JRF JOSEPH ROWNTREE FOUNDATION

INSPIRING SOCIAL CHANGE

DISTRIBUTION OF CARBON EMISSIONS IN THE UK: IMPLICATIONS FOR DOMESTIC ENERGY POLICY

This study examines the distribution of carbon emissions across households in Great Britain and implications for energy and climate change policy. It assesses the fairness and effectiveness of policies to reduce domestic emissions and explores an alternative approach.

Key points

- Household carbon emissions in Great Britain are strongly related to income: the richest 10 per cent of households emit three times that of the poorest 10 per cent from energy use in the home and personal travel.
- Current policies to reduce household carbon emissions have inequitable impacts: the average impact on household energy bills in England in 2020 is a 7 per cent reduction for the poorest 10 per cent and a 12 per cent reduction for the richest 10 per cent. This represents a triple injustice: the lowest income households pay more, benefit less from policies and are responsible for the least emissions.
- Anticipated decline in household energy bills in 2020 relates, in part, to potentially optimistic savings from improvements in product efficiency (i.e. appliances and lighting). If these are not realised, household energy bills in 2020 could rise by 4 per cent on average.
- The Feed-in Tariff (FIT) stands out as highly regressive: 12 per cent of households, with an average annual income of £62,389, are expected to benefit from FIT by 2020, by around £360 per year, but this is funded from all household energy bills and non-domestic customers who do not benefit.
- Current policies are expected to deliver a 45-million-tonne reduction in carbon dioxide emissions. Further emissions reductions are required after 2020 to meet targets.
- An alternative scenario to improving England's housing stock gives a potential reduction of around 77 million tonnes. Low-income households would receive measures free, funded through taxation, carbon pricing mechanisms, means testing Winter Fuel Payments, and a Green Deal charge on wealthier households.

The research

By a team at the Centre for Sustainable Energy and partners.

MARCH 2013

BACKGROUND

The UK Government has a target to reduce greenhouse gas emissions by 80 per cent on 1990 levels by 2050. In addition, there are statutory targets to ensure that no household is in fuel poverty by 2016. An understanding of how current and proposed policy approaches to meeting these targets are likely to impact differentially on domestic energy consumers is fundamental in ensuring policies are designed to be both fair and effective.

Distribution of emissions

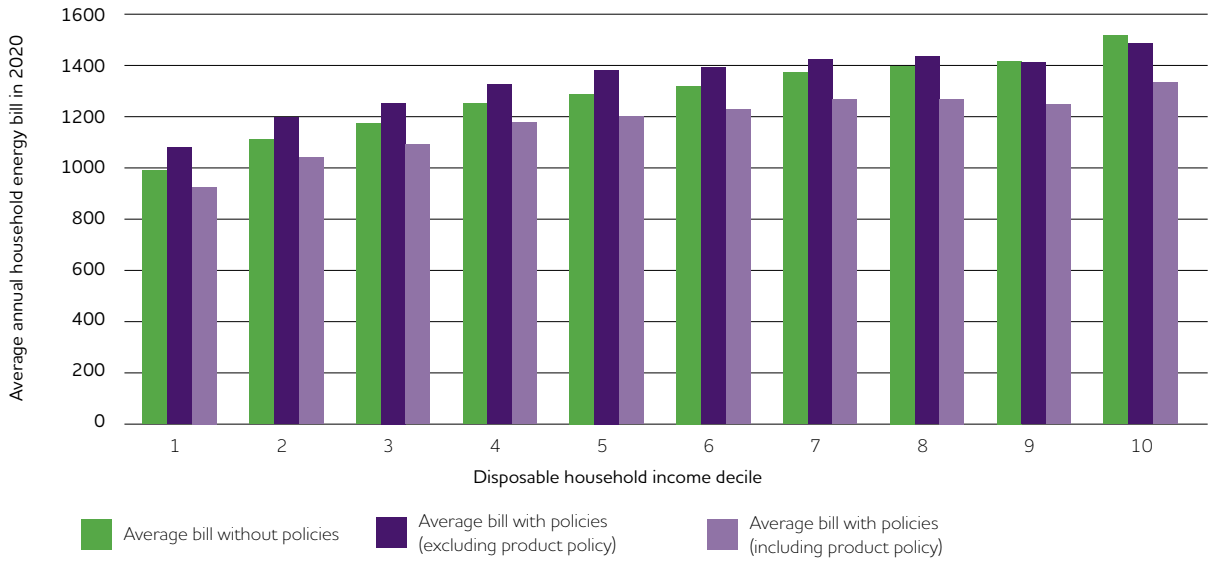
In terms of understanding fairness, it is important to take the pre-existing distribution of emissions into account. This is highly correlated with household income: the richest 10 per cent of households emit twice that of the poorest 10 per cent from energy consumed in the home. If emissions from personal travel (including private vehicle, public transport and aviation) are included, this differential increases even further: the richest 10 per cent of households emit 16 per cent of all emissions, while the poorest 10 per cent emit only 5 per cent of the total.

Distribution of the impacts of Government policy

Several factors influence the distributional impacts of a policy, or group of policies. These include the overall implementation costs, which types of household are most likely to benefit, and the way in which the costs are recovered (e.g. per unit of energy, per customer, via taxation, etc.). Figure 1 illustrates the income distribution of the impact of current Government policy on English household energy bills in 2020. This gives three average energy bills for each income decile: (1) in the absence of carbon reduction policies; (2) with current Government policies to reduce emissions, with the exception of product policy (i.e. excluding assumed improvements in energy efficiency standards of appliances); (3) with current Government policies to reduce emissions, including product policy.

Overall this shows that bills are expected to decline on average if Government assumptions about policy performance are correct i.e. product policy and Green Deal take-up. On a realistic set of

Figure 1: Average bill by income deciles with and without policies



assumptions about product policy, Government policies are most likely to benefit those households contributing most to emissions. This is because they are expected to have higher take-up rates of renewable energy measures and are less likely to use electricity to heat their homes. Electricity carries a higher proportion of the future policy costs and is a more predominant heating fuel in lower-income households.

When modelled independently of each other (one policy at a time) the impact and notably regressive nature of certain policies becomes more apparent. For example, households benefiting directly from FIT – some 12 per cent in the scenario modelled in this study – are notably higher income (36 per cent of the top income decile) and see an average saving of £359 on their annual energy bill in 2020. However, the remaining 88 per cent of the population pay for the policy at an average cost of £10 a year on their 2020 energy bill.

Effectiveness of Government policy

This study analysed the effectiveness of policy in terms of the extent to which it is expected to deliver the carbon reductions required by Government and Climate Change Committee targets. The table below sets out the results for current policy with and without assumptions regarding product policy. This shows that current policies are expected to meet 2020 targets only if assumptions regarding policy impacts, particularly product policy, are borne out. If not, there will be an approximately 8-million-tonne carbon dioxide ($MtCO_2$) shortfall.

Table 1: Carbon emissions from household fuel use (England)

	Total MtCO2	**Reduction cf 1990 MtCO2**	**Reduction cf 1990 %**
1990 emissions from household fuel use	128	-	-
Survey Baseline (2007)	111	17	13
2020 total with all current policies applied	83	45	35
2020 total excluding product policy	91	37	29
2020 Climate Change Committee target	83	45	35
2030 maximum abatement	57	77	60

An alternative approach

The study then asked the question 'What would a fully-funded, fair and effective policy to reduce carbon emissions from household fuel use look like?' An alternative policy scenario approach was modelled, to incorporate a wide-scale retrofit of the English housing stock, with optimum combinations of housing energy performance measures deployed, whilst avoiding the regressive distributional impacts of the current approach to policy cost recovery.

Table 1 shows that the optimisation of housing improvements results in total carbon reductions of 60 per cent on 1990 levels, which equates to around 77 million tonnes by 2030 (the modelled year for policy completion). This is significantly more than the savings expected from existing policies by 2020. However, cost recovery for such an ambitious and capital intensive policy needs to be carefully designed to avoid regressive impacts. A combination of revenue sources were explored including income tax, upstream carbon pricing mechanisms, savings from means testing of the Winter Fuel Payment and a Green Deal charge on the bills of wealthier households i.e. income deciles 5 and above.

The programme achieves a progressive overall result as low income households receive free measures and householders who receive measures last do not face a significant rise in energy costs to pay for the benefits experienced by others. The programme requires a significant investment of £293 billion between 2012 and 2030 (the equivalent of around £17 billion per year) with 39 per cent being raised by Green Deal finance and the remainder from income tax and other sources; however, this translates to 150,000 new jobs and fuel bill savings of over £1.52 billion in 2020 alone.

Fuel poverty

In 2010, official Government figures estimated there were 3.5 million households in fuel poverty in England. This could rise to 4.9 million by 2020 without any energy interventions; however, if Government policy performs as they expect, this could be reduced to 3 million in 2020. Adopting the alternative scenario for retrofitting the housing stock could reduce fuel poverty to 2.8 million in 2020 (part way through the roll-out of measures) with a further reduction to 2.4 million by 2030 (when the works are complete). Under the proposed Hills Review definition of fuel poverty, a household is fuel poor if it has a low income and faces high energy costs i.e. above the median for all households. As a result, fuel poverty numbers vary less between the different scenarios. The new headcount measure has been criticised by fuel poverty experts due to a lack of responsiveness to fuel prices and a median cost threshold that is too high i.e. it may lead to an underestimation of the real experience of fuel poverty.

Conclusions

Current approaches to reducing household emissions appear to be less than fair in terms of the income distribution of their costs and benefits, and unlikely to deliver the required emissions reductions. This injustice is accentuated by the fact that richer households emit more than their 'share' of carbon but contribute less than their share to the policy costs of cutting emissions.

Despite falling short of the 80 per cent reduction on 1990 emissions required by 2050, this study shows that a deeper programme of retrofit can achieve significantly higher savings than those expected from current Government policy i.e. 60 per cent compared to 41 per cent by 2030. This retrofit would cost around £293 billion, which could be raised from a combination of taxation, carbon revenues and a Green Deal charge on the bills of wealthier households, with progressive results.

About the project

The project was carried out by a team at the Centre for Sustainable Energy (CSE); the Townsend Centre for International Poverty Research, University of Bristol; and the Environmental Change Institute, University of Oxford. The research uses advanced modelling techniques to develop and analyse the datasets necessary to support further understanding of: the distribution of emissions across households in Great Britain; the impact of existing and forthcoming Government policies on consumer energy bills and household emissions in England; exploratory analysis of alternative approaches for improving the energy efficiency and sustainability of the housing stock in England. The authors would like to acknowledge the role played by academic staff at the School for Policy Studies (SPS), University of Bristol, during the early stages of the project. Dr Demi Patsios carried out the initial data harmonisation and Dr Eldin Fahmy contributed to drafting the project interim report. SPS staff did not contribute to the final report. The results reported and conclusions drawn are the responsibility of the team at CSE.

FOR FURTHER INFORMATION

This summary is part of JRF's research and development programme. The views are those of the authors and not necessarily those of the JRF. The main report, **Distribution of carbon emissions in the UK: Implications for domestic energy policy** by Ian Preston, Joshua Thumim, Vicki White, Toby Bridgeman and Christian Brand, is available as a free download at www.jrf.org.uk

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ISSN 0958–3084

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