

Technologies to tackle global warming

The Stern Review of the economics of climate change proposes a dramatic increase in public spending on research into carbon-mitigating technologies as well as market-based schemes for trading and taxing pollution. **Ralf Martin** suggests how these two policy elements might be most effectively combined.

The Stern review is a milestone in efforts to tackle global warming. The basic message is clear: natural scientists have gathered strong evidence that human-induced climate change is happening. Looking at the economics, Stern finds that early and strong action makes sense from a cost-benefit perspective.

He has been criticised for reaching that conclusion by allowing lower discount rates for future costs and benefits as well as giving more weight to potential one-off catastrophic events than earlier studies. But as many of the critics also point out, coming up with any discount rate and weight involves a good deal of value judgement. What matters is that the orders of magnitude are such that changing these assumptions a little bit upwards leads to a range of results where action seems both desirable and quite affordable.

The more interesting question then becomes what Stern actually proposes to do. His suggestions focus first on market-based schemes to internalise the costs of greenhouse gas pollution. Implicitly

through a carbon trading scheme or explicitly through a carbon tax, polluters should price the costs of climate change into their decisions to conduct polluting activities.

While this is standard environmental economics, there is hope that the high profile of the Stern Review and the elaborate discussion on the concrete design of such schemes will provide a much-needed political boost.

The second major policy suggestion is for a dramatic increase in public spending on research into technologies and practices to mitigate pollution. This includes spending on the early deployment and piloting of new technologies, recognising that our eventual adjustment to mitigate climate change will involve the development of a series of such technologies.

As Stern stresses, it is important that there are measures in place to ensure that this extra money is spent wisely. This could involve, for example, an arm's length approach where money is allocated by expert panels to a portfolio of the most promising research projects.

Overall, Stern draws an optimistic

A doubling of public R&D funds could be easily achieved with a low carbon tax on US car owners

picture. Strong action is needed and it is costly, but not so costly that it would be a major obstacle to prosperity. The report itself will be an important source of reference in the discussion to come. But it also raises a number of immediate questions.

First, a key requirement for success will be strong, internationally agreed reduction

targets, which lead to significant increases in the price of polluting activities. The experience of climate change negotiations so far makes it doubtful that strong targets can be agreed on and complied with. The carbon price that will eventually emerge is likely to be below optimal levels. This creates the risk of a final scheme that is simply a revenue transfer from polluters to the government, or whomever holds the pollution rights, without inducing significant behavioural changes that would reduce pollution. Among other things, such a scheme would be very unpopular.

Second, while increased spending on research and development (R&D) is certainly an important avenue, the report leaves open where the extra spending will come from.

My research leads me to a suggestion that would address both issues: why not combine the two policy elements and design the internalisation scheme in a way that raises some revenue?

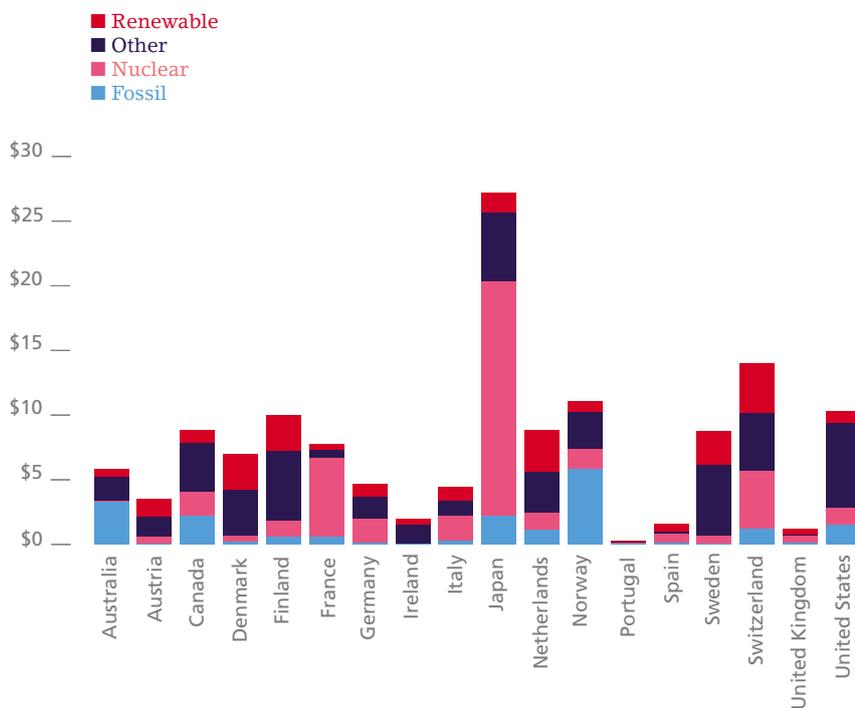
In the case of a carbon trading scheme, this can be achieved by



Climate change: economic sense and non-sense of carbon mitigation policies

- It is predicted that climate change caused by human activities will raise global average temperatures by between 1.5 and 5 degrees Celsius over the next 100 years. This could raise sea levels by one metre or more and lead to a number of other catastrophic climate changes and related phenomena. It could also have some benefits such as bigger harvests in some regions and longer and warmer summers.
 - Humanity's main response to this problem is the United Nations' climate negotiation process. The most important milestone of that process so far is the 'Kyoto protocol' which has set targets for reductions in greenhouse gas emissions and which came into force in February 2005.
 - Despite some attractive design elements, the Kyoto protocol alone is unlikely to make much impact on greenhouse gas emissions. This is mainly due to the failure of the agreement to include most of the world's current and future emissions, which will arise in China, India and the United States.
 - If, as seems likely, this status quo continues, then R&D, which leads to innovations that can both reduce the intensity of carbon emissions and reduce costs, will become an even more important part of the strategy to fight climate change.
 - While the Kyoto strategy of internationally agreed emission targets might create some incentives to develop these technologies, the incentives are probably insufficient. This suggests that some additional direct support from governments is required.
 - Another problem with targets is that by their very nature, they have to be based on very unreliable forecasts of what can be achieved in the future at reasonable costs. Pressing ahead with ambitious targets – as is the current UK strategy – might therefore risk wasting large amounts of public and private money without having much impact on climate change.
 - To avoid the danger of excessive costs or politically disastrous non-compliance, target schemes should include a 'safety valve' mechanism.
 - We propose an innovative solution of a safety valve mechanism operating through a Global Environmental R&D Fund. Countries could convert excess carbon into contributions to a research fund that would be used to develop technologies to reduce climate change.
 - Such a fund could also be used to construct a much needed enforcement mechanism for climate agreements if resulting innovations could be used freely by participating countries but licensed for a fee to non-participating countries.
- Extract from CEP Policy Analysis – *Climate Change: Economic Sense and Non-sense of Carbon Mitigation Policies* – available at: http://cep.lse.ac.uk/briefings/pa_climate_change.pdf

Figure 1:
Public spending on energy R&D per capita
(average values between 2001 and 2005 in
US dollars at purchasing power parities)



Source: Author's calculations based on data from the International Energy Agency

Getting international agreement on R&D spending targets might be easier than on pollution targets

auctioning the permits rather than allocating them for free (as currently happens in the European Union's emission trading scheme introduced in January 2005). In the case of a tax, revenue accrues naturally.

But rather than entering the general tax revenue, this extra revenue should be earmarked to contribute to the suggested increase in public R&D spending. Because the tax levels required to raise a revenue stream that would make a difference in R&D spending are likely to be much lower than those that induce behavioural changes, even a much watered down internalisation scheme has the potential to have a significant long-term impact on climate change.

For example, a comparatively low carbon tax in the United States on emissions of carbon dioxide from transportation of only \$5 (which would increase the average annual cost of running a vehicle by \$40) could raise a budget equal to current world public spending on energy R&D (which is approximately \$9 billion). In other words, the suggested doubling of public R&D

funds could be easily achieved by US car owners alone at a price that would hardly induce them to stop driving. Earmarking will also strengthen popular support.

A further issue concerns international variations in R&D spending. Stern rightly stresses the need to coordinate carbon targets internationally. But international coordination might also be required to double R&D spending while avoiding some countries 'free riding' on other countries' spending.

This is underlined by the current huge variations in public energy-related R&D spending across industrialised countries (see Figure 1). According to my calculations, this ranges between \$27 per person in Japan, over \$10 in the United States and \$1.20 in the UK.

Agreeing and committing to R&D spending targets might also be easier than agreeing on pollution targets. With the former, governments know what they are bargaining for. With pollution targets, the uncertainty over future costs is very high.

Ralf Martin is a research fellow in CEP's productivity and innovation programme and author of the CEP Policy Analysis published in 2006, *Climate Change: Economic Sense and Non-sense of Carbon Mitigation Policies* (see box for a summary).