Environmental Issues

Malcolm Keay considers the problem of environmental targets

Measurement sounds like the sort of technical detail best left to the anorak-clad experts – of passionate interest to them, perhaps, but of no great importance in the wider scheme of things. Yet a few moments' thought will show how wrong that view can be. It is a basic tenet of management that 'if you can't measure it, you can't manage it'. Furthermore, everyone involved with policy analysis knows that measuring public policy outputs is difficult – it is always possible to measure inputs (how much money is spent; how many schools or hospitals built?), but relating that to outputs (how does this affect standards of education or health?) is very complicated – and often not even tried.

At first sight, climate change might seem more favourable ground for measurement. The overall objective is clear enough – reducing greenhouse gas emissions – and there are tangible milestones and targets on the way, in the form of Kyoto and other obligations, so the desired outputs of policy are easy to define. Yet the old problem of linking inputs (expenditure on, say, energy efficiency or renewables) with those outputs remains – and, until that link can be made, governments cannot seriously plan the measures they require to meet their targets. At present, they are unable to do so.

A clear example is energy efficiency. Energy efficiency has been a centre-piece of government energy policy at least since the 'Save It' campaign of the 1970s, and central to climate change measures since the early 1990s. The expected outputs have been quantified – the UK Energy White Paper says 'we expect more than half the reductions in our existing Climate Change Programme – around 10MtC by 2010 – to come from energy efficiency' as well as 'half the additional 15–25MtC savings we are likely to need by 2020'. Yet today, two-thirds of the way through the Kyoto period, the UK is not in a position to say what its energy efficiency measures are achieving.

The problem is not new. A few years ago, the Environmental Audit Committee (Tenth Report, session 2003–2004), commented that

> A central theme emerging from this report is the difficulty of assessing progress on energy efficiency in the absence of robust and reliable energy projections and systematic ex post appraisals of the impact of specific policy measures…Indeed, in dealing with energy efficiency, there is a sensation of standing on shifting sands.

More recently the House of Lords Science and Technology Committee reported in July this year that little had changed: 'the Government appear to have no clear view on how to measure, and thereby manage [energy efficiency]'.

The problem is that there is no automatic link between improvements in energy efficiency and reductions in greenhouse gas emissions. Energy efficiency does not necessarily reduce energy use – indeed by effectively making energy services cheaper it may increase consumption. Careful analysis of the links between efficiency and energy demand, and hence emissions, is required.

In other areas this is well understood. For instance, in relation to labour efficiency (productivity), it is clearly wrong to make the simple top-down calculation that an improvement in productivity of, say, 1.5 percent a year means the loss of an equivalent number of jobs. Similarly, at least since the times of the Luddites, no one has advanced a bottom-up calculation, adding up the impact of all the efficient new machines installed across the economy, as a way of estimating levels of employment. Economies are dynamic and complex systems; the various interactions and feedbacks need to be taken into account. The government itself argues that improved productivity creates, rather than destroys jobs (i.e. increased labour efficiency increases demand for labour). Yet on energy efficiency, it takes the opposite view; it uses top-down and bottom-up calculations, of the sort it would reject out of hand in relation to productivity, based on the assumption that energy efficiency reduces demand for energy.

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More accurate measurement involves considerable methodological difficulties, from whatever end you approach the issue. To examine bottom-up impacts properly, sophisticated analysis is required – taking account of such issues as income and substitution effects; free-riding; principal/agent slippage; persistence; gaming; appraisal optimism; the impact of new services and so on. In practice, virtually none of this is done – it is very expensive and difficult to undertake. In the past, this did not matter much, since the aim was to improve efficiency rather than reduce demand as such. Now, when the aim is to reduce emissions, a much more determined approach is called for. In practice, however, the government does not measure the outputs of energy efficiency interventions in any rigorous way. Instead, it concentrates on measuring inputs (for example, insulation installed, compact fluorescent light bulbs distributed) and simply assumes that they achieve the expected results.

Top-down measurements are no easier

– partly because of the many confounding factors, such as movements in energy prices, changes in industrial structure and so on, but also because the government's energy projections are essentially econometric. They incorporate a factor known as autonomous energy efficiency improvement, a steady but undifferentiated increase in efficiency. There is no easy way of knowing, ex ante, whether an energy efficiency measure or programme will increase that rate of improvement; or, ex post, whether an energy efficiency gain was the result of policy measures.

In other words, as the Committees complained, there is no clear baseline, and therefore no way of knowing what effect energy efficiency measures are having. There is also no evidence that measurement is getting any better. It is difficult to see anything more than the triumph of hope over experience in the statement in the Government's Climate Change Review that: 'Since 1990, carbon dioxide emissions from the household sector have fallen by about 3%. On the basis of current policies, carbon dioxide emissions are expected to decline by about 16% between 1990 and 2010.'

Renewables, one of the government's other key measures, raise analogous problems. It is not in principle difficult to measure the physical output from renewable sources. Furthermore, support for renewables leads to increased, rather than lower, prices, so one might expect some positive feedback in terms of carbon mitigation. Yet here too there are enormous methodological problems.

The practical issues are relatively well recognised – will the desired quantity of plant be built and perform as expected? The facts that: all previous renewables targets have been missed; the practical problems are daunting (as pointed out in another recent report from the Science and Technology Committee on 'Renewable Energy: Practicalities'); and that there have been a number of recent announcements of problems with major renewables projects all reinforce the general belief that the government's 2010 target will be missed.

But even if it were met, what savings would it realise? The measurement problem here is that renewables are being introduced into a dynamic and responsive electricity market. It cannot be assumed that all other things will remain equal, apart from the renewables themselves – the savings can only be measured by looking at the impact on the whole electricity system, including non-renewable sources.

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Even in the short run, that impact is difficult to measure. It involves a calculation of what the renewables replace when they are operating. This depends on the rest of the system. During the last century, when coal was virtually always at the margin in UK generation, renewables generation could be regarded as displacing coal. Increasingly this century, as gas takes a greater place in the generating system, wind may find itself displacing gas-fired generation. That would, in itself, more than halve the CO_2 benefits from wind generation.

But the short-run problems are relatively straightforward compared with the longer-term issues. A programme for new capacity stretching into the future will have an effect on the composition of the system by displacing other new investment, which in all probability would either be new (and therefore highly efficient) gas stations, or even nuclear. The nominal CO_2 savings would fall – indeed if nuclear were displaced there would be no savings at all. Even if new fossil plant were displaced, there would be a significant penalty, because the new investment would have raised system efficiency. If the composition of the system changes as a result of a wind programme, emissions will rise for the whole time of operation (as compared with what they might otherwise have been); whether this increase is offset by wind power during the minority of hours during which it operates is uncertain, especially given the losses in operating efficiency across the system caused by the intermittency of wind.

The impact depends on what new plant is displaced. To take a simple example: If the UK were to meet its 2020 aim of 20 percent of electricity from renewables with wind only, the Sustainable Development Commission calculates that 26 GW of wind power would be needed, equivalent (because of the intermittency of wind) to around 10 GW of alternative plant. What investment if any would it displace? Wind advocates normally assume that investment elsewhere in the system would be unaffected, but this seems very implausible. The introduction of a significant volume of wind power, with its intermittent output, inevitably reduces the load factor of other plant on the system and increases the uncertainty about whether it can operate for long enough to remunerate the investment. The incentives to build new plant would be substantially reduced; the temptation to retain older plant, despite its lower efficiency and higher emissions, would increase.

So the impact of wind would be to reduce investment elsewhere, but the question is by how much – the 10 GW of fossil equivalent, the 26 GW of total wind power or some other (possibly higher) figure? The new plant displaced is likely to be new CCGT capacity (as the government assumes in its business-as-usual projections). As this would operate at up to 60 percent efficiency and would probably replace older coal plant operating at around 35 percent efficiency, enormous cost-effective CO_2 savings, which would otherwise have taken place, would be foregone. The effect could be to reduce, or even eliminate, any savings from the wind when it actually operated.

Similar uncertainties arise with other climate change measures – for instance with combined heat and power. Governments usually praise its high potential efficiencies – up to

90 percent – and compare that with the efficiency of existing fossil power plant (say, around 35 percent). But this is triply misleading;

- First, because in practice CHP plant rarely reach the high levels of efficiency that are technically possible. As the *Digest of UK Energy Statistics* shows, CHP schemes in the UK have an average efficiency of around 70 percent.
- Second, because CHP stations produce heat as well as power – indeed heat is usually their main output. In the UK, for instance, heat output is on average about two and a half times greater than power, so a comparison with power only plant misses the main part of the picture.
- Third, because comparing existing plant with new CHP investment ignores the significance of investment displacement. New CHP plant is normally installed at a time when a decision has already been made to replace existing plant; it is therefore likely to displace alternative new investment, rather than the existing plant (which would have been retired anyway). Since new heat plant may have efficiencies of 90 percent or so, and new power plant up to 60 percent, the comparison does not necessarily favour CHP.

Again, therefore, the result may well be that there is little or no emissions saving in practice; as with its other main policy measures, unless ways can be found of measuring the impacts more accurately, governments really have little idea whether the promotion of CHP makes a contribution to their climate change targets.

The analysis could go on, but it would only reinforce the message – that governments are not able to measure the impact of their climate change policies or forecast the results in terms of emissions. As a consequence, although they have both targets and supporting policies in relation to climate change, whether those policies contribute to meeting the targets is essentially a matter of chance.

It is therefore no surprise that only two countries in the EU-15 are on track to meet their targets. Most of the rest are set to fail; a small number might meet the target if planned new measures work as expected (which, as explained above, is unlikely). Outside the formerly centrally planned economies, other countries with Kyoto targets, like Japan and Canada, are in an even worse position.

Even in the two countries which are on track, the causes of CO_2 emissions reductions are to be found elsewhere than in their climate change programmes – in the UK, all the CO_2 emissions reductions since 1990 took place in the early 1990s, primarily as a consequence of the dash to gas in power generation, i.e. as a result of liberalisation rather than climate change policies. Sweden has a target of + 4 percent for overall greenhouse emissions. Although it is on track, its CO_2 emissions have increased by around that much since 1990. Given that it managed to reduce CO_2 emissions by about 40 percent during the preceding 15 years (i.e. in 1975–1990, as a result of its nuclear construction programme, and the substitution of electricity for oil in heating – this trend continues to influence the figures) that is hardly an overwhelming achievement.

In short, if governments want to take climate change seriously, they will have to start taking these measurement issues seriously. It will cost money to do so, but that can be no excuse for not trying. The present situation, where they rely on policies whose impacts they cannot measure, and fail to achieve the reductions they expect, benefits no one, neither the economy (there is no way of knowing if the measures on which governments are relying are cost-effective); nor the environment (Kyoto countries are missing their greenhouse gas targets and undermining their credibility for future regimes).

Benito Müller reports on the Montreal Climate Change Conference

Between 28 November and 10 December 2005, the capital of the Canadian province of Quebec hosted what was generally expected to be an important session of the annual United Nations climate change conference, an expectation reflected in a record attendance of almost 10,000 participants. The reason for this was, on the one hand, its being the first session of the governing body of the Kyoto Protocol – known as 'Conference of the Parties serving as Meeting of the Parties to the Kyoto Protocol' (COP/MOP) – signalling the full legal implementation of the Protocol, and, on the other, the fact that, by coincidence, it was also the year in which the Kyoto Protocol required the launch of negotiations on industrialised country commitments for the period after 2012, when its current initial commitments expire.

And, although not completely unexpected, it was seen as a good omen when the forty odd decisions of the 'Marrakech Accords', the Kyoto Protocol rule book – named after the Moroccan host city of COP7 (the 2001 seventh session of the Conference of Parties, the governing body of the UN Framework Convention on Climate Change) where they were finalised – were adopted without objection at the beginning of the Montreal meeting.

The mid-conference resolution of another issue, on which agreement had not been possible at Marrakech, was much less expected. The issue was, in essence, whether the consequences of non-compliance with the Kyoto Protocol targets should be legally binding penalties, or some form of 'rehabilitation' measures. In practical terms, the argument boiled down to the manner in which the draft compliance instrument would be adopted. For binding penalties, it had to be adopted as an amendment to the Protocol, for non-binding consequences an adoption by

decision of the COP/MOP would be sufficient.

Saudi Arabia had tabled a controversial proposal ahead of the meeting that adoption of the compliance instrument should be by way of an amendment to the Protocol alone and not through a COP decision. The reason why this was more than just a legalistic point is that an amendment would require separate ratification by the Parties to the Protocol, a process which experience has shown could take years. Without its adoption, the Protocol and its carbon trading instruments could not actually be implemented. The Saudi proposal, in short, could have easily led to a last minute derailment of the whole Kyoto process. As it happens, the Conference made a classic compromise, namely to adopt the compliance instrument by decision now, and at the same time schedule discussions on adoption as an amendment, to be concluded at COP/MOP3 in 2007.

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With the adoption of the Marrakech Accords and the compliance regime, the Kyoto Protocol became fully operational. Yet the Conference went further by also adopting improvements of some of its elements, in particular the Clean Development Mechanism (CDM), an emission trading mechanism in which developing countries can attract much needed investment in clean development projects from (industrialised) Kyoto Parties in return for emission credits generated by the projects. The CDM in its initial form had proven to have some bottlenecks which were unlikely to let it develop its full potential.

These achievements, by themselves, would have been sufficient for the first COP/MOP to have been deemed a success. Yet, at Montreal, there was more at stake. As mentioned, it was also meant to initiate the negotiations on the future of Kyoto beyond its first commitment period. And what made Montreal a historic meeting was that the Kyoto Parties decided to initiate formal negotiations to adopt industrialised country targets for a period beyond 2012.

This was historic because it finally gives the business sector, particularly in the industrialised world, the regulatory certainty indispensable for the investment decisions required to solve the climate change problem. Energy infrastructure investments, in particular, are medium to long-term and thus much more in need of regulatory certainty than other types of investments. The Kyoto Protocol has now moved on from being merely a potential 'one-period wonder' to the one and only multilateral regime which is here to stay.

'Finally,' – as Stéphane Dion, the Canadian Environment Minister and Conference President – reminded the delegates in his conference closing statement, 'we have achieved what many claimed was unattainable, a decision launching a dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention.' The reason why this was felt to be impossible was that it actually includes the United States, who until the very last moment categorically refused to enter into any discussion on future action under the aegis of the United Nations, to the point of actually walking out of the negotiations, in an act of brinkmanship, at one stage of the negotiations. There is no doubt that getting them to finally agree to some dialogue – if only one that is 'non-binding' and explicitly not meant to lead to negotiations of new commitments – is a tremendous personal success for M. Dion, and it is understandable that he considers this to represent 'a major victory for the global community. Now national governments will have the forum to exchange experiences and analyse strategic approaches and to free our imaginations to find further innovative solutions that I know we are capable of.'

But precisely because of the explicit limitations on its ambitions, one should not get too carried away about the Bush administration 'having blinked', as one observer put it, or even having changed their mind on either the Kyoto Protocol, or the usefulness of the UN process as a whole. The only way for the international community to engage with the USA in a meaningful manner on climate change in general, and to address US emissions in particular, is to bypass the White House, and instead deal directly with the many sub-national entities – be they cities, states, and even groups of like-minded states – who are willing to take on serious mitigation efforts, such as the group of north-eastern states that have introduced a carbon cap and trade system for their utilities.

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Indeed, given that the emergence of such regional trading systems is highly likely to lead at some point to a US-wide system – due to pressures from the sectors involved regarding inter-state competitiveness and regulatory streamlining – the most important step forward for the Kyoto Parties with regard to engaging the USA would be to integrate these regional US schemes with their own schemes, so as to ensure that an international component and Kyoto compatibility is from the outset built into these prototypes of such a US-wide scheme.

But the main 'message from Montreal' to the world has to be that the Kyoto Protocol, with its emission caps and trading mechanisms, is not only fully operational, but is the only viable existing multilateral effort to combat greenhouse gas emissions, and, most importantly, that it is here to stay!