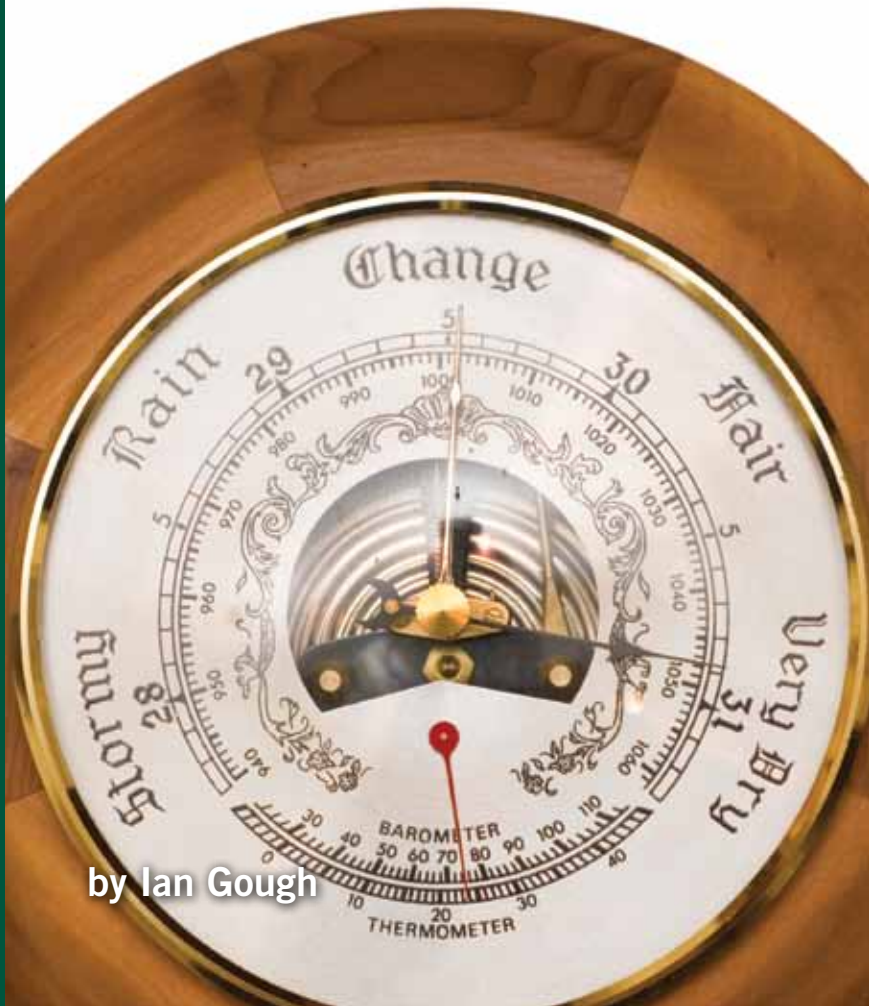
NEW PARADIGMS IN PUBLIC POLICY

Climate change and public policy futures



by Ian Gough

BRITISH ACADEMY
POLICY CENTRE

CLIMATE CHANGE AND PUBLIC POLICY FUTURES

A REPORT PREPARED FOR THE BRITISH ACADEMY

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NEW PARADIGMS IN PUBLIC POLICY

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FOREWORD

Climate change poses some of the most pressing and intractable problems facing public policy. The implicit political-economic scenario in Europe and the UK is 'green growth', founded on the belief that economic activity can be decoupled from carbon emissions via big investment in new technology, along with reframed carbon pricing and integrated policies to shift consumer behaviour. This strategy can access support from a range of political constituencies but will require substantial policy integration. Here, Ian Gough argues that the UK's current market-centred approach to climate change is ineffective. A modified and strengthened 'green growth' option is the most realistic way forward for social democratic and coordinated market economies.

Governments face many challenges and, after all, this is what they are there for. Commentators identify problems facing public policy in the UK on many levels. Two themes are perhaps striking in the current context. One is the assumption that radical changes are needed. For a number of reasons we can't go on as we are. The other is that we are failing to find new ways forward that offer the potential to solve our problems. Public policy is stuck and it is much easier to state the problems that to answer them.

The papers in this series, *New paradigms in public policy*, to be published throughout 2011, review some particularly difficult issues in public policy: climate change, recession and recovery, population ageing, neighbourhood problems and the Third Sector, rebuilding democratic engagement and managing the demands of an increasingly assertive public. The series reviews current understanding of the issues, situated within academic theory-building, and discusses possible ways forward. Rather than advocating one best solution to these problems, we analyse some possible scenarios. We also consider how the framing of an

issue in current debate affects the chances of success in tackling it. Some problems benefit from being approached in new and different ways. The guiding assumption is that analysing and re-framing is what academics do best, and is the most helpful contribution they can make in the policymaking process.

Peter Taylor-Gooby FBA
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June 2011

KEY MESSAGES

There is a strong scientific consensus that the world is warming due to human-induced economic activity and greenhouse gas (GHG) emissions, accepted by a falling majority of public opinion in the UK. The direct impacts of this climate change are likely to be mild in the UK but uncertain and potentially large outside our borders.

There is no 'silver bullet' in climate change mitigation and the costs are likely to be large. Emissions produced within the UK are much lower than the emissions embodied in UK consumption, but there is currently no international mechanism to compensate for this. Present climate mitigation policies in the UK are predominantly market-based, fall far short of the radical targets, and are regressive in their impact. The mismatch between ambitious goals and timid implementation may reflect public opinion within a democratic political system influenced by neo-liberal ideas.

The implicit political-economic scenario in Europe and the UK is 'green growth' – a belief that economic activity can be decoupled from carbon emissions via big investment in new technology, along with reframed carbon pricing and integrated policies to shift consumer behaviour. This strategy can access support from other political constituencies but will require substantial policy integration. It would appear to be a more realistic way forward for social democratic and coordinated market economies than the UK's finance-based liberal market economy.

Finally, the review suggests that emerging contradictions between dynamic growth in Asia and parts of the developing world and a finite planet must eventually challenge the belief in continued economic growth in the West, in which case still more radical thinking and action will be required. Either way, climate change will transform the future of public policy as we know it.

EXECUTIVE SUMMARY

Given general agreement that climate change poses the most egregious challenge to the sustainability of the planet's natural resources and of contemporary economic and social systems, this paper solely considers its impact on public policymaking in the UK and the rich countries of the West, although it recognises the problems that other regions may face. The UK government has adopted demanding and legally binding targets to reduce CO_2 and other greenhouse gases (GHGs), which have radical implications for public policy futures.

SCIENTIFIC CONSENSUS, SCEPTICISM AND THE DENIAL INDUSTRY

- There is strong scientific consensus that global warming is happening, and is a largely man-made, and potentially destructive phenomena, inevitably requiring control to avoid major impacts on human welfare and the environment. Precise scientific projections are uncertain, but they are the best evidence on which to base policy.
- A critical issue in shaping global carbon targets is the relationship between future stabilisation levels of CO_2 and other warming gases and likely global temperature increases. Climate modelling is an inherently uncertain exercise but agreement points to a maximum temperature target rise of 2^0C and an emissions target of 450parts per million carbon dioxide equivalent (CO_2e) by 2050. Climate change deniers have challenged this vigorously.
- In 2010, a substantial but falling majority (78%) of the public in the UK believed that climate change is happening, but people from rich Western countries are generally unwilling to pay a significant price to protect the world's environment.

- However, modern liberal democracies may be unsuited to tackling collective action problems and particularly climate change due to short-termism, the influence of well-organised interest groups, and the absence of political constituencies voicing the concerns of future generations and of peoples outside the borders of the nation state.

THE INTERACTION OF PUBLIC POLICY AND CLIMATE CHANGE RISKS: A FRAMEWORK

- Four impacts of climate change on the public policy environment in the UK have been identified: direct impacts in the UK, the results in the UK of impacts overseas, the impacts of adaptation policies and the impacts of mitigation policies. This review focuses on the last.
- Mitigation is the prime global responsibility of the rich industrialised world as recognised (inadequately) in the Kyoto framework. Climate change mitigation policies (CCMPs) will have the greatest impact in the medium-term on domestic living standards and on UK public policy.

THE ECONOMICS OF MITIGATION POLICIES: A SHORT NOTE

- CCMPs raise difficult issues given the uncertainties over a) desirable mitigation goals and their respective risks and consequences, b) the rate at which future costs and benefits should be discounted, and c) the likely costs of implementing effective long-term programmes globally.
- The Stern Review asserts that the costs of acting now will be far less than the costs of business as usual (although Stern

has now revised upwards his earlier estimates of futures costs). This review considers the discount rate and the costs of mitigation.

- The case for a positive discount rate, used to calculate the present values of future costs and benefits, arises for two major reasons:
  a) Future generations will have higher incomes than us and therefore the utility of an extra unit of consumption then will be less;
  b) The 'pure time preference' argument that consumption now is preferred to consumption in the future.
- Several criticisms are levelled at Stern: that he assumes an 'optimal' supply function of technologies, and 'optimal policies' to support this; he ignores the 'rebound effect'; and his models do not take full account of increasing returns to scale from present non-renewable energy patterns.
- The *Stern Review* 'assumes that rebound effects are small, mitigation is relatively cheap, and decoupling is achievable. In contrast ... rebound effects are large, mitigation is relatively expensive, and decoupling is difficult' (Sorrell 2009: 361).

UK CLIMATE CHANGE MITIGATION POLICIES

- The UK Climate Change Act 2009 was hailed as the world's most demanding and legally binding commitment to reduce CO_2 and other GHGs. As well as statutory targets, it established the independent Climate Change Commission (CCC) to advise government on setting and meeting carbon budgets.
- The UK was a leading country in achieving reductions in emissions from 1990-2005, but the CCC 2010 report shows that it will still be tough to reach the 2050 target. Furthermore, the figures they cite are production-based

emissions and do not include the carbon emitted in producing goods elsewhere that are consumed in Britain. In 2006 UK CO_2 emissions were 33% higher when offshore production of goods we consume was taken into account, and emissions of all greenhouse gases were astonishingly 51% higher.

- In theory there are at least three methods of influencing GHG emissions: market incentives; information, education and behaviour change; and direct regulation.

Economic incentives

- The main driver of carbon reduction over the three budget periods to 2022 is planned to be the EU Emissions Trading Scheme (ETS) which applies to large industrial concerns including power generation across Europe. It sets an overall cap and requires companies to submit allowances to cover their verified emissions. It is expected that the ETS will deliver two-thirds of the first three UK carbon budgets.
- The broad alternative to cap-and-trade is carbon taxation, which has several theoretical and practical arguments in its favour. Yet the popularity of carbon taxes has been declining since the 1990s. The cap-and-trade system is entrenched and a switch to carbon taxation would thus be expensive and therefore unlikely.
- Total spending on CCMPs is currently tiny in the UK – 0.3% of GDP – and one-half of this is mandated spending by energy companies. Environmental taxes raise about 2.5% of GDP, but their share is falling. The burden of CCMPs including the ETS falls ultimately on households, raising issues of distributive justice and colliding with other goals of public policy. Alternative policies are essential if both climate change and social justice goals are to be served.

Information, education, and behaviour change

- Orthodox economic consumer behaviour theory condones providing information to improve the decisions of rational individuals. This has failed in effectively reducing high carbon consumption.
- This failure can be explained by the second, social model of consumer behaviour, which recognises multiple drivers, such as identity, belonging, social norms and self-esteem. However, this model still ignores broader determinants of consumption.
- The third approach recognises material constraints on consumer behaviour – the way that 'systems of provision' lock households into patterns of consumption.
- There is a wide gap between these appeals – to rational consumers at one extreme and to engaged citizens at the other. Moreover, it has been suggested that the policies may conflict and thus fail to deliver their intended outcomes.

Regulation

- Traditional 'command-and-control' regulation prescribes a level of pollution abatement and uses institutional measures aimed at directly influencing the environmental performance of polluters.
- Many effective regulations exist, notably at the EU level, covering the energy performance of buildings and limits for car emissions, and filament light bulbs will soon be banned.

- The UK Climate Change Act and the *Low Carbon Transition Plan* are radical initiatives but can be criticised on several grounds. There is a major disjuncture between the vaulting ambitions of the targets and the policies and programmes thus far announced.

- The main emphasis in UK mitigation policy is on economic incentives. Lifestyle changes and direct regulations have had little attention.
- Above all, the issue of the UK's (and other developed countries') wide 'emissions gap' in foreign trade lies outside all current thinking.

FUTURE SCENARIOS

'Irrational optimism': More growth is the solution

- A neo-liberal alternative is emerging, growing out of climate change denial but going beyond it, which can be summarised as more growth, freer markets and technological optimism.
- Faster global growth will equip future populations to cope with climate change, mainly through adaptation, though this should be guided by policy initiatives to encourage techno-fixes such as geo-engineering (Lomborg 2010).
- This is close to the Republican mainstream position in the US federal government. Energy security is a major policy driver amid scepticism and/or denial about climate change.

Green growth – ecological modernisation – low-carbon industrial revolution

- In practice all European countries subscribe to variants of this position, which essentially argues that environmental interests, including climate change mitigation, can be incorporated within a successful capitalist economy.
- Low-carbon technology is likely to drive the next technological revolution and early innovation and investment in this field will enhance national competitiveness; also integration across environmental, economic and social policy

domains is needed. This will require a much more active state than the dominant model under neo-liberalism.

- Fears over the future of oil and gas, along with a call for a 'Green New Deal' emerging from the financial crisis, have strengthened this strategic approach.
- Some believe that social democratic welfare states and coordinated market economies are best-equipped for this approach, but, despite the absence of several predisposing structures, the UK seems to be a leader both in terms of past and present performance and in aspirations. However, to fundamentally switch the UK's political economy and path of development is a daunting challenge and current indicators of this are zero or negative.

'Degrowth' and radical transformation

- The fundamental premise underlying this third scenario is that endless economic growth is impossible within a bounded system – including a planet. It has been stressed that there is as yet *no* global decoupling of economic activity and emissions.
- This thesis argues that prosperity is about living well and hopefully, and is by no means equivalent to growing GDP or throughput of economic activity. A low-growth or no-growth scenario would therefore require a radical transformation in a range of public policies, and more policy integration.

1 INTRODUCTION

Climate change poses the most intractable questions about our future and the role of public policy. It has been described as 'a truly complex and diabolical policy problem' (Steffen 2011; cf. Garnaut 2008). In the words of the *Stern Review* (2007: 25) climate change is a new risk that is 'big, global, long-term, persistent and uncertain'. Together these five descriptors make it a threat unique from any other. It thus poses an utterly novel challenge for public policymaking. According to Giddens *et al* (2009: 14), current presentations of the climate change 'threat' come across as 'both overwhelming and existential, yet at the same time unspecific and distant' – a baffling combination to address.

This chapter addresses just a few of the issues posed by climate change for thinking about public policy futures. Many big issues are left to one side. Most ethical and normative perspectives and arguments are not directly addressed, including intergenerational justice and its links with other conceptions of social justice, and the relationship between sustainability, development and well-being (though these do crop up). Moreover, all other aspects of environmental policy are ignored, including air and water pollution, waste management, biodiversity protection, and the protection of natural resources, wildlife and endangered species. This paper concentrates solely on climate change or global warming, given general agreement that it poses the most egregious challenge to the sustainability of the planet's natural resources and of contemporary economic and social systems – though some argue the loss of biodiversity and the breakdown of the nitrogen cycle are equally urgent and menacing (Rockström *et al* 2009).

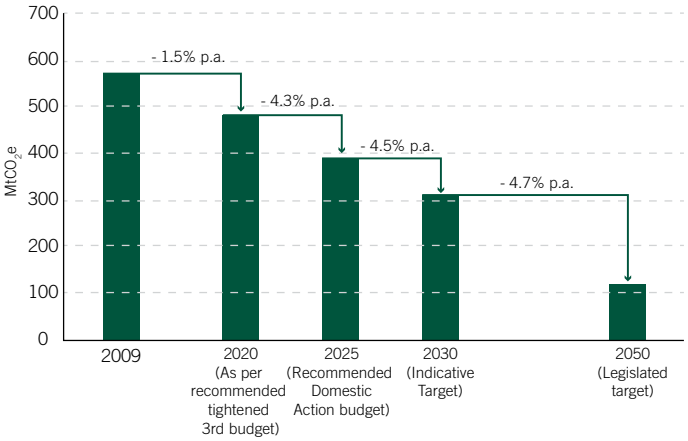
Most models predict substantially greater direct negative impacts on habitats and livelihoods in tropical and subtropical regions, which are also in general poorer than the temperate zones and bear little responsibility for the historic accumulation

of greenhouse gases (GHGs) in the atmosphere – a double injustice. Emissions in a third zone, the fast-rising capitalist economies of Asia, are escalating from a moderate level. These patterns give rise to profound issues in global governance, which this paper also ignores. The international governance of climate change comprises a plethora of relatively uncoordinated institutions, including the UN Framework Convention on Climate Change (UNFCCC) and the Global Environmental Facility (Held and Hervey 2011). Suffice it to say that the former hit a brick wall in Copenhagen in December 2009 and that the way forward is as yet unclear.[1] But this paper only considers the impact of climate change on public policymaking in the UK and the rich countries of the West.

To anticipate, climate change is already setting severe constraints on policymaking. 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% by 2050 and by at least 34% by 2020, compared with the base year of 1990. Furthermore, it has set three intermediate carbon budgets of an average of 604 million tonnes of carbon dioxide equivalent ($MtCO_2e$) in 2008-12, 556 Mt CO_2e in 2013-17 and 509 $MtCO_2e$ in 2018-22, and in May 2011 the coalition government committed the UK to the radical reduction targets for the fourth Budget period 2023-27. Graph 1 sets out the remarkable transformation in our economic and social structure to which this commits us. These commitments have radical implications for public policy futures.

1 One achievement was agreement on the Fast Start finance programme, promising $30 billion up to 2012 to help developing countries adapt to climate change and protect forests. The UK government would appear to be at least achieving its share: the Overseas Development Assistance budget is one of the few areas of public spending planned to grow in real terms up to 2014 and £1.5 billion is planned to be spent on Fast Start.

Graph 1: Rate of reduction of greenhouse gas emissions, excluding international aviation and shipping (2009 – 2050)



Source: UK Committee on Climate Change (2010: 25)

The remainder of this paper is organised in six sections. First, I summarise the scientific consensus and the case of climate change sceptics; I also consider public opinion and the interests behind the 'denial industry'. The second section develops a framework for thinking about the policy impacts of climate change risks and briefly summarises direct and indirect impacts. The rest of the paper concentrates on the impact of climate change *mitigation* policies (CCMPs) on public policy futures, because I regard these as the most significant. We begin in section three with a note on the economics and political economy of CCMPs. The fourth section surveys and appraises current carbon mitigation policies in the UK. In the next section I present three contrasting future scenarios and some of their policy implications, before concluding.

This paper develops an interdisciplinary political economy approach. Drawing on Caporaso and Levine (1992) and Gamble (1995), modern political economy is characterised

by two assumptions. The first is that political and economic processes, though analytically distinct under capitalism, are interlinked and should be studied as a complex and interrelated whole. The second is that the economy, the sphere of 'material provisioning', has a special weight in explaining and properly understanding the polity and politics. The approach adopted here also rests on a 'punctuated equilibrium' view of history with two further corollaries. First, national institutions, including economic, welfare and environmental structures, demonstrate complementarities and follow distinct adjustment paths to common challenges such as globalisation. Examples are national varieties of capitalism and welfare regimes, which exhibit strong path dependency over time (Crouch and Streeck 1997, Hall and Soskice 2001, Esping-Andersen 1990). Once a particular course of development is established, they tend to stick to it. Second, interactions between different causal sequences can sometimes lead to periods of systemic change ('switching points') when institutions and regimes may get shunted on to new tracks (Pierson 2004; cf. Gough 2010).

2 SCIENTIFIC CONSENSUS, SCEPTICISM AND THE DENIAL INDUSTRY

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. The science of climate change, and the extent of agreement versus debate on its various aspects, is presented in numerous places (see, for example, the Intergovernmental Panel on Climate Change (2007), Stern (2007) and the Royal Society (2010)).[2] To quote summaries from a report of the UK Committee on Climate Change (CCC), 'It is close to certain that increasing atmospheric concentrations of GHGs since the industrial revolution are due to human activity … It is close to certain that the planet has warmed since the late 19th century … There is a high degree of confidence that human emissions have caused most of the observed warming since the mid-20th century' (CCC 2010: 54-59). Looking to the future it concludes 'precise scientific projections are uncertain, but they are the best evidence on which to base policy. Current evidence points to major potential impacts on human welfare and ecological systems if efforts are not made to curb emissions' (CCC 2010: 62).

2 Some amendments have been made to correct errors in these reports since their initial publication.

Table 1

Stabilisation level (ppm CO_2 equivalent)	Temperature increase at equilibrium relative to pre-industiral (˚C)		
	IPCC TAR 2001 (Wigley and Raper)	Hadley Centre Ensemble	Eleven Studies
400	0.8 – 2.4	1.3 – 2.8	0.6 – 4.9
450	1.0 – 3.1	1.7 – 3.7	0.8 – 6.4
500	1.3 – 3.8	2.0 – 4.5	1.0 – 7.9
550	1.5 – 4.4	2.4 – 5.3	1.2 – 9.1
650	1.8 – 5.5	2.9 – 6.6	1.5 – 11.4
750	2.2 – 6.4	3.4 – 7.7	1.7 – 13.3
1000	2.8 – 8.3	4.4 – 9.9	2.2 – 17.1

Source: Stern (2007: 16)

A critical issue in shaping global carbon targets is the relationship between future stabilisation levels of CO_2 and other warming gases (expressed as parts per million of CO_2 equivalent) and likely global temperature increases. Table 1, taken from the *Stern Review*, summarises a number of these estimates. The Hadley estimate shows that if CO_2e (carbon dioxide equivalent) reaches 550 parts per million (ppm), then global temperatures are likely to rise by between 2.4^{0}C and 5.3^{0}C above pre-industrial levels. The current global level of CO_2e is 430ppm and it is rising by about 25ppm a decade. Yet the *Stern Review* used a stabilisation target of 550ppm which entailed a mean global temperature rise of around 4^{0}C, now recognised as dangerously high.

The consensus view on desirable global emissions has hardened in the last few years. Lenton *et al* (2008) argue that the Greenland ice sheet could melt if regional temperatures rise by around 3^{0}C. And Stern (in Kaul *et al* 2009: 136) writes:

> Five degrees is absolutely enormous. It would redraw the physical geography of the world. Large parts of the world

> would become desert, including most of southern Europe and the southern part of France. Other areas would be inundated. You'd see massive movements of population. If we've learnt anything from the last 200 or 300 years, it is that big movements of population have a high probability of conflict. This isn't a black swan, a small probability of a big problem; this is a big probability of a huge problem.

Stern himself now uses a 500ppm target. This, he estimates, would require annual global emissions by 2050 of some 20 billion tonnes CO_2e (compared with 40 billion tonnes in 1990). When dividing this by the then global population – some nine billion people - this equals just over two tonnes per capita (pc). The US currently emits over 20 tonnes pc and most of Europe around 10-12 tonnes pc. The EU commitment to cut emissions by 80% by 2050 would thus roughly achieve this global target, but it would need to be matched by all other countries to attain the 500ppm goal.

However, arguments are now mounting that this is still too risky a goal. Meinshausen *et al* (2009) stress that the total stock of emissions matters more than the final stabilisation target. To stand a 75% chance of keeping temperatures below 2^0C, cumulative emissions of all GHGs must be limited to 1.5 trillion tonnes between 2000 and 2050 – a drastic scenario. Weitzman (2007) argues for deep emission cuts, building on the fact that the probability functions of distant-future temperature changes are 'fat-tailed' and thus presents a higher probability of a rare event, including catastrophic temperature rises. Thus agreement has been coalescing (up to now) around a still lower target rise in maximum temperature of 2^0C and the lower emissions target of 450ppm CO_2e by 2050. Jackson (2009) models a 450ppm target and concludes that this would require enormous reductions in global emissions to reach just four billion tonnes in 2050 – under *one-half* of a tonne per person on the planet. These differences in targets have scale effects on mitigation costs, as discussed below.

The range of probabilities illustrates that climate modelling is an inherently uncertain exercise due mainly to natural climate variability, uncertainty about the evolution of emissions, and model uncertainties, including how to model feedbacks and other complex interactions. Yet, there is broad scientific agreement on the basic picture.

The above consensus is vigorously challenged by climate change deniers. These are represented in the UK by those such as Nigel Lawson and the Global Warming Policy Foundation, but are notably active in three of the highest emitting developed countries – the US, Canada and Australia (Christoff and Eckersley 2011). Behind these deniers is often well-financed lobbying by interest groups representing coal, oil and high energy-using industries, as revealed by Oreskes and Conway (2010). Business interests also regularly express concern about the short-term implications of climate change policies for profitability and competitiveness. The Institute of Directors continually warns that UK competitiveness will suffer if we act alone (see, for example, Muspratt and Seawright 2006).

Most surveys show public opinion in Western countries to be ambivalent – wishing to protect the earth's environment but unwilling to pay a significant price to achieve this. There has been some increase in climate change scepticism in the UK from 2005-2010, but it began from a low base. A substantial majority (78%) of respondents believe that climate change is happening, though this is a fall from 91% in 2005. Overall levels of concern about the issue have also fallen, as have risk perceptions (Spence *et al* 2010). There is also, however, a surprising level of concern about energy security. Most people say they would be willing to pay more for renewable energy and would vote in favour of spending taxpayers' money on projects designed to tackle climate change. Yet, a large majority do not accept that the main responsibility for taking action against climate change lies with individuals and families. Possible explanations for growing scepticism include

issue fatigue, recession, a desire to diminish 'cognitive dissonance' or the uncomfortable feeling caused by holding conflicting ideas simultaneously, the failure of the 2009 UN Climate Change Conference in Copenhagen (COP15) and the 'climategate' email revelations.[3] However, outside of the US, scepticism about man-made climate change and lack of interest in mitigation policies does not approach a majority position.

Climate change is contested terrain and, given the uncertainties and the very long time scales, will perhaps always be so. The CCC (2010: 17) summarises these conflicting trends: 'While developments in science since our 2008 report have marginally increased the strength of the case for forceful global action to reduce emissions, the likelihood of getting early global agreement has decreased'.

It can be argued that modern liberal democracies are unsuited to tackling collective action problems and particularly climate change due to short-termism, the influence of well-organised interest groups (notably business), and the absence of political constituencies voicing the concerns of future generations and of peoples outside the borders of the nation state (Held and Hervey 2011). The favourable record of democracies in tackling specific environmental problems may not apply to such a diffuse problem as future climate change (for instance, see Haas 1990). Bättig and Bernauer (2009) suggest that political democracies generate positive policy commitments to tackling climate change but their effect on outputs and outcomes is ambiguous. Radical long-term commitments to carbon reduction, such as those of the UK, *do* reflect public concerns, but implementation will likely be derailed by other political pressures (Held and Hervey 2011).

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3 Posted emails from the University of East Anglia Climatic Research Unit fuelled an internet storm of activity by climate change 'sceptics'. For a detailed account and evaluation, see the Muir Russell Report http://www.guardian.co.uk/environment/2010/jul/07/findings-muir-russell-review.

3 THE INTERACTION OF PUBLIC POLICY AND CLIMATE CHANGE RISKS: A FRAMEWORK

Our concern here is the impact of climate change on the economic and social future of countries like the UK, and thus its implications for future public policies. 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 →
Regional climate change →
Impact on human habitats →
Social well-being

It is common to distinguish two categories of climate change *policies*: mitigation and adaptation.[4] *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.

4 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.

Gough *et al* (2008) identify four impacts of climate change on the public policy environment in rich countries such as the UK:

- Direct impacts of climate change itself, distinguishing
  - impacts in the UK
  - the results in the UK of impacts overseas
- The impacts of climate change *policies*, distinguishing
  - adaptation policies
  - mitigation policies

This review will concentrate on mitigation policies, but I will deal briefly with the first three. The *direct* impacts of climate change on habitats and well-being will hit tropical and subtropical areas harder and earlier, 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. Arctic areas of Europe and Canada may experience dramatic temperature rises with direct consequences for indigenous communities. 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 heatwaves (Benzie *et al* 2011). The Department of Health first published its heatwave 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, are not likely to 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, as more live in higher risk areas, such as floodplains, and fewer have adequate insurance (Walker and Burningham 2011).

Necessary *adaptation* policies will follow from these direct impacts, such as 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% and 0.5% 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' (quoted in United Nations Development Programme 2007: 166).

This leads on to the *indirect* effects on the UK of global climate change beyond our borders. A major potential impact for the EU and the UK is rising levels of distress migration from tropical Africa and South Asia. (This is the subject of a major Foresight report overseen by the UK government's Chief Scientific Advisor Professor Sir John Beddington, which will be published in September 2011). Other potential impacts are the subject of another upcoming Foresight report (2011) which covers 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 which may harm the City of

London, slowing global economic growth, collapse of weak states, and growing international tensions weakening global governance. The report recognises that these threats can be accompanied by opportunities, such as the potential role of London in global insurance and carbon trading markets. This list reveals the problems of envisaging future scenarios in a global context. In the light of these, I will not say anything more here about indirect impacts from overseas.

The remainder of this chapter will concentrate on the impacts of CCMPs on public policy futures for two reasons: first, that mitigation is the prime global responsibility of the rich industrialised world as recognised (inadequately) in the Kyoto framework; second, that CCMPs will have the greatest impact in the medium-term on domestic living standards and on UK public policy.

4 THE ECONOMICS OF MITIGATION POLICIES: A SHORT NOTE

CCMPs raise difficult issues given the uncertainties over a) desirable mitigation goals and their respective risks and consequences, b) the rate at which future costs and benefits should be discounted, and c) the likely costs of implementing effective programmes – all of these over a global scale and over long time periods. The benchmark here is the *Stern Review*, whose central conclusion was that the costs of taking action now to reduce emissions will be far lower than the costs of business as usual, 'If we don't act the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever' (Stern 2007: vi) and could reach more than 20% of GDP. The costs of action were estimates at 1% of global GDP each year up to 2050. I have already stated that this rather benign view was based on too high a global emissions target that Stern has now revised downwards raising future cost estimates. This section briefly considers the other two issues: the discount rate and the costs of mitigation.

A discount rate is used to calculate the present values of future costs and benefits. The case for a positive discount rate arises for two major reasons: first, that future generations will have higher incomes than us and therefore the utility of an extra unit of consumption then will be less; second, the 'pure time preference' argument that consumption now is preferred to consumption in the future. The *Stern Review* (2007) allows for the first and embodies assumptions of continuing high global growth rates of 1.3% per annum (in the North as well as the South). However, it argues on ethical grounds against making any allowance for the second. This has been criticised by orthodox economists who, assuming that consumers are the best judges of their preferences, contend that this contradicts the

low savings rates of the current generation (Nordhaus 2007 and Dasgupta 2006). However, Stern firmly endorses the prescriptive, normative approach to evaluating discount rates over such long time spans, as do others (for example Broome (1992)).

Neumayer (2007) welcomes this, but contends that Stern still misses the real question of whether climate change inflicts irreversible and non-substitutable damage to 'natural capital' i.e. the multiple and various services of nature that benefit human beings. If damage to natural capital is non-substitutable, then it cannot be compensated by any amount of growth in future consumption. This implies larger benefits to mitigation. It also supports a more radical rights-based approach to thinking about the future where future generations have a fundamental and inalienable right to the non-substitutable services of nature and the current generation has a duty of intergenerational stewardship.

Turning to the costs of mitigating climate change, the '1% of GDP' estimate of the *Stern Review* has come under criticism. Using the tougher target of 500ppm, Stern now estimates costs at around 2% of world GDP. His back-of-the-envelope justification is as follows: achieving 500ppm CO_2e by 2050 would require taking out 50 billion tonnes of CO_2 a year compared to 'business as usual'; assuming a cost of $40 a tonne this would cost $2,000 billion (or $2 trillion); assuming world GDP has doubled in the meantime to about $100 trillion, this amounts to about 2% of 2050 world GDP (Stern in Kaul 2009: 155). It is important to stress that this figure is expressed as a share of future GDP and seems to imply that the mitigation costs will rise over time with GDP rather than being front-loaded.

These cost estimates have been heavily criticised by Helm (2009) among others on several grounds. Firstly, the *Stern Review* assumes an 'optimal' supply function of technologies, and 'optimal policies' to support this. In practice the activities of energy suppliers and others are partly driven by rent-seeking, and policies are affected by special interest groups and

their lobbying (some of which come into being as a result of the CCMPs, such as those around the EU Emissions Trading Scheme (ETS) – see below). These factors may also reduce the future rate of growth and thus raise the cost of mitigation as a share of future GDP. The list of potential indirect impacts of climate change on the UK, noted above, will also likely affect the efficiency of policy responses.

Secondly, some argue that the 'rebound effect', first noticed by Jevons (1865), undermines the effectiveness of many energy-saving policies and that this is likely to be large (Sorrell 2009). Rebound can occur in many ways, as when consumers use the cost savings from improvements in domestic energy efficiency to turn up the thermostat, or purchase other goods and services which may be even more energy intensive, or when producers use cost savings to raise output and emissions. (The average internal temperature of British houses rose by 6^0C from 1970 to 2001 (Shorrock and Utley (2003)).

Such critics also doubt that the models take full account of increasing returns to scale from present non-renewable energy patterns. Much capital stock in the developed world is locked into high carbon patterns that include long asset lives in the electricity distribution systems, existing road networks which result in very low marginal costs of driving, and dispersed urban settlement patterns. As Helm (2009: 14) comments, 'A carbon economy embeds fossil fuels into the fabric of its infrastructure'. Thus changes cannot be limited to the marginal changes analysed by orthodox economic models. Stern recognises that 'mitigating climate change does not constitute a small perturbation around business-as-usual, but a shift from one economic growth path to another' (in Hepburn and Stern 2009: 40), but this sits uneasily alongside the marginal cost approach in the *Stern Review*.

The conclusion is that 'economic growth may not be so easily compatible with the effects of, and mitigation costs of,

climate change' (Helm 2009: 31). Sorrell concludes that the *Stern Review* 'assumes that rebound effects are small, mitigation is relatively cheap, and decoupling is achievable. In contrast, the perspective presented above suggests that rebound effects are large, mitigation is relatively expensive, and decoupling is difficult' (2009: 361). In this light it would be wise to assume that CO_2 abatement will be, in Martin Weitzman's words, 'very expensive' (in Kaul *et al* 2009: 149).

5 UK CLIMATE CHANGE MITIGATION POLICIES

The UK figures as a future leader when policy aspirations are taken into account. The UK Climate Change Act 2009 was hailed as the world's most demanding and legally binding commitment to reduce CO_2 and other GHGs. As well as statutory targets the act established the CCC 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, headed then by Ed Miliband, published the UK *Low Carbon Transition Plan* which set out detailed targets and programmes to achieve these goals.[5] 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.

According to a range of indicators for large developed economies, the UK was the leading country alongside Germany in achieving reductions in emissions from 1990-2005, mainly due to the 'dash for gas' replacing coal in electricity generation (Christoff and Eckersley 2011 – though note, their survey excludes small European countries with good records). The recent CCC report illustrates just how tough it will be to build on this success to reach the 2050 target: the UK needs to reduce total GHG emissions to 80% below 1990 levels; excluding international aviation and shipping they need to fall by 85%; and excluding other GHGs carbon emissions need to fall by around 90%; finally, these emissions must be achieved entirely domestically without resort to buying carbon credits from abroad (CCC 2010: 18).

5 I understand that the coalition government is no longer formally following the plan as a policy document.

There is, however, a fundamental concern about all such figures, namely that these are production-based emissions, and do not include the carbon emitted in producing goods elsewhere in the world which are then consumed in Britain. The two diverge widely: in 2006 UK CO_2 emissions were 33% higher when offshore production of goods we consume was taken into account, and emissions of all greenhouse gases were astonishingly 51% higher. This is a difference between 10.7 tonnes per head and 16.2 tonnes per head – one of the biggest gaps in the world, due to deindustrialisation in Britain and the high import ratio (Gough *et al* 2011). According to Helm *et al* (2007), taking this into account reverses the success of the UK record: the greenhouse gas emissions produced in the UK have fallen by 15% since 1990, but those consumed here have risen by 19% over the same period (Helm *et al* 2007: 23).

Nevertheless, we will start from the UK government Kyoto-based targets. What CCMPs have so far been implemented? The picture is one of 'a proliferation of climate change policies, targets, direct subsidies, market-based support, levies, pricing schemes, and various trading schemes' (Hepburn 2009: 365).

In theory there are at least three methods of influencing GHG emissions: market incentives; information, education and behaviour change; and direct regulation. Each can take many forms. I will consider each of these three in turn.

ECONOMIC INCENTIVES

There is a division within economic incentive policies between those influencing the price of carbon, such as a carbon tax, to which the quantity of emissions adjusts, and those capping or otherwise influencing the quantity of carbon emitted, to which its price adjusts. The main driver of carbon reduction over the three budget periods to 2022 is planned to be the EU ETS which

applies to large industrial concerns including power generation across Europe. It sets an overall cap and requires companies to submit allowances to cover their verified emissions. Companies can trade their allowances and also use credits from economies achieved in developing countries. 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. The impact of phase two on UK emissions is likely to have been small, though the National Audit Office (NAO) regards the system as too complex to properly evaluate. Nevertheless, it has put in place the world's most ambitious cap-and-trade system, and it is expected that the ETS will deliver two-thirds of the first three UK carbon budgets (Department of Energy and Climate Change 2011).

The broad alternative to cap-and-trade is carbon taxation, which has several theoretical and practical arguments in its favour (Weitzman 1974). Yet, the popularity of carbon taxes waxed in the 1980s and early 1990s and has waned ever since (Environmental Tax Policy Institute 2009). The UK Climate Change Levy, an indirect tax on notional units of energy supplied to non-domestic consumers which exempts electricity generated from renewables, was introduced in 2001 but raises trivial sums. Helm (2009) and Hepburn (2009) both ask why cap-and-trade has triumphed over carbon taxation despite its manifold weaknesses. They conclude that it initially reflected the hegemony of market mechanisms. Once established the ETS created opportunities for gaming and vested interests which then lobbied heavily for its continuation and for less restrictive implementation. Futures trading in carbon also generated a powerful financial industry interest. Industrial lobbying and 'lock-in' raise the costs of change. The only realistic option

now, they argue, is to build in a price floor to the ETS carbon price, which the coalition government is committed to.

Present UK fiscal commitments to climate change mitigation are very small (Gough and Marden 2011). Total spending on CCMPs is tiny – 0.3% of GDP – and one-half of this is mandated spending by energy companies. Environmental taxes, notably fuel duties, are more important, raising about 2.5% of GDP, but their share is falling. The burden of CCMPs including the ETS falls ultimately on households – and this is intended. Thus CCMPs immediately raise issues of distributive justice and collide with other goals of public policy. Household energy use rises with income but falls rapidly as a share of income. However, household size and type and employment status also influences emissions, as well as lifestyle and 'lock-in' (the shaping of consumption patterns by spatial, economic and social factors not amenable to short-term modification). These findings undermine simplistic arguments for raising carbon prices and using revenues to compensate low income households as the 'losing' households are too heterogenous. Yet more is spent on poorly targeted winter fuel payments to compensate for fuel poverty than on all programmes to improve insulation for households (such as Decent Homes, which provides funds to improve standards in social housing, and Warm Front, which has now ended). The current policy mix is both inefficient and inequitable. Alternative policies are essential if both climate change and social justice goals are to be served (Gough *et al* 2011).

INFORMATION, EDUCATION, AND BEHAVIOUR CHANGE

This heading embraces at least three very different policies based on distinct theoretical foundations (Seyfang and Paavola 2008). First, there is orthodox economic consumer behaviour theory, which condones providing information to improve the decisions

of rational individuals. There is much evidence that this has failed in effectively reducing high carbon consumption. Numerous studies show that many energy reduction programmes in the home would pay for themselves, yet householders are loath to take up the schemes on offer. This can be explained by the second, social model of consumer behaviour, which recognises multiple drivers, such as identity, belonging, social norms and self-esteem. This model can endorse targeted measures, such as DEFRA's *Framework for Pro-Environmental Behaviours* (2008). This distinguishes between seven segments of the population according to their understanding of environmental issues, their willingness to act and their ability to act, as applied to different types of behaviour (using a car less for short journeys, wasting less food, etc.). However, it still ignores broader determinants of consumption, for example, pitting 'individuals against global corporations in the struggle to shift consumption patterns' (Seyfang and Paavola 2008: 672).

The third approach recognises material constraints on consumer behaviour – the way that 'systems of provision' lock households into patterns of consumption, as when rural and suburban residents have no viable alternatives to driving the car. This moves attention from individual motivations to institutions and everyday practices and supports very different climate change mitigation policies. For Dobson (2006) it requires the cultivation of 'green citizenship' to overcome several problems with economic incentives, such as the existence of very low price elasticities (found for example in taxes on 'gas-guzzler' vehicles), the way such policies may encourage more self-interested behaviour, and the existence of rebound effects. The strong sustainability necessary to forestall future climate change, he claims, will require a more ethical sense of mutuality, collective interest and the common good. This in turn entails public action and collective engagement, such as carbon reduction action groups and transition towns, and numerous discrete movements such as

farmers' markets (Whitmarsh 2011). It supports Ostrom's (2009) 'polycentric' approach of building a strong commitment to action in small to medium governance units linked through information networks and monitoring. Yet, Whitmarsh (2011) contends that growing distrust and apathy among voters and citizens is today undermining beliefs in the need for, and the efficacy of, grass-roots activism in the environmental field (cf Stoker 2011).

There is a wide gap between these appeals – to rational consumers at one extreme and to engaged citizens at the other. Moreover, the policies may conflict; incentives that appeal solely to self-interest may degrade intrinsic motivations such as altruism and solidarity – and thus fail to deliver their intended outcomes (Taylor-Gooby 2011). Public policies will need to be aware when economic incentives and intrinsic motivations cannot run side by side and choices must be made.

REGULATION

Traditional 'command-and-control' regulation prescribes a level of pollution abatement and uses institutional measures aimed at directly influencing the environmental performance of polluters by regulating processes or products (OECD 1994). This leaves the polluter with no alternative other than to comply with the regulation or face penalties for non-compliance. Because of the equal burden put on all polluters, irrespective of their specific abatement costs, environmental regulation is usually considered by economists to be cost-inefficient. Yet, when compliance and implementation costs and the scope for evasive action by firms are taken into account, regulation can be effective (Hepburn 2009). Indeed, many effective regulations exist, notably at the EU level, covering the energy performance of buildings and limits for car emissions, and filament light bulbs will soon be banned. However, it will take a serious engagement with critics

of the nanny state for a significant shift to rationing, regulation and controls to make progress.

To summarise the record, the UK Climate Change Act and the *Low Carbon Transition Plan* are radical initiatives but can be criticised on several grounds. There is a major disjuncture between the vaulting ambitions of the targets and the policies and programmes thus far announced. The CCC has called for a 'step change' to address this gap. Current programmes target 'low-hanging fruit' and there is insufficient upfront investment and, in my view, quite inadequate public subsidies. The legal backing to the commitments is hazy and difficult to reconcile with the British political system. The main emphasis in UK mitigation policy has been on economic incentives, and, within this, on cap and trade or indirect market systems. Lifestyle changes and direct regulations have had little attention.

This profile reflects the continuing domination of neo-classical economics and models of consumer behaviour, which study characteristics internal to the individual, such as attitudes, values and habits. Policy to alter behaviour then focuses on improving information or altering prices to internalise environmental externalities. Yet, at the same time, the plans call for some major reversals in neo-liberal ideology, for example in energy policy. Some of this has been forthcoming, such as the cancellation of the third runway at Heathrow, but the coalition government's radical reduction of the scope of the public sector appears to conflict with further progress here. There are many areas where policy integration is ill thought out, such as recognising the regressive consequences of loading the costs of insulation and renewals on households' energy bills. Above all, the issue of the UK's (and other developed countries') wide 'emissions gap' in foreign trade lies outside all current thinking.

6 FUTURE SCENARIOS

I distinguish three scenarios according to views about the future potential for economic growth in the developed world: a) that more growth is the solution; b) that growth can be decoupled from emissions – 'green growth'; and c) that growth is the dominant problem. In practice in Europe all countries subscribe to variants of the second position, and we have also noted the extensive commitments by UK governments to decarbonise the economy whilst maintaining growth. However, it is useful to frame this scenario within the two more controversial positions.

'IRRATIONAL OPTIMISM': MORE GROWTH IS THE SOLUTION

A neo-liberal alternative is emerging, growing out of climate change denial but going beyond it, which can be summarised as more growth, freer markets and technological optimism. Ridley (2010: 347) is optimistic about future warming and its effects: 'The probability of rapid and severe climate change is small; the probability of net harm from the most likely climate change is small; the probability that no adaptation will occur is small; and the probability of no new low-carbon energy technologies emerging in the long run is zero'. The source of the latter two optimisms is a lasting belief in Adam Smith's theory of exchange and in the ability of modern-day markets to prompt never-ending technological improvements. Faster global growth will equip future populations to cope with climate change, mainly through adaptation, though this should be guided by policy initiatives to spur a wide range of techno-fixes, including various forms of geo-engineering (Lomborg 2010).

Another variant is the recent *Hartwell Paper* (2010) which is premised on a Hayekian view of cognitive fallibility and support

for incremental, 'clumsy' solutions (cf. Verweij and Thompson (2006). This is coupled with a realist questioning of whether scientific consensus can ever engender political consensus. Copenhagen was a necessary failure based on a top-down, utopian perspective which ignored social and political realities; the appropriate alternative is a precautionary, disaggregated, indirect, bottom-up approach. In particular, climate change policies must build on other policy goals, notably a desire for more secure energy supplies, where there are more supportive political constituencies. Notwithstanding the overriding argument, the report nevertheless concludes with a decidedly top-down call for sustained public investment in alternative energy sources financed by a hypothecated carbon tax.

This first scenario is close to the Republican (and currently the dominant) mainstream in the US federal government, though not to many state, city and community initiatives across the US. Energy security is a major policy driver amid scepticism and/or denial about climate change. Favoured solutions are first and foremost deregulated drilling for oil and exploitation of Canadian tar sands, plus some federal subsidies and loan guarantees for alternative energy sources notably nuclear, carbon capture and storage, and biofuels, with energy conservation bringing up the rear (Graham 2011). A supporting role for public policy is accepted but this would necessarily lead to further reductions in most other areas of state intervention. These positions hardly amount to a coherent response to mid-range temperature projections, let alone more extreme scenarios. But buoyed with optimism in self-regulating systems they do not need to be.

GREEN GROWTH – ECOLOGICAL MODERNISATION – LOW-CARBON INDUSTRIAL REVOLUTION

The ecological modernisation thesis was developed in Germany in the 1980s and has been much discussed since (Christoff 1996; Mol *et al* 2009). This reform-oriented school of environmental social science essentially argues that environmental interests, including climate change mitigation, can be incorporated within a successful capitalist economy. This is to be achieved via 'policy integration' across environmental, economic and social decision-making (Nilsson and Eckerberg 2007). In this way the interests of business and national competitiveness can be harnessed to support a radical restructuring of the economy, which will gradually decouple carbon emissions from economic activity. Allied notions are sustainable development, first advocated by the Brundtland Commission, which distanced itself from 'limits to growth' arguments, 'green growth' (Brundtland Report 1987; OECD 2010), the 'low-carbon industrial revolution' (Stern 2011) and 'a green new deal' (New Economics Foundation (NEF) 2008).

Weaker and stronger forms of ecological modernisation have been identified, and the UK is usually placed at the 'weak' end of the continuum (Christoff 1996; Revell 2005). However, two features are common to most forms. First, a recognition that low-carbon technology is likely to drive the next technological revolution and that early innovation and investment in this field will enhance national competitiveness. This is now a policy focus across the world including the EU, US, Korea and China. Second, there is a need for integration across environmental, economic and social policy domains. This will require a much more active state than the dominant model under neo-liberalism. Giddens (2009) contends that this implies a return to planning in order *inter alia* to set goals and targets, manage risks,

promote industrial policy, realign prices, and counter negative business interests.

Since 2007, two more 'contingent' events have strengthened this strategic approach. The first was fears over the future of oil and gas – of declining production, rising prices and insecurity of supplies. 'Peak oil' is the point in time when the maximum rate of global production is reached, after which the rate of production enters terminal decline. There is still considerable dispute about when this will be, but oil prices peaked in July 2008 at over $147 per barrel and, despite the recession, have remained persistently high. There is also growing concern in Europe over excessive reliance on oil and gas from the unstable Middle East and authoritarian Russia. The link between climate change mitigation and energy security is not a direct one, but in Europe the two now reinforce each other and are driving a reversal of previous energy policy. In 1982 the Secretary of State for Energy Nigel Lawson announced the privatisation and liberalisation of energy markets, stating: 'I do *not* see the government's task as being to try to plan the future shape of energy production and consumption' (quoted in Giddens 2009: 43). The result was under-investment and growing dependence on imports once North Sea oil began to decline. This has now fostered a new policy in the Energy Act 2008 which recognises shortfalls in generation, plans for replacement investment and requires a directive role for the state. There are growing synergies between these concerns and climate mitigation programmes.

The second event was the financial crisis of 2008 and subsequent recession of 2009 onwards which engendered 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, via, for example, creating and training a 'carbon army' of workers to achieve the reconstruction programme. It is a radical exercise in policy integration for a post-crisis economy. Given the inherent contradictions of savage deficit reduction programmes, it is likely that green new deal proposals will see a revival.

It is difficult to summarise in any detail proposals for a green growth strategy. The sheer scope of the exercise often leads to long lists of disparate policy initiatives. The policy integration required extends to many existing domains. Take social policy as an example (Gough and Marden 2011); a higher carbon price, however achieved, will impact much more severely on low income households, so there is a regressive distributional impact which will worsen already high levels of 'fuel poverty'. Yet it is difficult to compensate low and middle income losers via the social security system, because they are so heterogenous – rural households dependent on car transport, elderly 'empty-nesters', people in poorly insulated housing (even by the very low standards current in Britain).

Thus, alternatives to compensation must enter the policy toolbox. One is 'reverse block pricing' by utility companies i.e. lowering the marginal costs of initial units of electricity or gas 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 and would tackle fuel poverty directly (CCC 2008: 409). Though this solution has been raised by the CCC 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. Another alternative is a serious commitment to 'eco-social investment' as part of a green new deal – for example street by street retrofitting of the existing housing stock, investment in

public transport and encouragement of cycling and non-car alternatives. To achieve this, the raft of government programmes needs to link up with the wealth of initiatives in civil society and alternative policies to encourage pro-environmental behaviours. This gives some indication of the revolution in policy integration that a realistic programme of climate change mitigation would entail.

Theory and history suggest that path dependency will be strong and that different types of economic, political and welfare regime will vary in their abilities to transform into 'eco-states' and achieve green growth (Meadowcroft 2005). According to Dryzek, 'social democratic welfare states and what Hall and Soskice call coordinated market economies … are better placed to handle the intersection of social policy and climate change than the more liberal market economies with more rudimentary welfare states' (in Gough *et al* 2008: 336). In a recent cross-national analysis of environmental governance regimes Duit (2008) identifies six 'thick eco-states' combining high levels of government involvement with high scores for civic involvement: Denmark, Norway, Sweden, Finland, Germany and Austria. The first four are social democratic welfare states and the latter two are paradigm coordinated market economies.

Yet, in a cross-national study of climate change policies by Christoff and Eckersley (2011), the UK emerges as a leading country both in past and present performance and in aspirations, despite the absence of several predisposing structures such as corporatist political institutions and proportional representation. Perhaps more important, they suggest, is a 'European' framing of issues which does not regard climate science as an 'ideological marker' underpinning adversarial politics in the way it has become in the US and Australia, for example (Christoff and Eckersley 2011). There is also a gap between the institutionalisation of 'carboniferous capitalism' in the US, Canada and Australia, and the dominant discourse of ecological

modernisation in the EU. Thus the UK is in an ambivalent position. The CCC (2009) has welcomed recent signals from British governments of a turn towards an active industrial policy, which may be taken as some recognition of this pattern. Yet to fundamentally switch the UK's political economy and path of development is a daunting challenge and current indicators of this are zero or negative.

'DEGROWTH' AND RADICAL TRANSFORMATION

The fundamental premise underlying the third scenario is that endless economic growth is impossible within a bounded system – including a planet. This was the thesis of *The limits to growth* (Meadows *et al* 1972): exponential growth in population and material output is unsustainable. If ecological equilibrium is not restored the limits to growth will be overshot and an uncontrolled decline will occur. The Ehrlich-Holdren (1971) equation I=PAT represents environmental impact – 'I' as the product of population 'P', affluence 'A', and a technology transformation factor 'T'. Neither the *Limits to Growth* argument or the Ehrlich-Holdren equation necessarily imply that economic growth must be curtailed ('T' could adjust sufficiently to ensure green growth), but they lend support for a more radical questioning of the imperatives of industrial, capitalist and consumerist societies. The UK Sustainable Development Commission published a report in 2009 by Tim Jackson titled *Prosperity without Growth?* (with the question mark added after pressure from the Treasury). This developed a sophisticated 'degrowth' argument marrying together arithmetic, ethics, recent research into the sources of well-being, and a political economy of modern capitalism (see also Jackson 2009).

First, Jackson joins others in attacking the 'myth of decoupling'. Inbuilt drivers in the world economy are pushing

up emissions at a *growing* rate: coal-fired electricity generation in China and India, a predicted 2.3 billion more cars by 2050, 97 new airports in China by 2020, and so on. There is as yet *no* global decoupling of economic activity and emissions (Garnaut *et al* 2009). Indeed, the global financial crisis and recession of 2008-09 has alone delayed the growth of global emissions by three years according to one estimate – the emissions level projected for 2015 will not now be reached until 2018.

To stabilise climate change on relatively optimistic assumptions may require global carbon emissions of below four billion tonnes per annum by 2050, one-fifth of the target in the *Stern Review*. To achieve this with continued global population growth (0.7% a year) and past rates of income growth (1.4% a year) would require a 7% a year – in sum a *twenty-fold* – improvement in the current global average carbon intensity (grams of carbon dioxide per dollar of GDP). The world economy would need an improvement in decoupling of 11.2% per year in order to achieve a world where the entire population enjoyed an income comparable with EU citizens in 2050 (assuming their incomes keep growing). Jackson concludes, 'There is as yet no credible, socially just, ecologically sustainable scenario of continually growing incomes for a world of nine billion people' (Jackson 2009: 86).

This case is backed by two supporting arguments. First, prosperity (Latin *pro-speres*) is about living well and hopefully, and is by no means equivalent to growing GDP or throughput of economic activity. This draws on much recent material on happiness, wellbeing and alternative measures (Layard 2005, NEF 2009, Stiglitz *et al* 2009). Second, deep structures within capitalist society reproduce a system within which an absence of growth is simply inconceivable: 'Someone once said that it is easier to imagine the end of the world than to imagine the end of capitalism' (Jameson 2003: 76). This argument rests on the role of efficiency in developed market societies which by

continually raising labour productivity thus requires continuing growth to employ displaced labour. It also generates an 'iron cage of consumerism' which requires more and more private consumption, rather than more public goods and investment in ecological maintenance (Jackson 2009: 87-102; 143-156).

A low-growth or no-growth scenario would require a radical transformation in a range of public policies, and more policy integration. There are very few signposts (though see the work of Herman Daly 1996 and 2008). A new macroeconomics of 'degrowth' would be necessary, including a sustained reduction in working hours, according to Victor (2008). The logic of commodification would need to be challenged – perhaps via rationing and personal carbon allowances and trading (PCAT) (Environmental Audit Committee 2008; Gough and Meadowcroft 2011). The suggestion is that in a steady-state economy, a radically different environmental/welfare policy regime 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. These are just a few of the implications of a zero growth economy for future public policy integration.

7 CONCLUSIONS

There is a strong scientific consensus that the world is warming due to human-induced economic activity and GHG emissions. This is recognised by majorities of public opinion in all Western countries, though least in the USA, and with some decline in the last few years. The direct impacts of this climate change are likely to be mild in the UK in the next two to three decades, but the indirect effects of climate change outside our borders are uncertain and potentially large.

The countries of the EU are now committed to a radical reduction in GHG emissions of 80% by the year 2050, and UK governments are committed to five year planned reductions up to 2027. Yet there is no 'silver bullet' in climate change mitigation and the costs are likely to be very large. Growth in developed countries like the UK could be slower, which would help emissions, but would raise the relative costs of mitigation policies. Moreover, these targets for emissions produced within the UK are much lower than the emissions generated by UK consumers, due to the deindustrialisation of the UK economy and the outsourcing of production to countries like China. There is at present no mechanism within the Kyoto or UNFCCC frameworks to account for and rectify these global emission flows.

Notwithstanding the radical nature of the UK's *Low Carbon Transition Plan*, present climate mitigation policies fall far short of what is needed to reach the targets. They are based on upstream cap-and-trade, notably the EU ETS, and mandated market solutions. Planned upfront investment and public carbon taxation and subsidies are inadequate. There is as yet insufficient recognition of the scale of policy integration – across economic, environmental and social policies – that will be required. The legal basis of the carbon commitments is also hazy.

This mismatch between goals and implementation may reflect public opinion within a democratic political system faced with a 'diabolical' policy problem stretching across time and space. It also reflects, I have argued, the continuing dominance of economic models with a marginal, equilibrium-based methodology and a simplistic view of motivations and behaviour change. A political economy approach provides a more realistic, but far more challenging, framework for climate mitigation policies.

The implicit political-economic scenario in Europe and the UK is 'green growth' – that economic activity can be decoupled from carbon emissions via big investment in new technology, coupled with reframed carbon pricing and integrated policies to shift consumer behaviour. This strategy can access support from other political constituencies by improving energy security in the transition period and by boosting business competitiveness in low carbon technologies. Yet this again requires substantial policy integration. It also challenges the still-dominant neo-liberal economic model. It would appear to be a more realistic way forward for social democratic and coordinated market economies. It is far more challenging for the UK's finance-based market economy. It will require new forms of public mobilisation and building of political constituencies.

In any case, it is impossible for the large Asian economies to follow the Western growth model. It may well be easier for newly emerging economies to fashion a new path of development and there will be lessons the older economies can learn from them. But if the economics of a finite planet point to the end of economic growth in the West, still more radical thinking and action will be required. Either way, climate change will transform public policy futures.

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