	<b>131.49</b>	<b>141.46</b>	<b>51.92</b>	<b>73.22</b>
H1 leisure goods	9.35	12.82	13.68	21.04	10.62	24.55	43.74	12.40	25.23	45.57	51.08	17.56	27.20
H2 pets	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.21
H3 entertainment and recreation	10.00	20.00	10.49	20.98	19.87	33.75	48.52	36.37	50.25	65.02	69.29	24.65	12.45
H4 TV licence and rental	2.70	2.70	2.67	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	5.58
H5 foreign holidays	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.32
H6 UK holidays	3.85	7.69	2.88	5.77	6.98	9.00	11.90	9.30	11.90	18.19	18.38	7.01	2.41
<b>Education Fees</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>7.04</b>
<b>TOTAL (excluding council tax and rent)</b>	<b>118.66</b>	<b>183.72</b>	<b>144.79</b>	<b>227.26</b>	<b>329.80</b>	<b>454.12</b>	<b>551.37</b>	<b>400.96</b>	<b>536.30</b>	<b>631.96</b>	<b>740.25</b>	<b>274.11</b>	<b>331.89</b>
Council tax	13.33	17.77	13.33	17.77	15.55	15.55	15.55	20.73	20.73	20.73	20.73		
<b>TOTAL (including council tax and excluding rent)</b>	<b>131.98</b>	<b>201.49</b>	<b>158.12</b>	<b>245.03</b>	<b>345.35</b>	<b>469.67</b>	<b>566.92</b>	<b>421.69</b>	<b>557.03</b>	<b>652.69</b>	<b>760.98</b>		
Rent	52.30	64.43	52.30	64.43	64.07	69.40	75.25	64.07	69.40	75.25	75.25		
<b>TOTAL (including council tax and rent)<sup>2</sup></b>	<b>184.28</b>	<b>265.92</b>	<b>210.42</b>	<b>309.46</b>	<b>409.42</b>	<b>539.07</b>	<b>642.17</b>	<b>485.76</b>	<b>626.43</b>	<b>727.94</b>	<b>836.23</b>		

<sup>1</sup> This is based on mean values from Table A1 of the Expenditure and Food Surveys 2004-5, 2005-6 and 2006-7, adjusted to 2008 prices using the Consumer Price Index.<sup>2</sup> The Single Working Age value differs from that quoted in Bradshaw et al (2008) of £210.14. From examination of their underlying figures the discrepancy is assumed to be due to a typing error in their report.



Each budget contains hundreds of costed items and allowances for activities and services purchased by each household type. 90% of items were costed at national chain stores such as Tesco and Argos. For non-food items the lifetime of each object was estimated (taking account of its quality and type of usage) and its cost was spread over its estimated lifetime. The budgets provide generous allowances for childcare (for example, £135.05 per week for a lone parent with one child).

The budgets give precise details of all expenditure items. Food menus were checked by a nutritionist to ensure they met current government guidelines for healthy eating. An example of the weekly meat allocation for a lone parent with one child (toddler) is: 150g stewing steak; 400g beef mince; 62g bacon; 128g pork sausages; 175g chicken breasts; and 34g cooked chicken. All budgets contained some alcohol, the majority to be consumed in the home. For example a couple with one child is allocated 4 cans of Fosters' lager; 4 cans of Thwaites' Draught; and one bottle of Chilean white wine per week.

A car was deemed unnecessary for the minimum standard of living to be met, and each budget includes a weekly bus pass for each household member (except for pensioners and small children who travel free). All budgets also included provision for taxi hire, to cover specific trips such as weekly supermarket visits, late night journeys, or emergency hospital visits. Each budget contained a one-week budget holiday in the UK.

The household fuel use estimated in the budgets was calculated at the level necessary to "*maintain health and well being of the householders and the fabric of the home*" (Oldfield 2008). Table 2 shows the type of dwelling in which each family type is assumed to reside, and its prescribed heating regime. Each household type is assumed to occupy a dwelling that is closely matched to its family size. It should be noted that this is not currently the reality in the UK, where many households, even those on low incomes, and especially pensioners, have an extra bedroom above the number specified in Table 2.

The heating regimes are based on World Health Organisation guidelines (Oldfield 2008). Average fuel use and costs were estimated using the Building Research Establishment Domestic Energy Model (BREDEM 12) (Anderson et al. 2002; Oldfield 2008). It was assumed that cavity wall insulation, loft insulation<sup>2</sup> and double glazing were installed in each dwelling. Again, it should be pointed out that this differs from the reality today. This assumption, alongside the close fit of family size to number of bedrooms, resulted in the estimated household fuel consumption of each household type being below actual expenditure as shown in the Expenditure and Food Surveys for equivalent households (Oldfield 2008).

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<sup>2</sup> The depth of loft insulation installed is not stated.

**Table 2:** Housing specifications and heating regimes. Source Oldfield (2008)

Family type	Dwelling and heating description
Single male, female	1-bed mid terrace ground floor flat, heating period 9 hours day, at 20°C.
Couple with no children	2-bed ground floor flat, heating 6 hours day, 12 at weekends, at 21°C
Single pensioner	1-bed mid terrace ground floor flat, heating 21°C 16 hours a day.
Couple pensioner	2-bed ground floor flat, heating period 16 hours day, at 21°C.
Lone parent one (toddler) child Couple one (toddler) child	2-bed end terrace house, heating period 16 hours day, at 21°C.
Lone parent or couple two children, pre-school, primary school	3-bed mid terrace, heating period 16 hours day, at 21°C. (pre school child in family)
Lone parent or couple three children, pre-school, primary school, secondary school.	4 bed house, heating period 16 hours day, at 21°C. (pre school child in family)
Couple four children, toddler, pre-school, primary school, secondary school.	4 bed house, heating period 16 hours day, at 21°C. (pre school child in family)

The minimum standard of living budgets are for ‘average’ households in Britain, and it is acknowledged by the authors that actual budgets would, of course, vary. For example, many rural dwellings are not connected to the gas mains, and in rural locations transport may be less convenient and reliable, and also more expensive. Furthermore, additional travel expenses or clothes for work are not included.

## 2. Methodology

The broad thrust of our analysis was to use the Surrey Environmental Lifestyle Mapping (SELMA) framework (Druckman and Jackson 2008; Druckman and Jackson 2009a; Druckman and Jackson 2009b) to estimate the GHG emissions<sup>3</sup> that would arise in the production and distribution of all the goods and services required to fulfil the Reduced Consumption Scenario. SELMA accounts for GHGs from the ‘consumption perspective’. This perspective is based on the premise that it is this demand for goods and services which drives the production processes that consume resources (including energy resources) and emit pollutants (including carbon dioxide and other greenhouse gases) (Daly 1996; Daly and Cobb 1989; HM Government 2005; UN 2002; UNCED 1992). The technique used for accounting from the consumption perspective is Environmental Input-Output (EIO) analysis, and equation 1 is the fundamental EIO equation.

$$\mathbf{c} = \mathbf{u}'(\mathbf{I} - \mathbf{A})^{-1}\mathbf{y} \quad (1)$$

where

<sup>3</sup> In this paper “GHG emissions” refers to a basket of six GHGs: Carbon dioxide, methane, nitrous oxide, hydro-fluorocarbons, perfluorocarbons and sulphur hexafluoride.

$\mathbf{c}$  is the vector of GHG emissions attributable to final demand expenditure;

$\mathbf{u}$  is the vector of GHG emissions intensity;  $\mathbf{u}'$  is the transpose;

$\mathbf{I}$  is an identity matrix;

$\mathbf{A}$  is the matrix of technology coefficients.  $(\mathbf{I}-\mathbf{A})^{-1}$  is known as the 'Leontief Inverse' matrix;

$\mathbf{y}$  is a diagonalised vector of final demand expenditure.

Equation 1 applies to a closed economy (in other words, an economy that has no imports or exports). The UK is, however, a relatively open economy and therefore it is important, when accounting from the consumption perspective, to take trade into account. This is done by extending equation 1 to enable imports to be accounted for. We apply a Quasi-Multi-Regional Input-Output (QMRIO) model which groups all the countries from which the UK receives imports into 12 world regions based on those used by Wilting (2008). In this model each region is characterised by a vector of GHG emissions intensities that reflects the industry of that region while the UK Leontief inverse matrix is used to model the industry structure of all regions. The QMRIO model is defined by equations 2 to 4<sup>4</sup>.

$$\mathbf{c}^P = \mathbf{u}'(\mathbf{I}-\mathbf{A})^{-1}\hat{\mathbf{y}}^{11} \quad (2)$$

$$\mathbf{c}^Q = \sum_{n=2}^{n=13} \left( \hat{\mathbf{u}}^{n1} \mathbf{u}' \right)' (\mathbf{I}-\mathbf{A})^{-1} (\mathbf{P}^{n1} \cdot \mathbf{B}^{imp}) (\mathbf{I}-\mathbf{A})^{-1} \hat{\mathbf{y}}^{11} \quad (3)$$

$$\mathbf{c}^R = \sum_{n=2}^{n=13} \left( \hat{\mathbf{u}}^{n1} \mathbf{u}' \right)' (\mathbf{I}-\mathbf{A})^{-1} \hat{\mathbf{y}}^{imp} \hat{\mathbf{p}}^{n1} \quad (4)$$

where

$\mathbf{c}^P$  are the GHGs associated with the flow P of goods produced in the UK to meet final demand in the UK;

$\mathbf{c}^Q$  are the GHGs associated with the flow of goods produced in the 12 non-UK world regions to meet intermediate demand in the UK for goods destined for final demand in the UK;

$\mathbf{c}^R$  are the GHGs associated with the flow of goods produced in the 12 non-UK world regions to meet UK final demand;

$\mathbf{u}^{n1}$  is the vector of the relative intensity of CO<sub>2</sub> coefficients for region  $n$  compared to region 1 (the UK);

$\mathbf{y}^{11}$  is the vector of final demand for commodities produced and consumed in region 1 (the UK);

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<sup>4</sup> Details of the derivation of equations 2-4 are given in Druckman (2008).

$\mathbf{y}^{\text{imp}}$  is the vector of final demand for commodities produced in the 12 non-UK world regions and consumed in the UK;

$\mathbf{p}^{n1}$  is the vector of the proportion of imports from region  $n$  to region 1;

$\mathbf{P}^{n1}$  is a square matrix formed by replicating vector  $\mathbf{p}^{n1}$ ;

$\mathbf{B}^{\text{imp}}$  is the Imports Use Matrix for imports to the UK from the 12 non-UK world regions..

These equations<sup>4</sup> describe the emissions embedded in goods and services purchased by UK final demand, to which we need to add direct emissions caused by fuel used directly by households, such as gas for heating and cooking and personal transport fuels. These are obtained from the Environmental Accounts (ONS 2008). Further details of SELMA's methodology and data sources are described in Druckman and Jackson (2008) and (2009a).

In this study we ran the QMRIO model within SELMA twelve times with different vectors of final demand: once for each of the household types identified in Table 1, and once for UK mean household final demand in 2004.

It should be noted that 2004 is the latest year for which sufficient data to run the QMRIO model are available, whereas the JRF study provided expenditure data for 2008. As a result some preparation was required before the JRF data could be used. In the first place expenditures were deflated to 2004 prices based on ONS (2009). We also considered the possibility of 'scaling' the JRF expenditures to reflect the fact that society moved on between 2004 and 2008. Specifically, the impacts of this are most likely to be that the budget requirements for a decent life were lower in 2004 than they were by 2008. On the other hand, estimating the extent of this change is inherently difficult, so we have chosen to assume that the requirements for a decent life changed only marginally over the period. It should be noted that this assumption is likely to overestimate the GHG emissions associated with the Reduced Consumption Scenario by comparison with the actual emissions in 2004.

A further preparation step was required because the QMRIO model requires expenditures in Standard Industrial Classification (SIC) categories and the JRF budgets were provided in COICOP<sup>5</sup> categories. Therefore the JRF expenditures were converted from COICOP into SIC categories using the proportionality method described in Druckman and Jackson (2008).

The JRF expenditures were then checked to be compatible and consistent with the other data sources used SELMA. The JRF report includes council tax payments: these are categorised as local government in the National Accounts and therefore, to achieve consistency, council tax payments were excluded from this study. As stated

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<sup>5</sup> Classification of Individual Consumption According to Purpose (UN 2005).

above, the JRF budgets allocate a relatively high amount of expenditure to childcare. Modelling them in SELMA would assume that the majority of the childcare takes place outside the home<sup>6</sup>, as the model would pick up all the GHGs associated with running nurseries and so on. However, examination of the heating regime for households with children (Table 2) shows that heating is switched on for 16 hours per day in these households<sup>7</sup>. This implies that childcare takes place within the home, and that the childcare payments listed are for nannies looking after children in the family home. We therefore exclude childcare payments in this study, as inclusion and allocation according to the Supply and Use Tables would over-estimate GHG emissions.

Once the GHG emissions for each type of household had been estimated, total emissions in the Reduced Consumption Scenario were estimated by grossing up emissions for each household type on the basis of the proportion of UK households represented by each type in the UK as shown in Table 3<sup>8</sup>.

**Table 3:** Distribution of minimum acceptable standard of living budget family types. Source: Bradshaw et al (2008)

	<b>Family Type</b>	<b>% of total UK households</b>
A	Single pensioner	16.4
B	Couple pensioner	12.2
C	Single working age	16.0
D	Couple working age	18.4
E	Single parent, 1 child	3.7
F	Single parent, 2 children	2.8
G	Single parent, 3 children	0.9
H	Couple parents, 1 child	8.0
I	Couple parents, 2 children	11.2
J	Couple parents, 3 children	3.5
K	Couple parents, 4 children	0.9
	Other <sup>9</sup>	6.0
	<b>Total</b>	<b>100</b>

In our analysis of household consumption we are interested in exploring the uses for which households emit GHGs. For this purpose the format of the results from the QMRIO model are not ideal, being in Standard Industrial Classification (SIC). We therefore convert them to COICOP which gives uses in twelve high level functional use categories. As our focus is on GHG emissions we separate out two categories of

<sup>6</sup> In the COICOP categorisation childcare expenditure is allocated to Social Protection. For use in the QMRIO model this has to be allocated to SIC categories. This is done on the basis of allocations published in the 'Households final consumption expenditure by COICOP heading' table in the Supply and Use Tables (ONS 2006). According to this, Social Protection is allocated mainly to SIC categories Social Work Activities (51%) and Health and Veterinary Services (25%). These allocations would not be ideal.

<sup>7</sup> We assume that on average the heating regime in these households would be 'on' for 16 hours during waking hours and 'off' for 8 hours during the night.

<sup>8</sup> It was assumed that N. Ireland has same distribution of types of households as Britain.

<sup>9</sup> 'Other' was ignored and the percentage of household types A-K re-scaled accordingly.

direct energy use (Electricity<sup>10</sup>, gas and other fuels; and Personal transportation fuels), making altogether 14 categories of GHG emissions as shown in Table 4.

**Table 4:** Extended COICOP categories used in this study

COICOP Category	Description
1	Food & non-alcoholic drink
2	Alcoholic drinks, tobacco, narcotics
3	Clothing & footwear
4.4.1	Electricity, gas and other fuels
4.1 - 4.3	Housing
5	Household goods & services
6	Health
7.2.2.1-2	Personal transport fuels
Remainder of 7	Other transport
8	Communication
9	Recreation & culture
10	Education
11	Restaurants & hotels
12	Miscellaneous goods & services

There are some important assumptions and limitations inherent in this methodology. These mainly arise from limitations in the data on which the QMRIO model is built. These limitations are discussed in detail elsewhere (Druckman and Jackson (2008), Druckman et al (2008)) and are therefore not repeated here. It should be said that, although the limitations are considerable, comparison of the results of SELMA with those from other studies (which largely share many of the same limitations) is favourable.

### 3. GHG emissions in the Reduced Consumption Scenario

Emissions in the Reduced Consumption Scenario are 37% lower than the actual consumption-based emissions in the UK in 2004. Figure 2 shows that in the Reduced Consumption Scenario the average household footprint is 16tCO<sub>2</sub>-e as compared to actual (historical) consumption-based emissions of 26tCO<sub>2</sub>-e

Comparison of specific categories shows that, as use of personal motor vehicles is not deemed necessary in the Reduced Consumption Scenario, emissions due to personal transportation fuels are zero whereas in reality 2004 UK mean personal transportation emissions were 2.6tCO<sub>2</sub>-e, or 10% of the total. In the Reduced Consumption Scenario holidays are assumed to be taken in the UK, eliminating

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<sup>10</sup> In fact electricity is not strictly a direct energy, as energy is generated at power stations while electricity is itself just an energy carrier. It is, however, included in this category as this is how it is commonly perceived by consumers, and it is subject to household decisions concerning its use and savings in a similar manner to gas.

aviation emissions<sup>11</sup> which were responsible for around 5% of UK household emissions in 2004 (Druckman and Jackson 2009a). Emissions due to Electricity, gas and other fuels are shown to be reduced by 45% in the Reduced Consumption Scenario. This is achieved mainly through the assumed higher standard of thermal insulation of dwellings in the Scenario along with the tight fit of dwelling size to number of inhabitants, as described earlier. Other categories of expenditure that are reduced by moving to the scenario are: Restaurants and hotels (69%); Miscellaneous goods and services (68%); and Household goods and services (60%). These categories represent largely discretionary purchases which are reduced in the Reduced Consumption Scenario. The only category that shows an increase is Food and non-alcoholic drink, and this reflects the diet chosen, which was nutritionally checked by a nutritionists and has higher fruit and vegetable content than average 2004 UK diets.

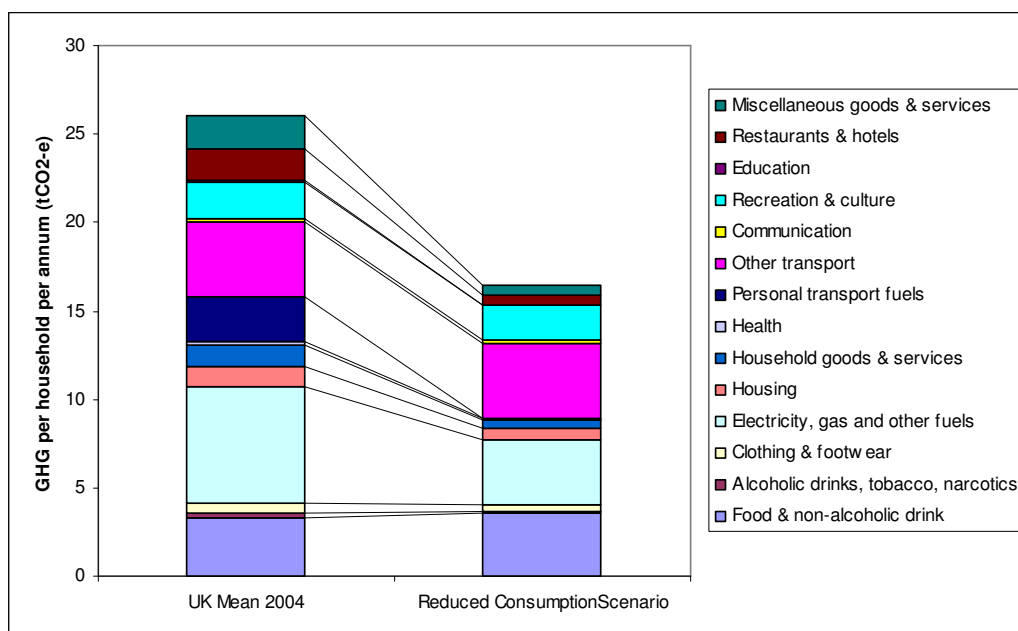
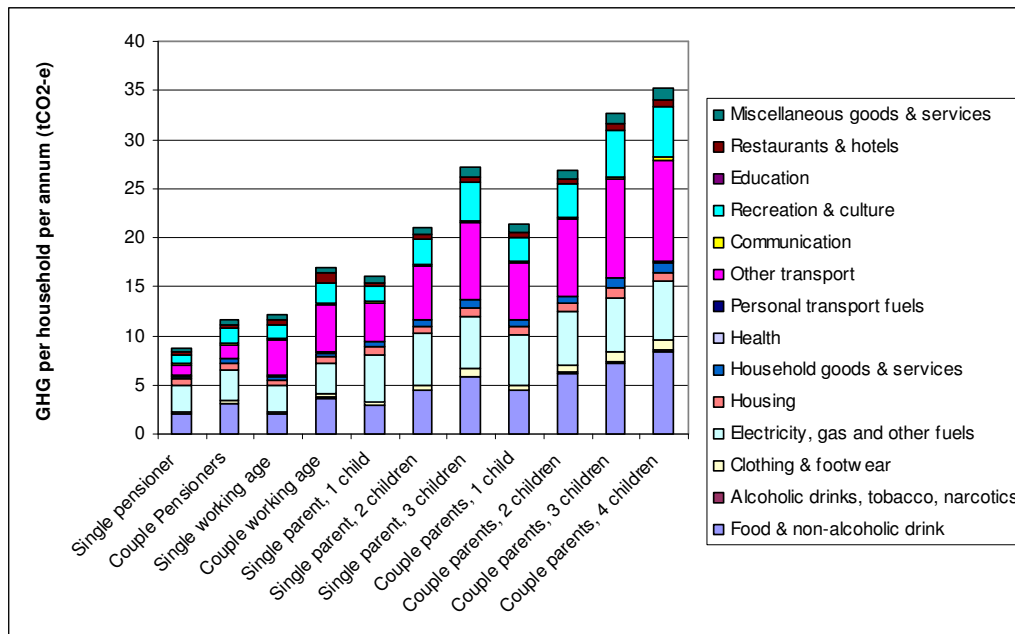


Fig. 2: Comparison of mean GHG emissions per household for UK mean in 2004 against the Reduced Consumption Scenario

Figure 3 shows the emissions per household for each family type in the Reduced Consumption Scenario. Single pensioner households have the lowest emissions and, as expected, couple parents with 4 children have the highest. The proportions attributed to each of the COICOP expenditure categories varies in accordance with the budgets allocated to each family type. One issue that this graph highlights is that because bus travel for pensioners and toddlers is free, no GHGs are estimated for their bus use and hence the emissions for these families is under-estimated<sup>12</sup>.

<sup>11</sup> Aviation is included in 'Other transport' in this study.

<sup>12</sup> It would, in future work, be possible to make assumptions in order to compensate for this under-estimate.



**Figure 3:** GHG emissions attributable to different types of households in the Reduced Consumption Scenario

#### 4. Discussion

In 1957 the British Prime Minister, Harold Macmillan, declared that Britons had "never had it so good"<sup>13</sup>. He went on to say "Go around the country, go to the industrial towns, go to the farms and you will see a state of prosperity such as we have never had in my lifetime - nor indeed in the history of this country." Since that time real incomes have doubled, enabling a shift in expenditures from more mundane subsistence items such as food, clothing, household goods and housing, towards more discretionary expenditures such as recreation, entertainment and eating out in restaurants (Jackson and Papathanasopoulou 2008).

Despite this material success, the percentage of UK citizens reporting themselves 'very happy' declined from 52% in 1957 to 36% today<sup>14</sup> and rates of stress and depression are increasing (Naish 2008; Wilkinson and Pickett 2009). Whereas the UK was ranked 6<sup>th</sup> in the world according to gross GDP, it was ranked only 108<sup>th</sup> using an index built from three different indicators (life expectancy, ecological footprint and subjective well-being) (Marks et al. 2006).

It is increasingly clear that a materialistic notion of the 'good life' does not make us happy (Easterlin 1995; IPCC 2007; Layard 2005; Marks et al. 2006; Perri and Christie 1998). Moreover, it is deeply inequitable and existing levels of material consumption are clearly unsustainable. These three features of consumption – ecological, social and psychological – are now broadly accepted limits of the conventional notion of

<sup>13</sup> [http://news.bbc.co.uk/onthisday/hi/dates/stories/july/20/newsid\\_3728000/3728225.stm](http://news.bbc.co.uk/onthisday/hi/dates/stories/july/20/newsid_3728000/3728225.stm)

<sup>14</sup> See Ruut Veenhoven's 'World Happiness Database' available on the web at: [www2.eur.nl/fsw/research/happiness](http://www2.eur.nl/fsw/research/happiness).



the good life (Abdallah et al. 2009; Jackson 2006; Jackson and Michaelis 2003; Marks et al. 2006; Perri and Christie 1998).

In these circumstances, there is a premium on identifying different visions of the good life in which it might be possible for human beings to have an equal opportunity to flourish, within the finite ecological limits of the planet (Jackson 2009; Sen 1984; Sen 1998). One starting point for developing such a vision is to understand what we mean by a 'decent life' and determine the minimum material requirements for it.

The Reduced Consumption Scenario is of help in addressing this task. The expenditure budgets used in the scenario have been carefully drawn up to provide enough to purchase all the goods and services considered necessary to live and participate in UK society. The JRF study indicates which expenditures we should aim to protect, and which are considered unnecessary and may be eliminated. As we've seen, the GHG reductions achievable by moving to such a Scenario are considerable.

It is clear that the material demands associated with leading a decent life are not exhausted by subsistence needs: food, clothing and shelter. The goods we buy play an important role in our lives: some satisfy our material needs for warmth, food, security and so on, but goods also fulfil a more complex role in the "social conversations" that allow us to participate in the life of society (Douglas 2006; Douglas and Isherwood 1996; Jackson 2005; Jackson 2006). We use goods to help to express our relationships with friends and family; to find ourselves a mate; to show which group we belong to; and to mark important occasions such as birthdays through, for example, the giving of gifts. Material goods are also implicated in the creation and maintenance of identity and the marking of status in society. Indeed this is a key aspect of modern consumer society and particularly relevant to this study.

Status plays out through psychological needs for belonging, self esteem and to feel needed by others (Layard 2005; Maslow 1968; Offer 2006). But the never-ending quest for status also brings anxiety, much of which rests with the constant need to win, demonstrate and retain status in a fast moving world (de Botton 2004). It has been shown that competition for status is higher in more unequal societies, as the struggle to "keep up with the Joneses" becomes more acute when the gaps between the rich and poor widen (James 2007; Wilkinson and Pickett 2009).

In current Western societies status is generally expressed and assessed through wealth, as borne out by displays of opulence such as luxury cars and designer clothes. But it is also clear, as Hirsch (1977) pointed out over 30 years ago that positional consumption is a net zero sum game (Jackson 2009; Naish 2008). Though we may change our relative position by acquiring a bigger house, a better car or the latest consumer gadget, the status gains are at the expense of those around us, so net wellbeing doesn't change. Indeed it may even decline, since a loss of status is believed to have a bigger psychological impact on wellbeing than a gain in status.

There is moreover a dynamic element to this positional competition that pulls more and more material goods through the economic system (Jackson 2009). As consumer novelties move from being high-status luxuries to common necessities, those who strive to stay ahead of the curve must move on to the next new item, and so the never ending chase up the ladder continues. The result is that a great deal of resources are used and GHGs emitted, with no net gain in status. The use of material goods as a mechanism for displaying status is fundamentally flawed.

In the light of this discussion, we now explore what the Reduced Consumption Scenario will mean for lifestyles. First, we note that in such a scenario society is by definition egalitarian, with everyone assumed to purchase no more material goods than are required for the minimum income standard. As discussed above, societies with lower inequalities have, in general, higher levels of well-being. Therefore, broadly speaking, the Reduced Consumption Scenario may be expected to lead to higher levels of well-being.

The Reduced Consumption Scenario is designed in such a way that basic subsistence needs are widely met, with great care and attention being given to, for example, the nutritional value of the prescribed food allocations, and adequate warmth in dwellings. But allowance is also provided to mark important occasions by buying gifts, and a certain amount of alcohol, for example, is included for participation in social occasions.

On the other hand, the JRF budgets are carefully planned to avoid many of the traps that modern consumers fall into. For example, everything in the budgets was considered to be “necessary” whereas in our current culture of consumption many goods are purchased that are subsequently found not to be needed (Trocchia and Janda 2002). This phenomenon of ‘over-consumption’ is illustrated by the plethora of unused items advertised on websites such as Freecycle<sup>15</sup>, Ebay<sup>16</sup>, and the expansion of the personal storage industry (Naish 2008). In the JRF budgets the vast quantities of purchases that result in goods being ‘under-consumed’ or even never used at all are eliminated. Accordingly, emissions of the GHGs that arise in the production and distribution of these goods are also eliminated in the Reduced Consumption Scenario.

On the surface at least, it appears that the JRF budgets exclude provision for goods which are seen mainly as positional goods or status markets. This raises the interesting question of whether the Reduced Consumption Scenario is in any sense a status-based society. Certainly, the egalitarian assumption of a consistent minimum income standard across the population would suggest that this is a far less status-

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<sup>15</sup> Freecycle is a grassroots and entirely non-profit movement of people who are giving (& getting) ‘stuff’ for free in their own towns. It’s aim is to encourage re-use and to reduce the quantity of goods sent to landfill.. See <http://www.freecycle.org/>

<sup>16</sup> See <http://www.ebay.co.uk>. A recent study has found that the percentage of unused products offered at eBay ranges from over 85% of books to around 12% of ICT and Consumer Electronics (Erdmann and Henseling 2009).

driven society. And as we have already noted, this could enhance the levels of wellbeing.

On the other hand, it is possible to conceive of alternative ways in which status may be marked, even when incomes are equalised and material distinctions are eroded. Although material goods are used widely for marking status in most cultures, Western society has recently taken this to extremes. For example, at the beginning of Margaret Thatcher's term as UK Prime Minister at the end of the 1970s, status was derived mainly through a person's job title, family history, and school attended. In contrast, by the end of her era some 11 years later, status was defined increasingly by material possessions (Bauman 1998; Goodall 2007).

A change in the indicators used for marking status relies on a quite significant shift in social norms and this is clearly a huge demand on the viability of a Reduced Consumption Scenario. However, it is also worth remarking here that some evidence for shifts in consumption norms does exist.

One place to look is the changing trends that have occurred since September 2008 when Lehman Brothers collapsed and global economies were plunged into recession. Clearly consumers have reduced their expenditures, and so the recession provides some indication of the changes that can be expected when consumption is restrained. Due to the time lags in compiling data it is too early to present a rigorous analysis of precise changes in expenditures and resultant GHG emissions. However, anecdotal evidence is already beginning to emerge.

According to the Chief Executive of one of the UK's top retailers<sup>17</sup> the recession has bred a new generation of frugal families who are buying smaller amounts of food, freezing leftovers and cutting out luxuries (Wallop 2008). A recent study has also found that people are now spending less in categories they consider to be 'indulgent' such as clothing, frequent meals out and confectionary (The Futures Company 2009). Perusal of the lifestyle sections of the national newspapers shows that it is now becoming fashionable to, for example, make your own clothes, mend worn out items, holiday in the UK and grow you own vegetables (Boycott 2009; Fletcher 2009; Mawer 2009; O'Connor 2009; The Independent 2009).

These diverse pieces of evidence suggest that people are attempting to make the most of what they still have when their expenditure is constrained, and they reveal a gradual shifting in norms that are accompanying the recession. Moreover, many of the shifting norms shown in the recession, serendipitously, have the effect of reducing environmental impacts. For example, holidaying in the UK reduces GHG emissions due to aviation, and mending worn out clothes increases the lifespan of products resulting in a reduced throughput of resources and associated GHGs. From this we can see that in times when consumerism has become constrained a gradual shifting of norms is evident and the same potential exists in situation in which consumption is restrained for ecological reasons.

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<sup>17</sup> Andy Bond of Asda.

It's worth examining some of the other assumptions that were made in the JRF scenario. For example, it should be noted that the remit of the groups setting the budgets in the JRF study did not include the environmental aspects of consumption. Therefore the budgets were designed largely without regard to resultant environmental impact. Interestingly, however, many of the expenditures reduced or eliminated are those that have high energy intensity. For example, the study assumed insulation levels in dwellings above the current national average<sup>18</sup> and, accordingly, consumption of gas for central heating is lower in the Reduced Consumption Scenario than current mean UK levels. The Scenario also assumes that personal vehicle transport is not necessary, and instead provides for purchasing bicycles and bus passes, along with taxi hire once a week for journeys that could otherwise be problematic.

It is of course contentious to assume that participation in society is possible without private vehicle use, particularly in a society structured as ours is today and heavily reliant on infrastructures of private transport. Some studies have estimated that private vehicle use could be reduced by around 20% - even within current transport structures (Anable et al. 2005; Goodwin 2008). But beyond this, without major infrastructure changes which are slow and costly to implement, participation in society may be jeopardised. Adjustments could be made to take account of this, but we have stayed faithful to the JRF study assumptions.

In short, for the Reduced Consumption Scenario to become a reality, considerable investment would be needed to increase the energy efficiency of dwellings, improve public transport and change the planning and infrastructure of provision. There have recently been calls for massively enhanced investment in the transition to a low-carbon society: calls for a green or sustainable 'new deal' (GND 2008; SDC 2009; UNEP 2009) suggest that up to 2% of GDP could legitimately be targeted at a green 'sweet spot' of low carbon investment (DB 2008) which includes domestic energy efficiency improvement and public transportation.

In the April 2009 budget the UK government pledged £375 million to support energy and resource efficiency in businesses, public buildings and households over the next two years (HM Treasury 2009). Although this will go some way towards carrying out the upgrading required, much more would be needed to achieve the changes required in the Reduced Consumption Scenario.

If the JRF study's remit had been to reduce environmental impacts it is probable that they would have made some different choices, particularly with regard to food. Our analysis estimates that 22% of total emissions in the Reduced Consumption Scenario would be attributed to Food and non-alcoholic drink. A diet with less meat and dairy foods would result in lower emissions, as livestock have been shown to account for a significant proportion of GHG emissions (Garnett 2008; Garnett 2009). This could be done without jeopardising nutritional standards. For example, in a study which

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<sup>18</sup> The heating regime was based on the requirements in social housing which has on average higher thermal ratings than the private sector (Oldfield 2008).

compared meals with comparable nutritional values, a meal made from potatoes, carrots and dry peas was estimated to have nine times lower emissions than a meal with tomatoes, rice and pork (Carlsson-Kanyama 1998).

It should also be noted that the JRF study did not challenge the underlying current consumer culture of the “throw-away” society (Cooper 2005). For example, it is assumed that adults’ socks last for just one year: this could be extended by education in repair techniques that could be used to extend product lifetimes.

An important aspect of the Reduced Consumption Scenario is consideration of how it might come about. Although analysis of this is beyond the scope of our paper, one possibility is that it might be accompanied by a general reduction in working hours whether through a shorter working week, a stepping down to one income per household, or a combination of both. This would, of course, have important implications both for macro-economic structure and for the work-life balance (Jackson 2009). But shorter working hours could also mean more time spent caring for children and the elderly, and for recreation and leisure. This in turn, may be expected to reduce levels of stress and increase levels of well-being.

## 5. Conclusion

This paper started with the premise that remaining within ecological limits demands a serious consideration of the possibility of consumption restraint in the richer nations. Our aim was to explore what GHG emissions would be required to support a ‘decent life’ under such constraints. For such lifestyles to become a reality we assumed that they must meet an acceptable standard with regards to providing subsistence needs and also the social need to participate in society. We have drawn on a report by the Joseph Rowntree Foundation that drew up detailed expenditure budgets for a minimum acceptable income standard in the UK. We used these budgets to estimate the GHGs that would be emitted (in the UK and elsewhere) in the production and distribution of all the goods and services that are purchased according to the budgets. Our calculations have estimated that in a Reduced Consumption Scenario, GHGs would be around 37% lower than mean household GHG emissions in 2004.

In material terms, the Reduced Consumption Scenario depicts a relatively equal society and much evidence shows that levels of well-being are higher in less divided societies. The Scenario provides the basics for people to live well and participate in society, but much of the ‘over-consumption’ that we associate with current lifestyles, and the pursuit of status through displays of material goods, would no longer be possible within the Scenario.

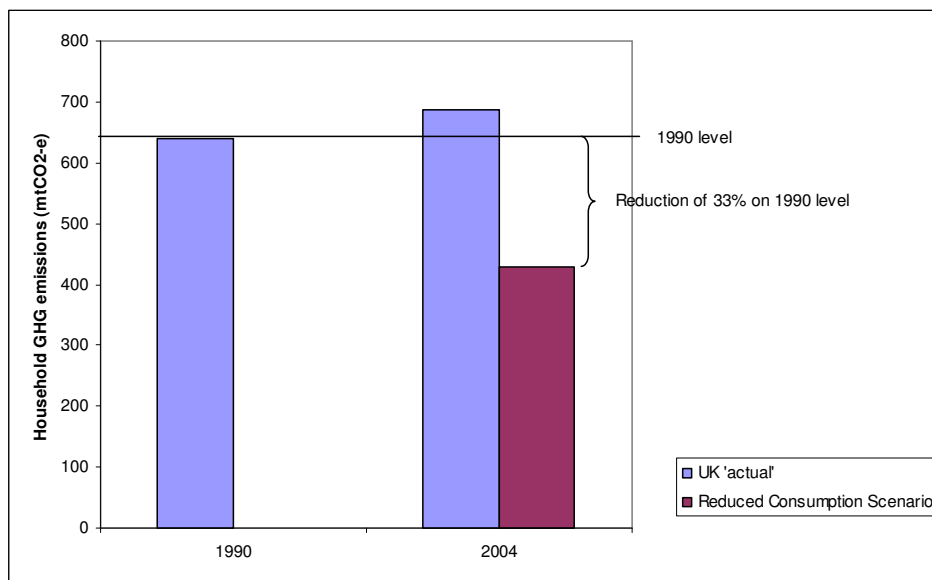
Public acceptance of consumption patterns in the Reduced Consumption Scenario would depend critically on a shifting norms. We have seen signs that during the current recession it is now becoming “cool” to pursue a less consumer-focused way

of life, and this gives a promising indication that the changes in norms required for the Reduced Consumption Scenario could become acceptable, given appropriate alternative means through which people could flourish as human beings.

Some structural changes would be essential to achieve these outcomes. These changes are very much in line with those required to move to a low carbon economy. Specifically, major investments are required to improve public transport and the thermal efficiency of the UK housing stock.

Finally, it is worth comparing the emission reductions achieved in the Reduced Consumption Scenario against the emission targets established by the UK Government. The UK has passed legislation to make legally binding GHG emissions reductions by 2050. The Act also established the Committee on Climate Change, which is an independent, expert body whose role is to advise Government on setting and meeting carbon budgets. The Committee has recommended that the UK should reduce emissions of all greenhouse gases by at least 34% in 2020 relative to 1990 levels, and that this should be increased to 42% relative to 1990 if a global deal to reduce emissions is achieved (CCC 2008).

The Reduced Consumption Scenario achieves a 37% reduction against actual 2004 emission levels. As Figure 4 illustrates, this represents a 33% reduction in GHG emissions relative to 1990 emission levels. Taking into account the further reductions that could be achieved within the scenario as described above, this suggests that the UK target of at least a 34% reduction of GHGs on 1990 levels by 2020 could be feasible within the household sector, assuming the other criteria for the Reduced Consumption Scenario are met, as discussed above.



**Figure 4:** GHGs emissions in the Reduced Consumption Scenario compared against UK GHG reductions targets

It should be noted here, in passing, that lower consumption in one nation or region does not in itself ensure that global emissions are reduced. Trade is global and UK household consumption must be considered as part of the global picture. As pointed out by Alcott (2008), lower consumption in one region may have the effect of lowering prices, which in turn stimulates demand by other regions. For effective global reduction in GHG emissions, reductions in developed countries' emissions through reduced consumption scenarios as addressed in this paper must be accompanied by globally agreed emissions quotas.

Nonetheless, the conclusion from this study is optimistic. A shift towards a society less focused on status-driven consumerism is essential. Such a society would have to prioritise the task of providing capabilities for flourishing in less materialistic ways. In particular it would need to build strong avenues for social participation and to renew a sense of common citizenship and purpose (Sandel 2009). This task requires strong leadership and significant investment. But if supported by specific structural changes, our analysis suggests that significant reductions in GHG emissions could be achieved without jeopardising social well-being.

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