Greenpeace submission to the Stern Review on the economic aspects of climate change

Greenpeace is an international environmental pressure group who seek to protect the human and natural world from the impact of industrialisation. In the UK, Greenpeace has approximately 220,000 financial supporters. We believe that climate change is the greatest threat to the natural world posed by the human industrialised society, including the potential extinction of a significant proportion of known species – as many as a third committed to extinction by 2050[1].

The terms of reference for the review cover 4 areas; projections of energy and emissions, consequences, costs and benefits of actions to reduce emissions, and impact and effectiveness of policies. This submission will address each in turn.

Projections

Other agencies have done emissions projections including International Energy Agency and IPCC. Projections can show a variety of outcomes but the main points from these are that a Business as Usual approach will deliver a marked increase in emissions over the coming decades. The projections by IEA in 2004 predicted that CO2 emissions would be 60% higher in 2030 than now - an increase of 1.7% per year - with over two-thirds of the increase coming in developing countries[2]. An alternative scenario, however, indicates that under an alternative scenario displaying the rapid deployment of environmental and energy security policies emissions could be held at today's levels, with considerable importance being placed on the containment of energy demand. Last year the global emissions of grew by 4.5%[3].

In the UK emissions of CO2 have shown a rise in the past 4 years – for example by 3.7% since 2000[4] - following a period of emissions decline as a result of substitution of gas for coal in power generation the early 1990s. Increases and volatility in gas prices have made coal a more appealing fuel and substitution back is occurring because the declines in greenhouse gas emissions were not based on any structural changes in energy demand or policy in the late 1990s or early 2000s which might have made permanent the gains made from fuel switching. Energy projections for the Department of Trade and Industry[5] show continued growth in energy demand, and potentially CO2 emissions. However energy scenarios for the Tyndall Centre[6] show that there are a variety of pathways by which deep cuts in greenhouse gas emissions from the UK can be achieved, specifically the 60% cut by 2050 which is Government policy.

The global and UK situation would appear to be similar in that short term rises could be precursors of even greater rises in greenhouse gas emissions, but that credible scenarios indicate much more climate friendly scenarios are perfectly possible over the next few decades.

Economic, social and environmental consequences of climate change.

The consequences of climate change are so many and varied it is difficult to quanify them. However it is important to place in context that climate change impacts are not purely a future phenomenon. Whilst still subject to debate in some cases, the following recent events and reports which have been firmly linked to climate change:

- The 2003 heatwave in Europe which caused approximately 32,000 deaths in Europe[7] as well as crop damage and other impacts
- The possible intensification of Hurricane Katrina and Hurricane Stan and the damage caused (as well as the deaths in S. USA and Mexico)[8]
- The World Health Organisation study which estimates that approximately 150,000 deaths per year *already* are being caused by climate change because of impacts on fresh water resources and disease[9]
- The UN University estimates that by 2010 there will be 50 million environmental refugees – more than from conflict – to which climate change is an important contributory factor[10]

The Terms of reference refer to major irreversible impacts of climate change and a chart of 'tipping points' in terms of climate impacts has recently been published[11] which indicates the following possibilities:

- Instability of Greenland Ice Sheet
- Instability of West Antarctic Ice Sheet
- Alterations of ocean currents owing to changes in salinity driven circulation, including North Atlantic Deep Water formation which drives the Gulf Stream
- Collapse of Amazonian rainforest
- Climate Change Induced Ozone hole in N. hemisphere
- Bistability of Saharan vegetation
- Transformation of Indian Monsoon
- Outburst of methane from Western Russia
- Changes to triggering (increases) in El Nino

These would either cause major changes in climatic conditions or provide major feedback enforcement for climate changes – they would be irreversible on any human timescale. Whilst the levels and rate of warming that would bring global climate to such 'tipping points' will be different, it is perhaps worth dwelling on one specific one – that of the Greenland ice sheet (GIS) to illustrate what is at stake.

A world scientific conference[12] held earlier this year as part of the process for UK presidency of G8 concluded that the GIS would melt, with the consequent sea level rise of 6-7metres, as a consequence of a global rise in temperature of as little as 2^{o}C. The same conference[13] also concluded that the probablility of avoiding a temperature rise of 2^{o}C would be only 95% with a CO2 concentration in the atmosphere of 400ppm The current concentration is 380ppm and rising at a long term average of around 1.5ppm per year. Thus in just over a decade we can expect to have around a 1 in 20 chance that we are already too late to stop the irreversible melting of a major ice sheet[i], with the probability of avoiding this outcome shrinking with every passing year. The melting of the ice cap would take place over a timespan of millennia rather than just decades or centuries. However, the challenges this poses for assessing costs and benefits of acting on climate change are considerable.

These changes in the physical world might still be easier assessments to make than 'tipping points' that exist in the socio-economic domain which could in turn entail considerable costs. Examples might include:

- Frequency of severe weather events such that insurance companies withdraw cover leading to flight of investment
- Frequency of severe weather events such that services from (cheaper) existing infrastructure no longer perform acceptably and require long-term replacement (e.g. power cables/pylons, cables for electric rail
- Collapse in land and building values in low-lying areas as only short-term investments are considered robust consequent of sea level rise or higher frequency of flood events.

We are not aware of any specific studies or evidence on these points but this should not negate the point. Again, the challenges to cost-benefit analysis are considerable because they do not deliver straightforward 'costs' but render whole areas 'economic deserts' where conventional economic activity can no longer be performed. The same is true for increasingly water stressed areas which will suffer population declines and no longer support extensive economic activity.

Further, climate change threatens to compromise public policy goals in relation to development. A coalition of environmental and development groups has recognised that climate change "threaten the attainment" of the UN Millennium goals[14] as most of them will require climatic stability for their realisation. It is worth quoting at some length from the coalition press release to a second report in order to emphasise that "costs" of climate change cannot be divorced from other policy goals in international development:

[i] The irreversible melting of the ice sheet arises because it is so thick – up to 3km in places – and what currently falls as snow on the summit of that thick ice sheet would fall as rain in its absence. It is effectively a relic of the last ice age.

"Africa: Up in Smoke? makes it clear that Tony Blair's efforts to alleviate poverty in Africa will ultimately fail unless urgent action is taken to halt dangerous climate change. The report says that G8 nations have failed to 'join-the-dots' between climate change and Africa. Unless addressed, this could condemn generations in the world's poorest nations. The G8 summit can choose to act now, or see human development gains go up in smoke, the coalition warns.

The report, with a foreword by Archbishop Desmond Tutu, details the impact that climate change is already having on Africa and the threat it poses to human development. Africa: Up in Smoke? calls for new and deeper emission cuts in rich countries, and for the G8 to make significant new funds available to help poor countries adapt to the impacts that are already being felt.

As a continent, Africa lives on the front line of global warming. Seventy per cent of the workforce rely on mostly rain-fed agriculture for their livelihoods and climate change is already disrupting these vital rains - bringing more droughts and floods.

The coalition believes that an either/or approach to climate change and poverty reduction is not an option, the two are inseparable"[15]

Costs and benefits of actions to reduce greenhouse gas emissions

This section of the submission will deal with 7 elements of greenhouse gas emissions :

1. Decentralised energy generation, microgeneration and behaviour change
2. Conventional costings of power supply
3. The industrial case for renewable power (Offshore jobs, wave & tidal)
4. Nuclear power
5. Transport
6. Fluorinated gases
7. Forestry and land use

Decentralised energy supply and efficient energy use.

There can be little doubt that the most cost-effective way to deliver energy services to buildings in both developed and developing countries in the foreseeable future will be via a decentralised system. Decentralised energy is that which is connected directly to low voltage local networks rather than the high voltage grid. It includes particularly Combined Heat and Power, solar PV, wind, small hydro, biogas, biomass heating, geothermal and local wave and tidal generation. We present here the preliminary findings of soon-to-be published work of a model of the UK energy system, which compares a continuation of a centralised model – where power is generated in large power stations generally remote from the point of use – to that where power and heat generation is local, avoiding losses and costs due to the grid transmission and waste of heat as normally seen in emissions from cooling towers of power stations. Electricity consumption in the UK generally utilises only about 22% of primary energy input to the system through losses in generation, transmission and inefficiencies in use. Generation of power close to point of use avoids many of these losses. The general case in support of decentralising power generation is given in the report Decentralising Power which is appended to this submission[16]. The provisional modelling performed by World Alliance for Decentralised Energy (WADE) on their model of UK power sector shows that fully decentralising new UK power provision could lead to a cut of the order of 25% in CO2 emissions, capital costs savings of around £65 billion, and retail cost savings of around 1.5p/kWh retail. Thus decentralisation of our power supply could cut carbon emissions and cut costs. This has already been illustrated in Woking (see below).

Consistently in this and other models the additional capital costs of small scale generation are more than offset by the savings in transmission and distribution. Expenditure on transmission and distribution will typically be about 50% of the costs of supplying electricity, yet all the focus tends to be on the costs of generation (see below). Mott McDonald support this view in their study for Ofgem on embedded generation concluding that the costs of substantially increasing capacity would be 'considerably outweighed by the benefits….defer[ing] reinforcement costs and reductions in

distribution losses'. Embedding 25% of peak demand capacity would deliver economic benefits of £1.3 billion[17].

Furthermore a decentralised power system is not simply a theoretical model. The London Borough of Woking has already used decentralised power technologies in the public sector buildings and social housing to[18]:

- Reduce CO2 emissions by 77%
- Reduce fuel bills for occupants by 30%
- Make their power supply more secure by not needing the grid 99.85% of the time

It would appear that the absence of take up in this model is due to market failure in introducing barriers to this form of generation and effectively constraining retail competition for power supply to a competition over only a quarter of the costs of supply rather than over 90%[19]

Decentralising power leads to other benefits when allied with microgeneration. One of the frustrations in energy policy circles has been that energy efficiency options are often highly cost-effective for householders yet, despite encouragement and grants, are too-rarely taken up, for example only 80,000 owner-occupiers installed Cavity Wall Insulation in the first two years of the Energy Efficiency Commitment, in spite of typically 50% discounts being aggressively offered to them by the energy suppliers[20]. The conventional explanation is that there are a number of cultural and informational barriers to efficiency take up. Programmes by Government to stimulate greater awareness of efficiency have generally not been a success and this appears to be because underlying assumptions in information campaigns are misplaced and counter productive[21]. New research by the Sustainable Consumption Roundtable[22] on peoples' attitudes to energy on fitting of microgeneration equipment shows that these attitudes can change markedly. To quote from the report:

> *"the impact of micro-generation may reach far beyond a simple analysis of kilowatts produced and carbon emissions averted. A whole host of attitudinal and behavioural shifts do seem to be fostered (although not automatically created) by the presence of on-site micro-generation…..the behavioural impacts in terms of energy awareness efficiency were often considerable."*[23]

Thus micro-generation could succeed where Government information campaigns have failed. These benefits of energy awareness are not guaranteed but need to be supported by education and awareness coupled with the installation and use of the devices. Fortunately such programmes have already been undertaken in UK and in the public sector can be delivered at net negative cost. Global Action Plan has conducted studies in schools, businesses and even households which largely looked at behavioural change through peer support and community building[24]. Savings on energy are around 20% (with wide variation) in schools and over 20% in households. The roll-out of this programme in schools across the country is estimated to cost £4 million over 3 years with estimated savings to the public purse of £50million per year[25]. Failing to develop this programme is, therefore, not only environmentally irresponsible, but financially absurd. The benefits of such a programme coupled with micro-generation to give householders, schools and offices even greater incentives to manage their energy well are likely to be even greater.

Thus in the UK context there is good evidence to suppose that a decentralised model of power generation is highly cost-effective in its own right, and would act as a stimulator of further action on efficiency and effectiveness of energy use. It cannot be emphasised enough that many studies of energy efficiency indicate that many measures can be taken which have a negative net cost[26]. Decentralised energy generation offers the opportunity to tackle the non-financial barriers – informational, cultural, inertial – in a new and effective way. Other policy measures, particularly ESCos (see below) will promote this as well. Further information on the cost-effectiveness of measures to stimulate efficiency of energy use is given in the policy effecitveness section below.

International experience further supports this view. The same WADE model referred to earlier for the UK was applied to China for the UK Foreign and Commonwealth Office[27]. It indicated that using a decentralised model of energy generation for meeting that country's needs would cut capital costs by 38% ($400 billion) compared to a centralised generation model. It would also avoid emissions of 416Mt CO2 per year by 2021 and decrease their demand for fossil fuel. Like in the model for the UK,

this does not assume that ALL generation is converted to decentralised power in 20 years, but only that NEW generating capacity is added through a decentralised approach.

More generally a decentralised approach allows countries to use their own resources rather than create further demands on fossil fuels which creates external debt. It has been estimated that use of bagasse – the dry residue from sugar cane after harvesting and extraction – could provide 11.5% of Brazil's electricity demand and 25% of Cuba's[28]. Decentralisation of power is applicable to all countries and would bring considerable benefits to developing ones. If Britain were to begin a shift from a centralised model of power generation to a decentralised one the policy impact elsewhere may be considerable.

Conventional costings of generation

Whilst we firmly advocate decentralisation as the best way to provide future energy supply it is quite possible that large scale power will continue to be required. Construction and operating costs for different technologies are notoriously difficult to accurately estimate, due to the myriad assumptions that must be made on future fuel prices, steel prices, differing levels of technological maturity and so on. Some attempts have been made to quantify these costs; a recent example being the detailed assessment of renewable supply costs by Enviros as part of the Government's ongoing Renewable Obligation consultation (February 2005). Other relevant studies include Oxera's "Non-Market Value of Generation technologies" (2003) and the cost estimates of wind power in the Sustainable Development Commission's report, 'Wind Power in the UK' (May 2005).

None though are comprehensive, with the most authoritative study of future generating costs still being those quantified by the Government's Performance and Innovation Unit as part their research to inform the Energy White Paper[29]. The PIU concluded that by 2020, onshore wind will offer the lowest generation costs, closely followed by energy crops, offshore wind and Combined Cycle Gas Turbines. Nuclear power and fossil fuels with carbon capture and sequestration internalised in to the cost price did not do so well. The question might well arise as to what has changed to substantially undermine those projections. The only changes would appear to be that fuel prices have gone up. Thus the continued emphasis on support for renewable energy technologies is justified on the grounds that by 2020 they will likely be the cheaper option, as well as the ones compatible with action on climate change and increasing diversity of power supply within the UK.

Industrial case for investing in renewable power

As climate change is now an internationally accepted problem the potential growth in use in Low Carbon Technologies will be considerable. The first movers in the market are likely gain considerable benefit as Denmark did from wind power and Germany is hoping to do from solar PV. A report commissioned by Greenpeace from Energy for Sustainable Development did a case study of Offshore Wind (report appended to this submission), finding that if 20% of UK electricity were provided by offshore wind by 2020 it would create nearly 50,000 jobs in that year. This is aside from the export potential that such an industry would have. These jobs arise because renewable energy costs arise to a much greater extent from skilled labour than fossil fuel or nuclear generating stations. Wind generates work in manufacturing, operation and maintenance, rather than revenue flows for fuel costs (which for the UK will increasingly be heading overseas).

The UK could act as a crucible for development of new technologies and skills in much the same way that Denmark has done from the onshore wind market. As outlined in the appended report the UK is well positioned to take advantage of the experience in offshore operations and fabrication as well as the considerable wind resource available to this country. A similar argument could be made about wave and tidal stream power where device developers have set up in UK. Unfortunately the engineering lead set by the UK is likely to be squandered by *ad hoc* short term support. The first commercial wave farm in the world will be built in Portugal even though it is being built by a British firm, and the UK has the best wave resource in the world[30].

Nuclear Power

The recent announcement of the energy review has focussed on whether there is a real need for new nuclear power stations. Before outlining issues around the costs of nuclear power several things need to

be borne in mind abut the nature of a major initiative on new nuclear build, in particular the policy and political risks involved:

1. New nuclear power would be a very big risk because of the 'lumpiness' of the investment i.e. a minimum of 8–10 large nuclear power stations. This can be contrasted with the much smaller stages of investment in scaling up virtually any other form of generation including various micro-generation technologies.
2. Thus a commitment to nuclear power is the ultimate in inflexible options. Given the long timescales of licensing, planning and construction, any revelation after a decision to proceed that stations do not work as planned, or that costs are much higher than expected cannot be corrected on a timescale much less than a decade. By contrast any weakness in other technology deployment (e.g. solar, ground source heat pumps) should any arise, can be picked up relatively quickly and acted on in policy terms. However a commitment to nuclear power would foreclose options. A senior economist, Gordon McKerron, has recently written about the "sterilisation of non-nuclear investment following a decision on new build".
3. It is not uncommon to find it argued that 'renewable energy cannot deliver' and that only nuclear power is sufficiently reliable. In the twilight zone of nuclear power logic, this ignores the fact that none of the possible designs for construction in the UK exist outside of technical drawings. There is no real evidence base for this dramatic reduction in projected costs. If there is an evidence base it is the olong timescale and cost overruns of previous nuclear industry projects in UK.
4. Thus a decision to go for new-build on nuclear power is an extremely risky one, not just for the investors and for the public (waste, discharges, accidents etc.) but also for UK plc. This high level of policy and energy security risk rarely finds expression in current debates. A decision to go for new nuclear build effectively removes considerable freedom of manoeuvre and ability to respond to changing circumstances for Government over the next decade.
5. This is important because any decision by the current Government to support new nuclear power is likely to dramatically reduce investment and deployment in a host of other technologies as there will be no guarantee of a long-term market if it is thought that nuclear power will get most of the share of new generating capacity.
6. New businesses – like a new renewable power business - cannot just be switched on like a tap. They require time and skills (installation and engineering, grid balancing, financing, business management, brand development etc.) to build up. A decision to go with new nuclear build would leave the Government and Prime Minister over the next decade very much in the hands of the nuclear industry to fill the 'energy gap'. Given the track record of operating performance and scandals around British Energy and British Nuclear Fuels/British Nuclear Group this would not seem a prudent political or practical option.
7. A few years after any potential decision to build new nuclear power is taken, a future Prime Minister will be in a situation where the nuclear industry construction plans cannot be allowed to fail. Given historic cost over-runs, such a decision now would be like writing a blank cheque to the nuclear industry, irrespective of levels of support (or not) at the time of a decision.

Other risks go beyond those of political and financial. Embarking on a new build programme in the UK would send a signal across the globe that nuclear power is an appropriate response to tackling climate change yet presupposes that there are the abilities to handle the investment capacity and safety management issues associated with it. The majority of materials and technology used in nuclear power programmes are dual-use – that is they can be used in civil *and* military programmes. Existing diplomatic stand-offs in Iran and North Korea illustrate that the political costs of the world embarking on a nuclear new-build programme would be high. It also illustrates that nuclear control by Western powers through direct control of technology and materials is increasingly likely to be ineffective. Quite simply, spreading nuclear power spreads the wherewithal for nuclear weapons proliferation.

A global increase in the use of weapons usable nuclear materials would serve to further increase the chances of these materials falling into the hands of terrorists. More nuclear reactors here and the attendant spent fuel stores, means more terrorist targets – which could, over time, increase the likelihood of a successful attack on such an installation. Which form of energy would Al Qaida most like UK to invest in?

The full range of issues associated with new nuclear build is given in the attached submission – part of Greenpeace evidence to the recent Environmental Audit committee enquiry. In summary costs are very uncertain but high, subject to uncertainties in planning, licensing and construction, and that

Government support will be necessary (in addition to the £56 billion publicly funded clean-up of liabilities transferred to the Nuclear Decommissioning Agency).

Transport

CO2 emissions from the transport sector continue to grow. For road transport the increases arise largely from the light van and HGV sector although in terms of total quantity the car sector remains the dominant emitter[31]. However aviation emissions are also increasing sharply[32]. Mitigation, like in the power sector involves one of increasing the efficiency of fuel use, substituting lower carbon fuels, or decreasing demand. Given the current rise in emissions it is clear that mitigation will only occur driven by regulatory or fiscal policies – a main plank of CO2 mitigation in the transport sector as been the voluntary agreement with car manufacturer trade associations ACEA, JAMA, KAMA to reduce emissions per km to 140g CO2 by 2008 (or 2009). However it would appear that these targets look unlikely to be met[33]. Emissions from transport look set to increase and preventing that increase will require intervention from Government. Thus the costs of any measure to mitigate greenhouse gas emissions cannot easily be divorced from the specific measure which drives that change.

Reports which have looked at the potential for mitigation of transport emissions generally conclude that fuel substitution (especially biofuels) can play only a niche role in alleviating GHG emissions[34]. This situation may change with the advent of new conversion technologies for biomass but this cannot be guaranteed. Large-scale deployment of renewably produced hydrogen as a fuel is some way distant[35]. Thus the main option appear to be reduction of demand and efficient fuel use. Demand can be reduced in the short term by financial incentives e.g. fuel duty or local charging. The congestion charge in London has been effective in reducing CO2 emissions from within the zone by 19% [36]. The revenue raised has been deployed to improve public transport. One estimate is that *National* revenue-raising congestion charge could raise £16 billion for the Treasury and decrease CO2 emissions by 7 per cent[37] – 2.8MtC per year - and have the impact of decreasing congestion (and the associated costs) especially in urban areas.

The other main way of decreasing CO2 emissions from the transport sector is improved efficiency. Cars are already available – the Honda Insight - which produce less than 100gCO2/km[38], well below the fleet target of 140gCO2/km for the voluntary agreement at EU level. The UK vehicle fleet average fuel efficiency is comparatively poor against the European average[39]. A soon-to-be-published analysis for Greenpeace by Institute European Environment Policy shows that pushing fuel efficient vehicles into the market could save UK billions of pounds through reduced imports of oil. This argues strongly for UK to introduce incentives for more fuel efficient cars including VED and reform of company car tax.

Fluorinated gases

Whilst understandably policy and climate change concerns tend to focus on emissions of CO2, it should be remembered that action on other gases can be important, especially in giving 'room for manoeuvre' with respect to sources of CO2 that may prove troublesome to control. One recent scientific paper has assessed the contribution of F-gases to climate change, and emissions control which would avoid a greater than 2^{o}C temperature rise (see above). Given the existing temperature rise of 0.6^{o}C and our commitment to a further 0.6^{o}C (or so) rise through gases already emitted into the atmosphere, the 0.15-0.2^{o}C projected contribution by F-gases could be almost a third of the contribution of greenhouse gases to breaching the 2^{o}C limit[40].

We concentrate here on particularly HFCs used in commercial refrigeration. It is clear that the use of alternatives to HFCs can yield clear benefits in energy savings, especially in the domestic and commercial sector. Three major international companies – Unilever, Coca-Cola and McDonalds – have committed themselves to a phase-out of HFCs in their point-of-sale refrigeration equipment[41] - an initiative that Greenpeace has publicly supported. The companies have incurred costs in technology development, but are now able to report that aside from the savings in emissions from HFCs efficiency improves significantly meaning savings in CO2 emissions:

- Unilever record a 9% efficiency improvement using hydrocarbon refrigerant compared to HFCs

- Coca-Cola record a efficiency improvements of 17-35% depending on equipment, using CO2 as a refrigerant compared to HFCs
- McDonalds HFC-free restaurant in Denmark consumed approximately 12% less energy against a comparable restaurant using HFC refrigerants.

Here the cost have been incurred by the private sector but clearly intending that this R&D should be an investment in future savings. However, this is not simply a matter of private R&D improving technology. The companies concerned have formed an industry grouping - the Refrigerants Naturally Group – in order to influence the supply chain in refrigeration. Although they have invested millions of dollars in R&D and now are deploying new technology, the long-term viability of of the initiative is threatened by inertia in the supply chain keeping costs of new technology high. The companies are thus sharing information about the technology openly with competitors (rather than restricting it through intellectual property rights) in order to get other companies to commit to a similar future trajectory. In the light of the demonstration of the technology, and the clear energy and cost savings expected, it is reasonable to expect that *judicious legislation to restrict and ban HFCs would have a net negative cost to the economy*. Studies that indicate 'costs to the economy'[42] would appear to be contradicted by events on the ground where companies are actually seeking to deploy new technology.

Forestry and Land use

It has been suggested that the use of forestry could be used as an 'offset' for CO2 emissions. Greenpeace rejects this. At best it is an unreliable short-term measure. At worst a fraudulent palliative which delays real action. The use of forestry as a climate change offset has come under fire from the Royal Society in their report[43] which it is worth quoting from at length:

> *"There is still considerable uncertainty in the scientific understanding of the causes, magnitude and permanance of the land carbon sink. However our curent knowledge indicates that the potential to enhance the land carbon sink through changes in land management practices is finite in size and duration. The amount of CO2 that can be sequestered in these sinks is small in comparison to the ever-increasing global emissions of greenhouse gases. Projects designed to enhance land carbon sinks must therefore not be allowed to divert financial and political resources away from the restructuring of energy generation and use (e.g. increased use of renewable energy)"*

These concerns about the permanence of a land sink can be captured in questions such as; what happens when there's a forest fire? What will happen to people who previously used or occupied the now forested land? How will the economic activity that relied upon the reforested land change or alter, and with what impact on greenhouse emissions? In practice finance used for offsetting might be better spent preserving large areas of forest currently being lost through deforestation.

This is not to say that land-use, and particularly agriculture, does not play a significant role in climate change. A major dairy food company, Danone, has calculated that with a cradle-to-grave analysis, the majority of the company's product climate change impacts arise from non-CO2 greenhouse gases emissions from the agricultural production of ingredients[44]. Its operations include manufacturing, packaging, refrigeration and retail distribution. However the relationship between greenhouse gas emissions and agricultural practice is poorly developed. One clear element of agriculture that causes GHG emissions is fertiliser manufacture and use, both CO2 and N2O and effective policies to reduce fertiliser use would be effective on both climate and river water pollution.

Policy Effectiveness

This section looks at the policy changes needed to promote GHG reduction and the available evidence base to assess their effectiveness. Some of this has already been covered in the section above.

Decentralised Energy

The best example of this under UK arrangements appears to be in Woking and as outlined above this has, for Woking Borough Council led to:

- Reduced CO2 emissions by 77%
- Reduced fuel bills for consumers by around 30%
- Making their power supply more secure by not needing the grid 99.85% of the time

This Woking project was undertaken despite restrictions imposed by the bureaucracy and charging rules of the national grid and distribution networks rather tan because of support from them. Replicating such exmples of good practice would be much simpler if changes were made. The barriers are explained in the report 'Decentralising Power' but to quote a couple of examples from the report:

> *"DNOs [Distribution Network Operators] are regulated by the Distribution Price Contro, which…. Is directly related to the volume of electricity passing through their wires from the national grid. Connecting decentralised power to local networks is therefore potentially perceived by DNOs not only as an inconvenience, but in the longer term as offsetting centralised grid power and therefore actually diminishing the core revenue which flows to them from centralised power distribution."*[45]

> *"Microgeneration under 3kW, which has huge market potential at the householder level, is currently impeded by complex issues of cost and benefit allocation. As a result there is at preent no guaranteed remuneration form the surplus energy generated; while even the modest rewards that microgenerators can claim through ROCs involves completing a 19-page appplication form. Today, most surplus power from microgeneration spills onto the local networks without recompense for the householder or other producer."*[46]

Thus policy could usefully be directed at adjusting incentives, reducing red tape and barriers which would reduce costs to microgenerators. Whether there are costs to these measures or not has not been researched but they should be (at worst small), and as outlined above sould be at negative cost to the economy as a whole.

More generally on the issue of renewable energy provision, international comparisons on the effectiveness of promotion of renewable energy would be a worthwhile exercise. Given the difficulty of securing supplies for the installation of new wind capacity (and recent cancellation of planned projects like Scarweather Sands off Porthcawl), clearly other countries policies are more effective than those in the UK. Anecdotally those that are most successful in attracting wind power construction are Germany, Spain, Denmark and USA.

Enclosures:
Greenpeace Decentralising Power report
Greenpeace Env. Audit Committee submission on nuclear
Offshore jobs report

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[1] Thomas et al., 2004. Extinction risk from Climate change. Nature, 427, 8 Jan 2004, p.145
[2] World Energy Outloook 2004, International Energy Agency, Vienna
3 ENDS Daily, EU holds the line as world CO2 emissions rocket, 28 September 2005. http://www.environmentdaily.com/articles/index.cfm?action=article&ref=19501 This reports a study by German economics institute DIW. At time of writing this was not available in English.
[4] Calculated from figures reported in ENDS report 363, April 2005, pp 3-4, Bad news piles up on CO_2 emissions
http://www.endsreport.com/index.cfm?action=report.article&articleID=13816&q=climate%20change%20emissions%202004&boolean_mode=all
[5] Department of Trade and Industry, 2000. Energy paper 68
http://www.dti.gov.uk/energy/inform/energy_projections/index.shtml
[6] Anderson et al., 2005. Decarbonising the UK: Energy for a Climate Conscious Future. Tyndall Centre. http://www.tyndall.ac.uk/media/news/tyndall_decarbonising_the_uk.pdf
[7] As reported by Sir David King, Chief Scientific Adviser to HMG, Presentation to Foundation to Science and Technology event "Climate Change: Technology for mitigation and adaptation", 22 November 2005.

[8] This is a controversial topic, but a balanced discussion of the scientific issues related to climate change and hurricanes by a number of climate science experts can be found at http://www.realclimate.org/index.php?p=181

[9] World Health Organisation, 2003. Climate change and human health - risks and responses. See particularly conclusions and recommendation section: http://www.who.int/globalchange/climate/summary/en/index12.html

[10] As reported at http://news.bbc.co.uk/1/hi/sci/tech/4326666.stm

[11] Kemp, M. 2005. Inventing an icon: HJ Schellnhuber's map of global 'tipping points' in climate change. Nature 437, p.1238

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