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**Friends of
the Earth**

Briefing

New research on the economics of climate change

A briefing ahead of the Stern Review

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Introduction

This briefing summarises two new pieces of research. The first report (from Tufts University, USA) sets out the consequences and colossal economic costs of not tackling climate change, and the absolute urgency of taking action now if economic and environmental catastrophe is to be averted. The second report (from Ecofys UK) sets out how the UK and the EU could set a carbon budget to commit to annual reductions in emissions. Friends of the Earth is urging the Government to introduce a Climate Change Bill and the carbon budget concept supports this work. The full reports are available on request and on the internet (*see page 7 for details*).

This briefing also highlights major economic benefits from transforming the UK into a low-carbon economy. The reports are being issued in the run-up to publication of the Stern Review on the economics of climate change, carried out by the UK Treasury under Sir Nicholas Stern.

What delaying action really means

Climate Change – The Costs of Inaction, written by economists from the Global Development and Environment Institute at Tufts University, Massachusetts, is a collation of work from many top universities and research bodies around the world on the impacts of climate change. The report illustrates the incalculable damages both the world and the UK economy face if temperatures increase more than 2 degrees above pre-industrial temperatures – which will happen unless immediate action is taken. It represents a stark warning on why this limit is so crucial, and why staying below it would prevent very large economic, as well as social, damages. Climate policies in many countries, despite much rhetoric, are hardly ever consistent with this goal.

The report explains what these costs might be. It illustrates how the first 2 degrees of warming will cause considerable economic and social damage, and how the effect of any further warming is incomparably more dangerous and costly. Table one summarises the difference in damage between two degrees and higher temperature rises.

The economic cost of these damages would be staggering.

Models described in the report state that, by the year 2100, a 4 degree increase in global temperatures would cause economic damage in the region of \$20 trillion per year, around 8% of global economic output at that time. However, action now to limit the rise to 2 degrees would eliminate over half of this damage, at far lower cost. The \$20 trillion is also a major underestimate as it only includes the impacts which are easier to measure.

Table 1. Likely Impacts of Climate Change

Temperature rise by 2100	Likelihood	Effects
0.6°	<i>Has already occurred</i>	<ul style="list-style-type: none"> • More frequent extreme weather events, more floods and more droughts, more heat waves; • A slow pole-ward migration of plant and animal species, with less mobile and less adaptable species increasingly at risk of extinction.
2°	<i>Will be exceeded unless there are immediate and vigorous efforts to reduce emissions</i>	<ul style="list-style-type: none"> • More tropical diseases over a wider geographical area; • Decreased crop yields in the developing world and, as a result, widespread hunger; • Many communities facing serious water stress and widespread droughts; • A total loss of arctic ice and the extinction of many arctic species; • A near total loss of coral reefs due to “bleaching;” • And perhaps the onset of the complete melting of the Greenland ice sheet, slowly but unstopably raising sea levels by 7 m over the course of the next 3000 years.
3°	<i>Extremely likely without major efforts at reducing emissions</i>	<ul style="list-style-type: none"> • Decreasing crop yields in the developed world and decreasing world food supplies; • Widespread species extinctions and desertification; • The wholesale collapse of the Amazon ecosystem; • The complete loss of all boreal and alpine ecosystems.
4°	<i>Likely with no efforts at reducing emissions</i>	<ul style="list-style-type: none"> • Entire regions will have no agricultural production whatsoever and the melting of the West Antarctic ice sheet will gradually increase sea levels by 5 to 6 m (in addition to the increase from the loss of the Greenland ice sheet).
>4°		<ul style="list-style-type: none"> • There is a 50-50 chance that the ocean’s circulation system will shut down, removing the crucial currents that warm and stabilize the climate of Northern Europe.

Source: IPCC 2001bⁱ; IPCC 2001aⁱⁱ; Watkiss et al. 2005ⁱⁱⁱ. The climate change scenarios cited here are B1 (2.3° in 2100), B2 (3.0°), and A1F1 (4.8°) from IPCC 2001.

In the UK, impacts of a 4 degree average global rise would include:

- “Hot” (1995-style) summers in 63% of years by 2080, compared with 1% of years in 2020;
- This heat accompanied by summer droughts – 40% less rain in summer, and 30% more rain in winter;
- By 2080 the annual cost of flooding in the UK estimated to be £22 billion;
- A doubling of the number of people at risk of coastal flooding, to 1.8 million;
- The capacity of the Thames Barrier more and more challenged by rising sea levels;
- The London underground system needing cooling, so far an insoluble problem;
- Demand for air-conditioning increasing – needing expensive new power plants for peak times – an electricity cost of £5 billion a year if we matched current USA levels of air conditioning;
- Warmer seas affecting fish and bird life – sand eels are already seeking cooler waters with knock-on effects for British birds, and cod is migrating northwards;
- Climate change in developing countries creating environmentally-driven refugees and a need for greater expenditure on aid.

But the real costs are incalculable

The report also goes on to express concerns about the way in which these damages are treated by economists and the assumptions they use. As colossal as some estimates of future economic costs are, they remain partial and inevitably incomplete. Things without a precise price – such as extinction of species of no perceived economic value – are simply not taken into account. Costs to our grandchildren are counted as being worth much less than costs to our generation.

But although the economic, social and environmental costs of climate change will be massive and virtually incalculable, the extent of damage is still in our control. These costs can be heavily reduced. Keeping to two degrees still has major impacts, but the worst, catastrophic impacts are avoided, in a way which will maintain a strong economy. But action is needed right now.

Staying within budget – a key solution

There is a finite quantity of carbon dioxide that we can put into the atmosphere between now and 2050 if we are to stay below 2 degrees. This quantity can be calculated (within the limits

of current scientific understanding) so giving us a carbon budget.

Developing a Carbon Budget for the UK with opportunities for EU action, has been written by Ecofys UK, leading international consultants in energy and climate strategies. The report looks at one key tool – the carbon budget - to support policies to reduce carbon emissions and how it might operate. A carbon budget is defined as a set amount of carbon that can be emitted in a given amount of time, either by the whole economy, or a pre-selected sub-population or set of activities.

This follows from a report published in September by the Tyndall Centre for Climate Change which outlined how to achieve the necessary changes over the next four decades whilst living within an overall carbon budget^{iv}. The Tyndall report concluded that there are only four years left to get the UK on the right path, and called for the urgent establishment of a budgeting system. The Ecofys report now explains in more detail how this could be done, both in the UK and in other countries - at a reasonable cost. The UK government – and later the European Union – could establish carbon budgets, in a comparable way to the UK Treasury’s annual financial budget.

The report explains that carbon emissions should be treated in a much more long-term, cumulative, and high profile fashion than is true today. The Prime Minister would report on the carbon budget to Parliament every year, alongside announcements on the financial budget. Both issues should be given the same priority and profile within government.

A carbon budget differs from targets because it makes it clearer that national emissions of greenhouse gases must be strictly limited, and cannot be overshoot without penalty. The UK currently has reduction targets, but carbon dioxide emissions have still risen from one year to another in six of the eight years since 1997 – with little political consequence. Under a budgeting system policy makers will need to shape the country’s emissions profile (downwards), and amend policies as necessary to keep within the carbon budget. The scheme would also give more certainty to business, whilst still allowing flexibility by allowing “borrowing” from one year to another or over a short cycle. Annual reporting against a budget underscores the urgency to make cuts in the short term.

The report also illustrates how such a scheme could be later extended to the European Union. The European Council is the regular meeting of heads of state of all 25 member countries and is arguably the most high profile decision-making body in the EU. The Council should announce the EU’s carbon budget and progress towards it at one of its meetings every year. This responsibility would directly parallel the role of the Prime Minister in the UK.

It would also be possible for the UK to promote such a concept more widely in Europe and around the world, while implementing it first at home. France, Germany, the Netherlands, Norway, Japan and California all have or are developing frameworks in place for long-term emission reductions – so the UK would not be alone in taking ambitious action to curb emissions in the long term. By adopting a carbon budget the UK would however set a global example on how to do it in practice.

Economic Opportunities

At the global level there are enormous economic savings to be made by averting disaster – avoiding economic costs of \$12 trillion through investments of \$3 trillion. But there are also significant short and medium economic benefits at a national level of taking action on climate change now.

Improving energy efficiency saves money and reduces emissions. Investing in energy efficiency is an economic opportunity for households and businesses. People in the UK could save £6 billion a year by using energy efficiency measures in the home^v. New homes built to the UK's Building Research Establishment "excellent" standard will cost only around 1% more but have lower running costs and cut carbon emissions by around 50% a year^{vi}.

All of UK industry can save money through energy efficiency. Small and medium-sized firms alone are estimated to be able to cut over £1 billion off their energy bills every year through energy efficiency measures^{vii}. The Carbon Trust in June 2006 revealed that UK businesses could save £570 million in the summer alone by taking simple cost-effective efficiency measures. The Government has found that *"No- and low-cost measures can result in a 20 per cent reduction in energy use and can have the same effect on profitability as a five per cent increase in sales."*^{viii}

Innovation is vital for both a dynamic economy and reducing carbon emissions. Taking effective action on climate change now will boost innovation both in firms selling the solutions and those having to comply. Environmental regulations have been a spur to innovation where they set challenging targets, that are enforced and that do not prescribe technologies. Time and again innovation in response to Government environmental policy has resulted in the solutions being far cheaper than predicted^{ix,x}.

There is also huge potential for the growth of new sectors – particularly the renewables sector. Already the environmental sector is growing fast. Between 2002 and 2004 sector turnover increased from £16 billion to £25 billion and employment more than doubled to 400,000^{ix}. The UK has some of the best wind and wave resources in Europe and the engineering skills to exploit them. Countries which have intervened to boost the renewable sector have reaped economic benefits such as Denmark's wind power sector and the German solar power sector. The German solar industry has increased turnover ten-fold in the last six years and is now worth 3.7 billion euros annually^{xi}. Overall, the world market for environmental goods and services is estimated to grow to 565 billion euros by 2010 – as big as the pharmaceutical industry^{xii}.

These benefits of increasing efficiency, boosting innovation and succeeding in new markets together offer a significant opportunity for the UK economy. They can increase competitiveness, create jobs and improve our security of energy supply.

A World Bank review of competitiveness and environmental regulation concluded that *"Contrary to common perceptions, higher environmental standards in industrial countries have not tended to lower international competitiveness ... countries that adjust early and invest in environmental protection can maintain and even create comparative advantage in environmentally sensitive industries"*^{xiii}.

Many of these energy efficiency measures and new low-carbon technologies would also create widely-distributed local jobs. For example, improvements to the existing housing stock need customised solutions and create jobs for construction industry workers. Decentralised power generation solutions – such as domestic wind turbines or solar panels – need skilled workers across the country. The German solar sector now employs 42,500 people in production, distribution and installation^{xi}.

Investment in renewable energy and energy efficiency will also make us more energy secure and less dependent on imports of oil.

These significant economic opportunities are increasingly widely recognized. Most recently a group of major companies in the UK, including Shell, BAA and Tesco, asked the Prime Minister directly for ambitious plans to tackle climate change – so that they know exactly what they will need to achieve in the future, but also to stimulate innovation and help the UK become a world leader in certain technologies such as tidal and wave energy^{xiv}.

The Way Forward

The situation is serious – rising carbon emissions in the UK and around the world are pushing the world closer to climate catastrophe. By setting ourselves a carbon budget and immediately implementing policies (many of which are clearly at hand) to reduce emissions year on year we can still avert economic and environmental disaster.

To put this into a legal framework, Friends of the Earth's Big Ask campaign has put forward a Climate Change Bill which would commit the UK to year on year reductions in the order of 3% per annum.

Now is the moment at which we have to choose - a world damaged beyond recognition with maimed economies and massive loss of human life, or a world pulled back from the brink of chaos with a low-carbon economy and a stable future.

The reports are available as follows:

Climate Change – The Costs of Inaction

www.foe.co.uk/resource/reports/econ_costs_cc.pdf

Developing a Carbon Budget for the UK with opportunities for EU action

www.foe.co.uk/resource/reports/carbon_budgetting.pdf

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