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Submission to Stern Review

From Dr Richard Tipper, the Edinburgh Centre for Carbon Management

Qualifications / Experience:

- Director of the Edinburgh Centre for Carbon Management
- UK Roster of Experts on Climate Change for IPCC
- Lead author of two IPCC Reports
- Technical author on methodologies for GHG abatement projects for OECD/IEA
- Expert witness to Scottish Parliament on the Scottish Climate Change Programme
- Review of Scotland's Climate Change Programme for Scottish Executive (2005)
- Advisor on climate change initiatives for BP

I have prepared three short briefing notes that I hope add to your evidence the economics of climate change in specific policy areas:

1. Costs of reducing greenhouse gas emissions from UK business sector

2. Climate Change Impacts and Sustainable Energy for Developing Countries

3. Consideration of albedo control as an interim measure to control thermal impacts of greenhouse gases

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1. Costs of reducing greenhouse gas emissions from UK business sector: the 3W's

Over the past 8 years our team has undertaken greenhouse gas emission assessments for over 150 private sector companies and public organisations within Europe, covering a range of sectors. While there are some important variations, the overall picture that emerges can be summarised roughly as follows:

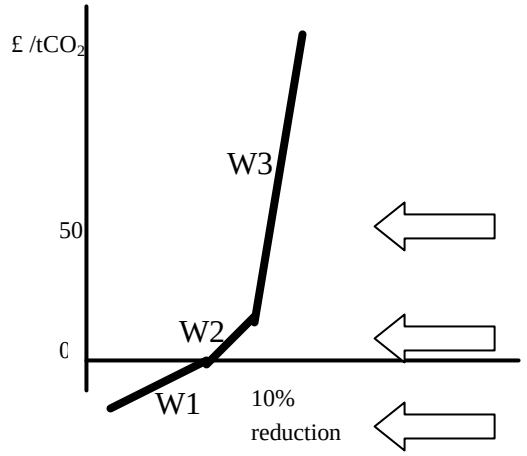
Most companies and organisations could make an initial wedge (**W1**) of around 5% to 10% reductions in emissions at zero net cost by undertaking some "easy win" actions such as fitting variable speed drives and improved process or building controls.

A further wedge (**W2**) of approximately 5% emission reductions can normally be achieved at "moderate" cost (up to around £30 per tonne CO_2) through the application of more capital intensive actions that have a longer payback than would normally be considered attractive.

Beyond this point the marginal cost of abatement nearly always rises dramatically: the so-called "cost curve" is actually more like a "wall" (**W3**). "Wall" measures would generally involve:

- Early retiral / replacement of equipment and physical infrastructure;
- Fundamental changes of design of products manufacturing processes;
- Reduction in absolute output (produce less).

The figure below illustrates the 3Ws, and notes that only W2 policies are really effective at reducing emissions in the long run.



Policies to push W3 measures tend to export emissions by reducing output in UK, or reduce emissions at expense of depressing output.

Policies to push W2 measures effective but difficult to "tune" to business circumstances.

Policies to promote W1 measures reduce site-level emissions but £ savings likely to be re-invested in expansion, increasing LT emissions.

It should be noted that the scope for W2 reductions depends upon the nature of the business, the state of capital equipment, the capital renewal cycle and the availability and cost of new (lower carbon technologies). The scope for W2 improvements is always greater at the point of capital renewal.

The challenge for policy makers is to tune interventions to fit the W2 zone. It must be recognised that the scope for W2 will be limited at any given time.

2. Note on Climate Change Impacts and Sustainable Energy for Developing Countries

Over the past 12 years, our team has worked on a number of projects designed to improve rural livelihoods and energy security in developing countries, particularly in East Africa, India and Mexico.

All estimates of economic costs of climate change in developing countries should be treated with caution. Conventional economic methods such as cost benefit analysis are poor tools for assessing the impact of climate change on poverty reduction and economic development. Many of the costs of environmental change are hidden within the informal / subsistence economies. Different social groups vary considerably in terms of their vulnerability and adaptability to local environmental changes, depending on the type of agricultural system, the split between cash and subsistence income. In many places it is difficult to distinguish between local environmental change resulting from human-induced climate change and the effects of local human activities such as grazing, fuel extraction and cropping.

One of the great opportunities to address climate change and poverty – the provision of sustainable woodfuel and charcoal in developing countries, is poorly addressed by the present policy framework.

Currently over 70% of primary energy consumption (approx. 150 million tonnes of oil equivalent per year) in sub-Saharan Africa, excl. South Africa is from woodfuel in the form of wood (rural areas) or charcoal (urban areas). Much of this consumption is non-sustainable and is associated with deforestation and land degradation, and as such the associated greenhouse gas emissions could be in the order of 450 million tonnes CO_2 per year.

Actions to make this energy supply more sustainable would not only reduce CO_2 emissions but would also have very significant livelihood and poverty reduction benefits, and contribute to energy security for Africa.

We have undertaken a number of pilot projects and studies that indicate a cost of GHG abatement through sustainable woodfuel and charcoal production of £3 to £10 per tonne CO_2 avoided.

Current international climate policies such as the CDM have been largely ineffectual at addressing sustainable energy use in developing countries.

3. Consideration of albedo control as an interim measure to control thermal impacts of greenhouse gases

Given the high costs of imposing low carbon technologies in society over a short timeframe, and the current trajectory of emissions growth in developing countries, I believe that there is a strong case for serious examining technologies to compensate for radiative forcing through albedo control.

At present the effectiveness of albedo control technologies is still unproven. However, initial models suggest that the cost of compensating the thermal effect of increased atmospheric CO_2 could be as low as £0.3 per tonne CO_2 using technologies such as Salter's sprayships (Salter 2005).

While this would provide a masking effect rather than a solution to climate change, it may help to prevent certain ecosystems, such as the boreal forests from becoming sources of CO_2 to the atmosphere instead of sinks within the next 20 to 40 years.

If successful, albedo control could fit within a 3-pronged strategy to control climate change along the following lines:

Component of strategy	**Measures**	**Approximate cost**
Albedo	Masking of thermal impacts of radiative forcing gases by albedo technologies.	£0.5 per t CO_2
Carbon-neutral energy supply by 2100	Phased introduction of carbon capture and storage to 20% of new power plants by 2020 rising to all plants by 2060. Transition to renewable transport fuels / hydrogen by 2060. Growth in renewable energy to around 30% by 2050.	£20 to £40 per t CO_2
Maintenance and restoration of sinks	Conservation of natural forests, grasslands and peatlands; Restoration of degraded ecosystems. Improvement of agriculture and agroforestry.	£5 to £10 per t CO_2

Such a strategy would prevent net warming to occur while allowing transition to lower carbon technologies to take place over a timescale that would significantly reduce the high costs associated with early retiral of capital equipment.

The long term (1-2 century) objective would be to return atmospheric concentrations of carbon to pre-industrial levels by eventual adoption of zero carbon energy and the maintenance and restoration of terrestrial carbon sinks.

urther research is required to determine whether albedo control technologies could significantly reduce the overall costs of addressing climate change.

Reference:

Salter 2005, *Sea-going hardware for the Cloud Albedo Control Method for the Reduction of Global Warming*. Unpublished article.