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Climate Change, Double Injustice and Social Policy

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Abstract

Those groups and populations likely to be most harmed by climate change are the least responsible for causing it and have the least resources to cope with the consequences – this is the 'double injustice'. This paper studies the phenomenon only within rich OECD countries building on UK studies and data. Do ambitious policies to de-carbonise the economy, notably in Europe, pose new challenges to the institutions of the welfare state? This question is in two parts: within the Kyoto framework and beyond it. The first part establishes that the impact of carbon mitigation policies is regressive. The only secure route out of this dilemma is massive eco-social investment in low carbon housing, transport etc as part of a green growth strategy, but the role of supporting social policies is analysed including compensation and carbon rationing. The second part questions the core assumption of the Kyoto framework by moving the focus from greenhouse gases *produced* in the North to those embodied in Northern *consumption*, which are estimated to be half as high again. In the UK these consumption-based emissions pose a similar distributional dilemma for carbon taxes and quotas. Further social policy measures are considered to reduce these, including reduced hours of work. The conclusion is that new forms of policy coherence will be needed, to integrate the redistribution of carbon, work/time, and income/wealth.

This paper complements my Report for the British Council *Climate Change and Public Policy Futures* (Gough 2011).

Introduction

Those groups and populations likely to be most harmed by climate change are the least responsible for causing it and have the least resources to cope with the consequences – this is the 'double injustice'. Originally developed to understand the dilemmas posed by climate change for a just and equitable world order, the double injustice can also be applied to the situation *within* countries - in both South and North. This paper reverses the order: it begins with an analysis of climate change and social equity within the UK and similar countries in the North, and the role of social policy in addressing the dilemma. (My intention was then to consider some of the issues at the global level; unfortunately, that is still in the future). My approach will try to combine normative concerns with a realpolitik political economy analysis.

UK and EU governments are already committed to drastic reductions in the output of carbon and other greenhouse gas (GHG) emissions to counteract this future risk. So the issue arises, how will these carbon mitigation programmes impact on the most extensive group of existing state policy commitments – those of the welfare state? This is answered in two parts: within the Kyoto framework and beyond the Kyoto framework. For the purpose of this paper, the distinction is between monitoring and reducing emissions produced within a given territory compared with those originating from consumption within a given territory. In both cases I consider only dilemmas arising within rich OECD countries (the 'North'); within these my data and examples are taken from the UK.

In the first stage, two questions are posed: fiscal and distributional. First, will climate mitigation programmes compete for public resources with social programmes, at a time of the steepest ever cuts in public spending? Second, will the distributional consequences of climate mitigation programmes create new social injustices that in turn impose new demands on the welfare state? The short answers to these two questions are 'no' and 'yes'. Thus we consider ideas for rethinking social policy to cope with the 'distributional dilemma' posed by climate mitigation – that almost all policies to reduce emissions bear more heavily on lower income groups, even though they emit far less than richer households. The social dimension must be integrated with the environmental dimension. This requires more policy integration, and examples are discussed focusing on social policy.

But even this is insufficient because it takes for granted the focus of the Kyoto Protocol on the *production* of GHGs in Annex I countries, not the GHGs embodied in their *consumption* of goods and services. New analysis shows that the gap is wide due to outsourcing of manufacturing to emerging market economies, notably China. This paper goes on to analyse the distribution of total embodied GHGs within the UK revealing a similar distributional dilemma. To reduce consumption emissions *in* the North whilst avoiding greater inequality *within* the North, a set of more radical policies is advanced, including carbon rationing and reduced hours of work. But this in turn poses issues for the traditional 'welfare state' which has been built on 'traditional economic growth'.

Climate change and the challenge to social policy

There is a strong scientific consensus that global warming is happening, that it is largely man-made, that it is global, cumulative and potentially destructive, and that it will have

to be brought under control sooner or later if disaster is to be avoided (Intergovernmental Panel on Climate Change (2007), Stern (2007), Royal Society (2010), Committee on Climate Change 2010). This paper accepts this dominant scientific consensus.

Our concern here is the impact of climate change on future economic and social wellbeing. The causal chain is long; a simple and incomplete model linking these is shown below:

Economic activity →
Energy consumption →
Greenhouse gas emissions →
GHG cumulative concentrations →
Global temperature rise →
Regional climate change →
Impact on human habitats →
Social well-being

It is common to distinguish two categories of climate change *policies*: mitigation and adaptation. *Mitigation* policies act to reduce greenhouse gas emissions or to increase greenhouse gas sinks. *Adaptation* policies reduce the damaging effects of climate change that does occur, but do nothing directly to prevent it**.** Broadly speaking mitigation policies address the first three factors in the model above and adaptation policies address the last two. (A third category is geo-engineering i.e. the large-scale engineering of the earth's environment to counteract trends in atmospheric chemistry, which is not considered here).

Turning to impacts on rich countries of the OECD world like the UK – our focus here - Gough et al. (2008) analytically distinguish four:

- Direct impacts of climate change itself, distinguishing
    1. impacts in the North
    2. the results in the North of impacts elsewhere in the world
- The impacts of climate change *policies*, distinguishing
    3. adaptation policies
    4. mitigation policies

Direct impacts in the North

Most models predict substantially greater *direct* negative impacts on habitats and livelihoods in tropical and subtropical regions, which are also in general poorer than the temperate zones and bear little responsibility for the historic accumulation of greenhouse gases (GHGs) in the atmosphere – the double injustice on a global scale. But this does not mean the northern, richer world will be unaffected. Southern Europe, Australia and the southern United States will experience rising heat and water stress, and low-lying coastal regions such as the Netherlands will be vulnerable to rising sea levels. According to a forthcoming (2011) Foresight report, direct impacts in the UK are likely to be mild over the next two decades. The Joseph Rowntree Foundation is currently promoting research on the direct impacts of likely climate change on social welfare and social justice in Britain, including flood risks, drought risks and heat waves (Benzie et al. 2011). The Department of Health first published its heat wave plan for the UK in 2004 and it has been revised several times since. In my view these risks, and the costs of managing them, will not be especially burdensome for a rich country over the

next three decades. However, there will be distributive consequences as direct impacts are likely to affect lower income groups more: more live in higher risk areas, such as floodplains, and fewer have adequate insurance (Walker and Burningham 2011). I do not here pursue further this aspect of double injustice within the North.

Indirect impacts in the North of global climate change

One major potential impact is rising levels of distress migration from tropical Africa and South Asia. This is the subject of a major upcoming Foresight report overseen by the UK government's Chief Scientific Advisor Professor Sir John Beddington, which is eagerly awaited. Other potential impacts are covered in another recent Foresight report (2011). They comprise a vast range of issues including: resource scarcity, epidemics, degraded coastal infrastructure impeding shipping, disruption of vital oil and gas supplies, insecurity of food supplies and rising and more volatile prices, disruption of international economic networks and chains, growing restrictions on free trading and global financial institutions, slowing global economic growth, collapse of weak states, and growing international tensions weakening global governance. These global risks of climate change could be critical, but are beyond the scope of this paper.

Adaptation policies in the North

These include: investing in flood defences to protect against storm surges, extra reservoir capacity, and making buildings more resilient to climate change. The *Stern Review* (2007: 417-429) estimates that member countries of the Organisation for Economic Cooperation and Development (OECD) would need to invest between 0.05 per cent and 0.5 per cent of GDP extra each year in adaptive measures, and more if temperature rises exceed the central forecast (Fankhauser 2010 provides more recent but still widely varying estimates). These figures are high but not daunting. The contrasts with the poorer developing world are extreme. In the words of Desmond Tutu, "rich countries can use their vast financial and technological resources to protect themselves against climate change, at least in the short term… But as climate change destroys livelihoods, displaces people and undermines entire social and economic systems, no country – however rich or powerful – will be immune to the consequences. In the long-run, the problems of the poor will arrive at the doorstep of the wealthy" (in UNDP 2007: 166).

All these critical issues are left aside in what follows! The remainder of this paper will concentrate on the impacts of *climate mitigation policies* (CMPs) on social policy in countries in the North, primarily responsible for global warming but facing a double injustice within their own borders.

The Kyoto Model: Production of GHGs

The response of the North: EU v US?

It is widely recognised that the Kyoto framework confirms the responsibility of rich Northern countries for past emissions but provides a wholly inadequate framework to restrain them. But less well researched is the variation across Annex 1 countries in their carbon mitigation efforts. The survey by Christoff and Eckersley (2011) reveals sharp differences across Western nations in their past emissions performance, present rankings on emissions intensity, and policy aspirations for the future. Their data shows

that Germany and the UK are climate change 'leaders' on all measures, though this masks the great improvements exhibited by France and Japan in the 1970s and 1980s – and their database of large emitters omits the small Nordic countries who are also leaders. The clear 'laggards' are the USA, Canada and Australia. The fact that all these countries are rich democracies shows that capitalism and democracy alone are poor predictors of climate mitigation, so what are the relative determinants?

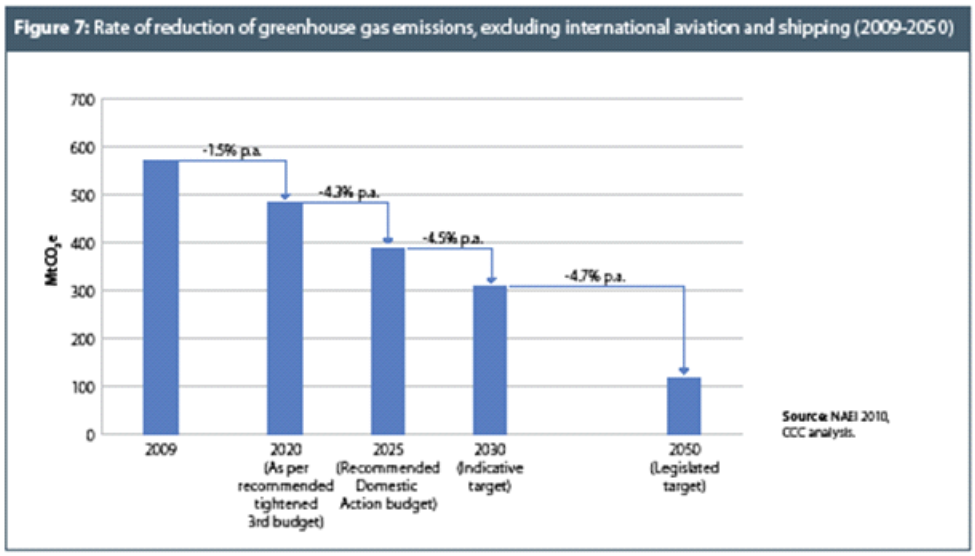
Christoff and Eckersley find several. First, domestic political institutions play a role: proportional representation and substantial green parties (versus first-past-the-post), parliamentary rather than presidential constitutions, and corporatist systems which include business and labour, rather than majoritarian parliamentary systems, all favour robust CMPs. Second, national vulnerability to climate change is a poor predictor (Australia is a highly vulnerable country) but reliance on fossil fuel extraction and energy intensive industry heightens opposition to carbon reduction. Third, the construction of ideological discourse is important. In the US and Australia climate science has been reduced to an 'ideological marker' between adversarial political parties, and climate deniers have been accorded much space in the media. This links to the role of veto-coalitions among fossil-fuel producers and energy-intensive industries notably in the US, Australia and Canada.

Together these can explain the pre-eminent role of Germany and the Nordic countries: twenty years of aggressive carbon constraints to enforce technological innovation and new green jobs which then generates path-dependent green growth. But how can we explain the more recent leadership of the UK? In my view, the answer is its crash deindustrialization in the 1980s and 1990s. The intent of the Thatcher government to destroy the mining unions and pursue the 'dash for gas' laid the basis. The subsequent crash deindustrialisation of the UK meant that there has been no overwhelming business lobby within industry or the trades unions opposed to de-carbonisation, while at the same time new opportunities arose in carbon trading for the City of London. This, together with the unsustainable exploitation of North Sea oil and gas which is now declining, explains the continuing commitment of the Coalition government to the pursuit of green policies, at the same time as it unleashes a savage onslaught on the welfare state.

UK Climate Mitigation Programmes and their fiscal impacts

What then is the record of one of the 'climate leaders' – the UK? The UK government is said to have adopted the world's most demanding and legally binding targets to reduce CO_2 and other GHGs. The Climate Change Act 2008 commits the UK to reduce GHG emissions by at least 80 per cent by 2050 and by at least 34 per cent by 2020, compared with the base year of 1990. Furthermore, it has set three intermediate carbon budgets up to 2022, and in May 2011 the coalition government committed the UK to further radical reductions for the fourth Budget period 2023-27. Figure 1 below sets out the remarkable transformation in UK emissions to which it is committed.

Figure 1: Rate of reduction of greenhouse gas emissions, UK 2009-2050



The act established the Committee on Climate Change (CCC), currently chaired by Adair Turner, as an independent body to advise the government on setting and meeting carbon budgets. At the same time the new Department of Energy and Climate Change published the UK *Low Carbon Transition Plan* which set out detailed targets and programmes to achieve these goals. This, and the subsequent very detailed reports of the CCC, analyse plans and achievements in reducing emissions under five main headings: power and heavy industry (which accounts for about one-half of all emissions); transport; homes and communities; workplaces and jobs; and farming, land and waste. The Coalition government have broadly stuck to these targets and programmes.

A recent OECD report (Bowen and Rydge 2011) evaluates the success of current policies. The main driver of carbon reduction over the three budget periods to 2022 is planned to be the EU Emissions Trading System (ETS) which applies to large industrial concerns including power generation across Europe. We are now approaching phase three of the ETS which will run from 2013-20. So far all the UK allowances have been loaded on to the power generation sector. It has encountered numerous problems in the first two phases (National Audit Office 2009): early allowances were given free which generated windfall profits, and implementation resulted in a 'highly complex economic and regulatory landscape' with substantial monitoring and verification costs. In addition the implicit carbon price has been both low and volatile. The impact of phase two on UK emissions is likely to have been small, but the expectation is that the ETS will deliver two-thirds of the first three UK carbon budgets. This seems unlikely and the government has introduced a range of other price signals, including tradable quotas (the Renewables Obligation) and forms of carbon tax (the Climate Change Levy). Less progress has been made in promoting clean energy. Many new policies have been launched including Feed-In Tariffs but government expenditure and R&D spending is relatively low and private finance falls well short of the £450b in energy efficiency and low-carbon energy supply estimated to be needed between 2010 and 2025.

At the *household* level, which is more relevant to social policy, there are a range of programmes that have a climate change mitigation objective and which are expressed through taxation, government expenditures and government-mandated expenditures by energy suppliers and other businesses (Marden and Gough 2011). Direct government programmes include *Warm Front, Decent Homes* and the *Renewable Heat Incentive*

(RHI). The government obliges electricity suppliers through the *Renewables Obligation (RO)* to increase generation from renewables. It also *mandates* all energy suppliers to improve domestic energy efficiency, particularly for low income households, through the *Carbon Emissions Reduction Target (CERT)* and the *Community Energy Savings Programme (CESP)*. These are now to be rolled into *Green Deal* after December 2012. This will allow households to obtain energy efficiency upgrades at no upfront cost with payment coming though part of the saving in energy bills. Energy companies will be required, under the new *Energy Company Obligation* (ECO), to help poorer customers and those in hard to treat homes and to provide basic heating and insulation to the poorest and most vulnerable households. However, there are serious concerns that the Green Deal will not meet its targets. Finally the government raises large revenues from a range of taxes that can be considered to have at least the partial objective of climate change mitigation.

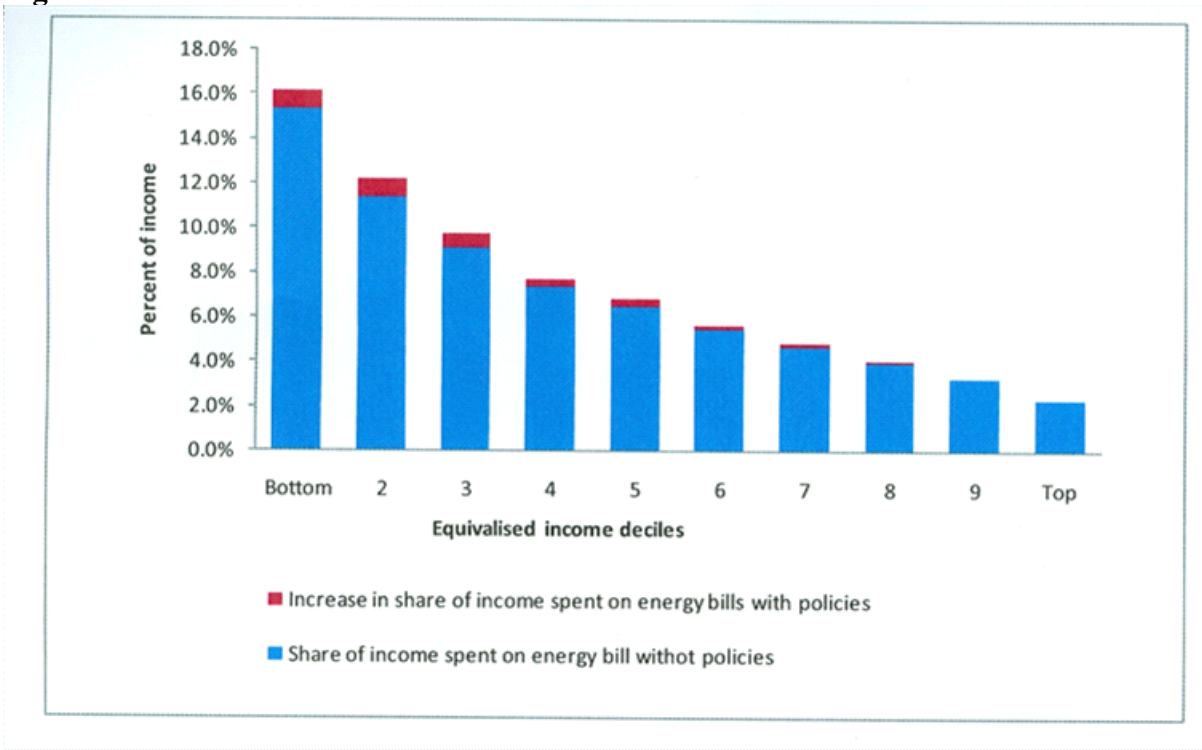
Overall, the ambitious carbon targets of the 2008 Climate Change Act are not reflected in the UK government programmes and budgets. Current spending on all programmes – direct and mandated - amount to a mere 0.24 per cent of GDP now and will rise to 0.27 per cent by 2014. These are tiny sums of money given the scale of government ambitions. There is no present or likely future fiscal competition between carbon mitigation and the welfare state. This is not surprising since much carbon mitigation entails capital, not current, spending.

Carbon mitigation and the distributive dilemma

This brings us on to our second question: what are and will be the distributional consequences of CMPs? DECC (2010b) estimates the impact of these mandated policies on energy prices and consumer and medium size commercial energy bills in 2010, 2015 and 2020, compared to a counterfactual of no climate change policies. Its 'central' scenario, in which the price of oil is assumed to be $80 per barrel by 2020 (at 2009 prices), implies a real increase in electricity wholesale prices of 14 per cent over the next decade and in gas prices of 15 per cent. The predicted impacts of these mitigation measures on domestic users are stark: gas prices are 4 per cent higher today, rising to 12 per cent higher by 2020. Electricity prices are thought to be 15 per cent higher than otherwise today and are expected to be 40 per cent higher by 2020. The average impact on actual energy bills will depend on the uptake of energy efficiency measures and renewables incentives. DECC estimates assume great success in this respect, with average domestic bills expected to be only 4 per cent higher than otherwise today and just 1 per cent higher in 2020. These assumptions may be over-optimistic, not to say complacent.

Thus the burden of current carbon policy is regressive, as several studies have shown (see for example, Büchs et al 2011). It is admitted by the Climate Change Committee and DECC that these burdens will fall more heavily on lower income households – and this is intended (see Figure 2 below). There exists a 'distributional dilemma' in the North.

Figure 2: The 'distributional dilemma'



Alternative social policies

The orthodox reply of economists is to use social policy to 'compensate the losers'. For example, the recent OECD report (2011) calls for the VAT on domestic energy use in the UK to be raised from its present low level of 5 per cent to the standard rate of 20 per cent, with "distributional concerns to be addressed through targeted support".

However a wide range of studies shows just how difficult this is because the domestic energy use of households is so variable (Druckman and Jackson 2008: Thumin and White 2008; Dresner and Ekins 2006). Thus, given across the board compensation, Thumin and White predict large numbers of low-income losers including: large families in rural, hard-to-heat houses, 'empty-nesters' in large houses and houses without gas central heating, retired under-occupied urban households, and urban households with vehicles (not an exhaustive list). Hills (2009) concludes that even the most progressive use of revenues from carbon taxes to protect the poor would leave up to a third of low-income households losing out.

The commonly-agreed essential alternative is to radically expand the programme of eco-social investment, as in various proposals for a *'Green New Deal'* (UNEP 2009; NEF 2008). These call for a sustained public programme to invest in renewable energy and to deploy radical conservation measures. This would at the same time boost demand in slow growing post-crisis economies like the British and create new employment opportunities in the reconstruction programme and elsewhere. It is a radical proposal for policy integration for a post-crisis economy. Some of this expenditure would be on the capital account, but to incentivise serious inroads into household energy savings would also require public subsidies that could compete fiscally with current, reduced social spending on the welfare state. Advocates of a more radical proposal for Green New Deal would contend that the investment boost would benefit public finances in the longer term, but this would require a shift in current orthodox economic thinking (Nef 2008). This important issue is not considered further here.

However, even if this was implemented in a crash programme starting today, many households, notably on low incomes would find themselves squeezed by rising fuel and carbon mitigation costs in the meantime. Thus some form of compensation is also necessary. This might entail computing a special *low-income price index* to take account of the regressive effect of rising domestic energy prices. UK inflation rates over the eleven years 2000-10 reveal a higher rate in the lowest quintile group: 3.4 per cent compared with 2.9 per cent in the highest decile (IFS 2011). This was especially so in 2006 and 2008 when gas and electricity prices soared (by 31 per cent and 52 per cent respectively in 2008). The central DECC projections of fuel cost increases mentioned above will drive up low income inflation, even though lower income households exhibit greater price elasticity than higher income. In other words consumption will likely decline as well as costs paid increase. Nevertheless, a separate index for low income and pensioner households and workers on the minimum wage would appear to be necessary as we enter an era of steadily rising oil prices.

Another form of quasi-compensation would be to adjust the energy tariffs faced by different households and income groups. This could be done via *social energy tariffs*: adjusting the current charging policies of utility companies by lowering the marginal costs of initial units of electricity or gas or oil consumed, and raising the marginal costs of successive units. This would recognise the 'basic need' component of the first block of household energy and the progressive choice element in successive units, and thus would be intrinsically progressive. The UK Office of Gas and Electricity Markets (Ofgem 2009) has modelled a scheme where electricity charges are lower for the first 2000kW hours per year and then rise sharply. It would be both progressive and exert price constraints on higher user households. Though this solution has been raised by the Climate Change Committee (2008) it would require a radical shift in the pricing policies and regulation of private utility companies – a reversal of the liberalisation and deregulation agenda of the past three decades.

A more radical measure advocated in the UK is *personal carbon allowances and trading* (PCAT). This tackles the distributional dilemma head-on by instituting a form of universal carbon rationing coupled with trading. There is a wide variety of such proposals, but all entail a cap on a country's total GHG emissions (decreasing year by year) and a division of this amount into equal annual allowances for each adult resident (usually with a lower allowance for each child) (Committee on Personal Carbon Trading 2008; Fawcett and Parag 2010). In effect a dual accounting standard and currency is developed – energy has both a money price and a carbon 'price'. Those who emit less carbon than the average could sell their surplus and gain, while higher emitters would pay a market price for their excess. Advocates claim many benefits: a PCAT scheme covering domestic energy, road fuel and air travel would be on average quite progressive; it would make real the carbon rationing required and could bring about behavioural change more directly and quickly. It could be implemented using personal carbon cards and smart metering, though the administrative difficulties should not be underestimated. In effect it would constitute a carbon form of the Basic Income idea, and could have similar benefits by redistributing income while not harming disincentives to work; indeed it would likely have more legitimacy than a basic cash income.

PCAT would be inherently progressive, so overcomes the distributional dilemma inherent in mandated markets and carbon taxation. However, it raises similar issues of fairness to carbon taxation, concerning those living in inefficient or underutilised housing, or dependent on car travel, or with special needs. Too many exceptions to the

standard allowance could undermine the scheme, but too few would result in 'rough justice', which could undermine public support (in addition to the political risks of such an overtly redistributive project). For these and other reasons the UK government in 2008 abandoned its plans for testing the idea. A recent series of studies considered it a suitable future framework for delivering long-term, sustainable cuts in carbon emissions in a way that other policies cannot. However, its integration into the existing policy landscape raised problematic questions which differed from country to country according to its energy sources, transport infrastructure, and other factors (Fawcett and Parag 2010).

Conclusion

Ambitious moves towards a low carbon economy would exacerbate distributional inequalities part of domestic energy and transport constitutes a basic need. Alongside radical eco-social investment, and carbon rationing, some possible compensatory policies are also discussed.

Post-Kyoto: From production to consumption

But this is only one half of the story. The Kyoto Protocol is concerned only with the emissions of carbon and GHGs within national territories. But globalisation has fostered a widening gap between these and the consumption of populations and thus the GHGs embodied in this consumption. (Consumption here refers to all expenditure components of GDP including government consumption and investment). Table 1 below compares our own estimates of the two sums for the UK in 2006. It shows a wide divergence: UK CO2 emissions are 33 per cent higher when offshore production of goods we consume is taken into account. This is close to the 37 per cent gap reported for 2000 by an OECD report (Nakano et al 2009: Table 8). The table also reveals the UK's consumption based emissions of all greenhouse gases to be an astonishing 51 per cent higher than its production of greenhouse gases – one of the widest gaps in the world.

Table 1: Comparison of production- and consumption based UK emissions[i]

UK, 2006	*Carbon emissions CO2*			*All greenhouse gas emissions: CO2e*		
	Production-based	Consumption-based	Difference	Production-based	Consumption-based	Difference
Total emissions	551mT	733mT	+182mT	650mT	984mT	+334mT
Emissions per capita	9.1T	12.1T	+3.0T	10.7T	16.2T	+5.5T

According to Helm et al (2007), this reverses the supposed 'success' of the UK record. While on the UNFCCC basis, UK greenhouse gas emissions have fallen by 15 per cent since 1990, on a consumption basis, emissions have *risen* by 19 per cent over the same period' (see also Nakono 2009). Part of the UK's 'success' is due to the outsourcing of production to the developing world. Conversely, a significant part of China's exploding emissions come from the production of goods for export to the North. Not surprisingly there is increasing criticism of the Kyoto production-based calculation. Hence we need to broaden our analysis to consider the wider distributional impact of *all* GHG emissions, both direct and indirect. But 'any changes to this notion of responsibility for

trade-related emissions would profoundly reshape assessments of national responses to climate change' (Christoff and Eckersley 2011).

The distribution of total household GHG emissions in the North: a UK case study

How then are consumption-based emissions distributed within the UK? I report here a few results from a longer study (for all details see Gough et al 2011; see also Baiocchi et al 2010; for the Netherlands see Vringer and Blok 1995; for the US Weber and Matthews 2008). To do this we marry together two databases: the government's 2006 *Expenditure and Food Survey,* and the Stockholm Environment Institute's (SEI's) *Resources and Energy Analysis Programme* (REAP), an input-output based software tool that calculates the environmental pressures (footprint) associated with consumption activities. By linking the EFS expenditure categories to the COICOP categories used in the SEI data, we are able to calculate the average per household emissions for each COICOP (Classification of Individual Consumption by Purpose) category. The values calculated as a result of this approach are per household. Per capita values were calculated by dividing these figures by the mean household size for each household type for each income decile. In doing so, children were treated as equal to adults. (But see below for some complications).

Consumption-based emissions in the UK in 2006 averaged 33.2 tonnes CO2e per household, according to our REAP-based data (see Table 2). On a per capita basis, the average household emitted 15.2 tonnes GHG. Of this public services (mainly health and education) accounted for 1.8 tonnes, and private consumption for 13.4 tonnes. The table also shows the breakdown between the major private expenditure items. This shows that direct emissions – household domestic energy use and petrol and diesel for private cars - account for only 20 per cent of total private emissions.

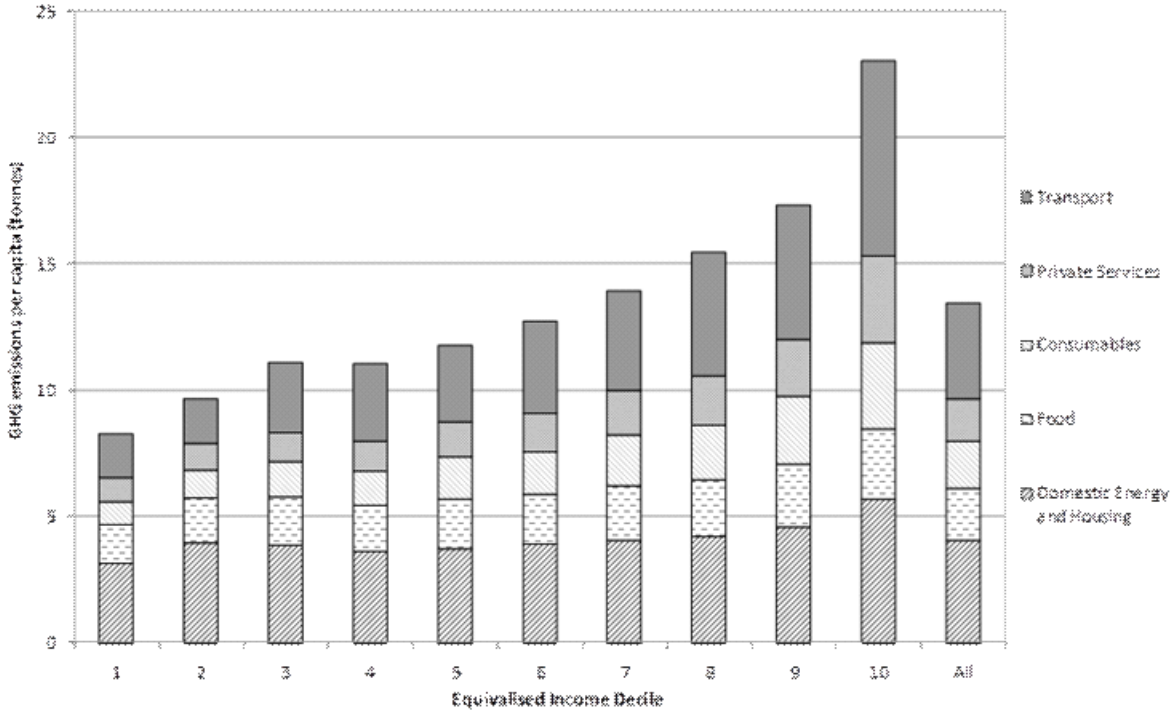
Table 2 Consumption-based emissions

	Per Capita emissions		Household emissions		Per Equivalent adult emissions	
	Average in tonnes	%	Average in tonnes	%	Average in tonnes	%
Direct emissions	2.71	20.2	5.71	19.8	2.88	20.2
Indirect emissions	10.69	79.8	23.19	74.0	11.39	79.8
Domestic Energy and Housing	3.98	26.2	8.17	24.6	4.23	25.9
Food	2.07	13.6	4.54	13.7	2.21	13.5
Consumables	1.83	12.1	4.07	12.2	1.96	12.0
Private Services	1.68	11.1	3.73	11.2	1.81	11.1
Transport	3.78	24.9	8.39	25.2	4.04	24.7
Public Services	1.78	11.7	4.26	12.8	2.02	12.4
Total emissions and other	15.18	100.0	33.22	100.0	16.35	100.0

Figure 3 below presents the distribution of all embodied household emissions by income decile – which are calculated on an equivalised basis to take into account household size and composition. Emissions rise in line with income; in particular, the highest income decile is out of line, emitting 5.7 tonnes per person more than the next highest decile, indicating a long tail of high emitters. Income is significantly correlated with all types of emissions, but much more so with indirect than direct emissions. Comparing the per capita emissions of the highest and lowest deciles, we find these are 4.5 x higher for

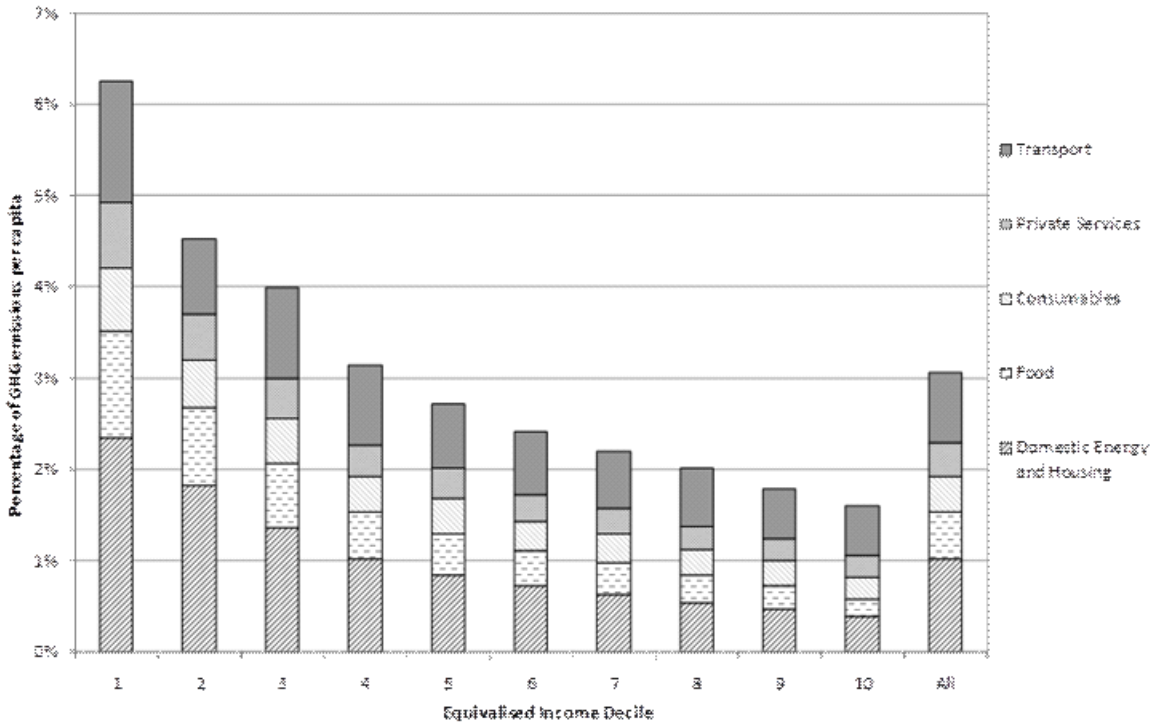
transport and over 3.5 x higher for private services and consumables, compared with a ratio of only 1.8 for the more basic goods of domestic energy and food.

Figure 3 Distribution of household emissions by income



However, if we are concerned with the distributional implications of policies to reduce carbon emissions, we must go beyond total emissions per person to consider the ratio of emissions to income. Dividing average household emissions from all private consumption by average household incomes yields a figure of 3.1 grams CO2e per £ of income. Figure 4 below then disaggregates this figure by income decile and source of emission. Immediately the picture of rising lines is reversed. Per capita emissions, and all categories of emissions, are greatest in relation to income in the lowest income decile and fall as income rises: the lowest decile emits four times as much in relation to its income as the highest. This simply reflects the fact that inequality in incomes far exceeds inequality in expenditures. The decline with income is especially acute for domestic energy and housing and food emissions, 'necessary' expenditures with a lower income elasticity of demand.

Figure 4 Per capita emissions by sector



Other variables (for which we have information from the FES) that impact on per capita emissions include household size, household type, housing tenure, and the employment status and hours of work of the household reference person. To disentangle the impact of these we turn to multivariate analysis, using the log of per capita emissions as the dependent variable. The best fit model is presented in Table 3 below (see Gough et al 2011 for details). This contains just three significant variables - income, household type and employment status – and shows an adjusted R^2 of 0.42, a reasonable figure for a cross-sectional analysis.

The *income* coefficient is by far the most powerful: an increase of equivalised income of £100 per week or £5000 per year results in an 8.6 per cent reduction in emissions as a share of income. Type of household is also significant: single householders (of all ages) emit most greenhouse gases per person, followed by two-person households, followed by larger households - due to the absence of economies of scale of consumption. The *employment status* of the household reference person is also significant: all three groups of 'workless' households - retired, unemployed and unoccupied –experience higher ratios of emissions to income, compared to households with a head in full-time work. The implication of this regression is that any increase in the price of carbon will bear most heavily on low income, single person and workless households.

Table 3 Impact of per capita emissions by household type

Log Per Capita GHG Emissions	Coefficients	Standard Error	T-Statistic
Intercept	-3.12494	0.032	-96.36
Equivalised income	-0.00086	0.000	-43.29
Households with two or more people aged 60+	-0.13555	0.023	-5.90
Households with only one person under 60	0.02588	0.032	0.81
Households with two adults, no children	-0.12882	0.029	-4.38
Single parent households	-0.36312	0.036	-10.21
Households with two+ adults, and children	-0.42225	0.030	-14.23
Households with three+ adults, no children	-0.27472	0.033	-8.26
Part time employed	0.13416	0.024	5.51
Retired	0.13873	0.028	5.02
Self employed	0.20633	0.024	8.77
Unemployed	0.35095	0.048	7.26
Unoccupied	0.31779	0.022	14.13
Adj R^2 =0.421			

Thus our analysis confirms but modifies previous findings for direct emissions. *All* forms of consumption expenditure and hence emissions rise with income, but at a lower rate than incomes rise. The emission elasticities of all the large categories that we investigate are less than one. Thus any rise in carbon prices, which is necessary to help mitigate UK emissions in line with agreed carbon budgets, will hurt lower income households more. However the degree of regressivity varies according to the category of private consumption expenditure. Expenditures on, and emissions from, domestic energy and food take a proportionately higher share of incomes lower down the income scale than spending on and emissions from transport, consumer goods and personal services. If a way could be found of raising the price of carbon and greenhouse gases embodied in all consumption goods and services, then the result would still be regressive, but not as regressive as current government policy which operates mainly on the cost of domestic gas and electricity.

Social policy implications

How can the goals of carbon mitigation and social equity be reconciled when our attention turns to all consumption-based emissions? All the alternative policies discussed in the previous section are directed towards *direct* carbon emissions, not to the much broader swathe of indirect emissions from all personal consumption.

If we wish to target all embodied greenhouse gases, there are two alternatives: broader carbon taxes and broad-based upstream cap and trade system such as the EU ETS. Various proposals for carbon taxation could yield more equitable outcomes, but this will depend on how the revenue is spent and how wide is the carbon tax net – the inclusion of aviation, in particular, improves its progressivity (Green Fiscal Commission 2009). If we want to move seriously to tracking and curbing total carbon *consumption* within the country, and not simply carbon production, this will require charging or taxing the carbon content of imports. The ETS applies across the EU so it reduces the problems of border levelling; nevertheless they do exist. This raises big issues which cannot be considered here. However, we note that a UNEP-WTO joint report (2009) was positive about the acceptability of border measures to level the playing field between firms subject to national carbon or energy taxes and importing firms subject to less stringent environmental regimes.

The inability of existing policies to reduce the emissions embodied in the high consumption of Northern societies means that more radical policies may be required. Even PCAT schemes would target domestic energy and transport, and it is difficult to see how they could be extended to include the carbon content of supermarket goods and the myriads of services in a modern economy.

I finally consider one of these – *reduced working time*. For the past two decades the dominant activation policies within the EU have been designed to raise the proportion of the working age population in paid work. However to reduce incomes, consumption and expenditure a reversal of this policy goal would be necessary. This could also have other benefits: to distribute working time more evenly across the population, to reduce the ill-being associated with unemployment, and to enable a better balance between paid work and the variety of unpaid activities, such as child care, personal care, engagement in local activities etc. (This goes well beyond the trade-off between work and 'leisure' found in economics textbooks).

Some recent studies have demonstrated the reduction of emissions achievable if average work time was reduced in the long term to 30 hours a week (Nässen and Larsson 2011) or by a factor of 20 per cent (Pullinger 2011). The latter revealed an overall fall of 4-6 per cent in household emissions, concentrated mainly in higher income groups. Several countries have initiated experiments in reducing work time. Between 2000 and 2008 the French government operated a maximum working week of 35 hours, which did not have the entirely negative consequences often attributed to it (Fagnani and Letablier 2004). The present Belgian Time Credit Scheme enables workers to accumulate rights to career breaks etc. More radical proposals have been developed by Nef (2010) and Schor (2011).

However, it is unquestionable that this policy shift too would raise serious distributional problems, including the risk of increasing poverty among the low paid and trade union opposition to its impact on earnings in all income brackets. Given that high income groups would have a greater capacity to reduce work hours without harmful effects, another outcome would be growing time inequality. There is already evidence that some households are both income-poor and time-poor (Burchardt 2008); to simply enact that working time be reduced *pari passu* would worsen this dilemma for low income families.

Thus we return in the end to a more traditional goal of (some) social policies: to redistribute income and wealth. In the first place, resources to deal with climate change adaptation and mitigation will have to come from somewhere, and the argument can be made that the affluent can afford to contribute more. Second, if everyone is being asked to watch their carbon footprint, then the luxury consumption of the rich may fall under the spotlight. Third, since the conspicuous consumption of the affluent is about positional goods and helps drive fashion, it would be disproportionately important to curb excesses. Fourth, there is evidence that large income inequalities erode the social solidarity required for an active public policy oriented to deal with common problems such as climate change. The traditional redistributive case for welfare states is enhanced in a future of radical climate change mitigation.

Yet these are harsh times for the political economy of redistribution, with inequality high across the OECD, and a group of countries, notably the US, UK and Canada, becoming so extreme in income and asset inequality that they constitute a novel form of capitalism labelled 'plutonomy' (Citigroup Research 2005). Furthermore, according to

Hacker and Pierson (2010), the US political system has been hi-jacked by the super-rich so the difficulties of reversing course are greater still. Nevertheless, I continue to believe that the system contradictions within carboniferous and financialised capitalism are growing (Gough 2010). The promise of green growth is that a political coalition built around low carbon growth, energy security and sustainability may provide a lasting impetus for a new industrial revolution safeguarding both the future of the planet and social justice.

Conclusion

In post-Kyoto world where the total consumption of affluent societies needs to be constrained, a radically different welfare system would need to *integrate the redistribution* of carbon, work/ time, and income/ wealth (Nef 2010). At present these are mainly studied, and policies developed, within separate silos, but that would need to change. This scenario takes me beyond the scope of this paper. It would require a new economic model to link economic activity to measures of final well-being and sustainability, as distinct from throughput measures such as GDP (Stiglitz et al. 2009). Given that the welfare states of the 20th century were founded on 'growth states', this would pose profound questions for the political economy of 21st century welfare-eco states. One thing is certain: they would require profoundly deeper forms of public policy integration and coherence.

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