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Serendipity is not a strategy: the impact of national climate programmes on greenhouse-gas emissions

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This article examines the efficacy of national climate programmes (packages of policies introduced by governments to meet emissions reduction targets set out in the Kyoto Protocol) by considering emissions trends before and after their implementation. Analysis reveals that only four of 21 countries with defined programmes demonstrate improved emissions trends following their inception and in only one is the change statistically significant. The reasons for this are manifold but serendipity appears to play as large a part as strategy in determining national emissions trends in the early years of climate programmes. Inflated claims of success by national governments are unhelpful for effective policy analysis and development.

Key words: *climate policy, greenhouse-gas emissions, national climate programmes, quantitative analysis*

Introduction

The entry into force of the Kyoto Protocol on 16 February 2005 has re-sharpened political attention on the extent to which Annex B Parties (those countries with quantified emission limitation or reduction commitments) are meeting their obligations under the Protocol. Although Kyoto contains a range of compliance obligations, interest lies primarily in Article 3, paragraph 1, which states that Annex B Parties

> shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases . . . do not exceed their assigned amount, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B. (United Nations Framework Convention on Climate Change (UNFCCC) 1997, 3)

Government strategies to meet international emissions obligations typically comprise assortments of existing and planned policies and political intentions, often wrapped together under a 'national climate programme', designed to reduce dependence on fossil fuels and to make a shift to more sustainable patterns of energy generation, energy consumption and land use (e.g. DETR 2000). Determining the optimal global economic framework for reducing emissions, in terms of the social cost of carbon, remains highly contested in theory (Pearce 2003), but to go further and determine optimal practical policies – individually or in combination and taking into account environmental, social and economic effects – remains extremely challenging (Sorrell and Sijm 2005; Kerr *et al.* 2003). It is, nonetheless, possible and important to assess national climate programmes with reference to their primary goal of contributing towards meeting emissions targets inscribed in the Kyoto Protocol whilst maintaining a growing economy.

This explicit and common aim, coupled with knowledge about the inception date of national climate programmes, suggests that we can distinguish between: (a) whether a country is on course to meet its individual emissions commitment; and (b) whether its climate programme is contributing towards that commitment. The former is the sum of multiple economic and land use activities over time; the

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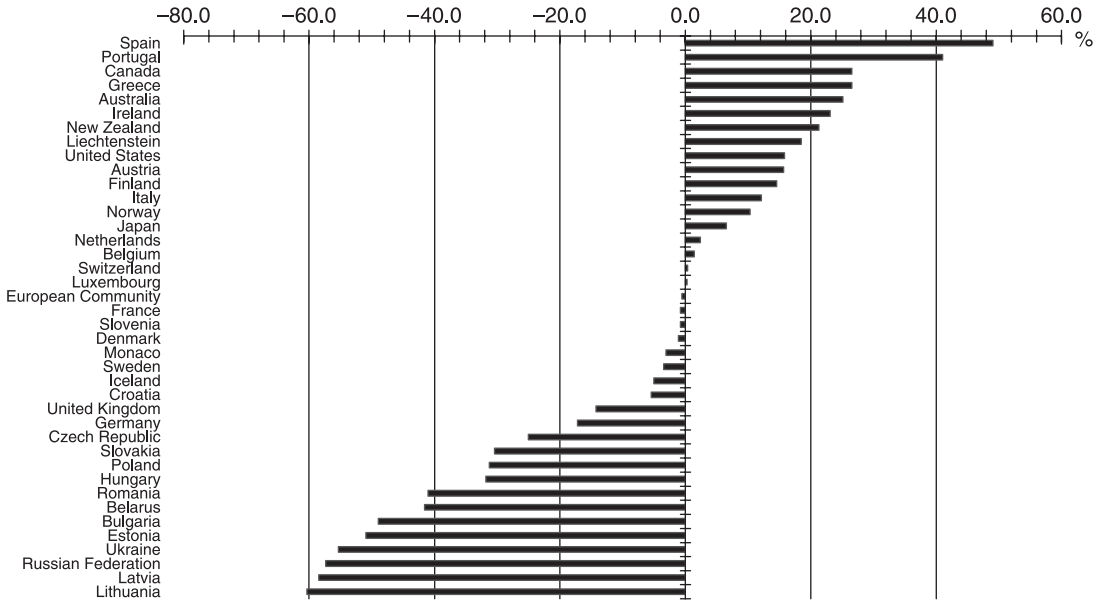

Figure 1 Per cent difference between greenhouse-gas emissions (without LULUCF) in 1990 and 2004 of individual Parties named in Annex B of the Kyoto Protocol
Source data: UNFCCC (http://ghg.unfccc.int/index.html)

latter reflects the response of national emissions to a specific package of emission mitigation policies over a much shorter timescale.

In this paper, I examine the latter issue by comparing national emission outcomes before and after the implementation of national climate programmes and by considering these outcomes in relation to net emission targets[1] set in the Kyoto Protocol. The purpose of this analysis is to critically scrutinise the extent to which emissions cuts achieved thus far can genuinely be attributed to national strategies (recognising that the full impact of some measures will not yet be felt) or to more serendipitous factors and, thus, to interrogate national governments' claims about the effectiveness of these strategies. The next two sections review emissions data and national climate programmes before analysis and discussion of links between the two. Finally, brief conclusions are drawn on the implications of the research for the analysis of climate policy implementation.

Emissions data

At the time of writing, the most recent comprehensive dataset of national inventories for Annex B Parties to the Kyoto Protocol comprises 1990–2004 data (UNFCCC 2006). These data (summarised in Table 1) provide the basis for a widely publicised chart produced by the UNFCCC secretariat showing changes in emissions by each country since 1990 (on which Figure 1 is based). Total emissions without land use, land-use change and forestry (LULUCF) emissions are the preferred unit of measure because they provide a more consistent indicator of progress by governments than 'with LULUCF' figures (following UNFCCC 2006) because of wide variations in LULUCF capabilities and policies.

These emissions data are used to calculate the rate of change of emissions per year for each country from 1990 to 2004 and to infer trends in emissions: (a) since 1990 (the baseline year for most Annex B countries); (b) since the Kyoto Protocol was opened for signature in 1998; and (c) since each national climate programme was instigated. Trends since 1998 are examined as well as 1990 because this provides a common baseline from when all Annex B Parties explicitly recognised the need for legally-binding targets under the Kyoto Protocol, though the USA and Australia have since withdrawn from the Protocol. In contrast, the UNFCCC (1992), which was signed in 1992 and ratified in 1994, set only a general stabilisation objective leading to a rather

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Table 1 Total greenhouse-gas emissions (excluding LULUCF) since 1998 from Annex B Parties (Gigagrams). Start year for national programmes in italic

	1998	1999	2000	2001	2002	2003	2004
USA	6 767 132	6 808 241	6 975 929	6 886 890	*6 909 407*	6 952 561	7 067 570
EU	4 184 732	4 119 135	*4 129 317*	4 174 119	4 155 328	4 216 469	4 228 006
Russian Fed.	2 082 420	1 839 340	2 366 210	2 303 800	1 874 970	1 753 680	1 953 920
Japan	*1 306 016*	1 327 418	1 345 531	1 320 588	*1 352 996*	1 358 324	1 355 175
Germany	1 054 287	1 023 345	*1 022 798*	1 034 912	1 018 644	1 024 377	1 015 273
Canada	686 372	698 385	725 048	718 819	*725 547*	753 751	758 067
United Kingdom	706 291	672 459	*672 195*	679 700	659 243	664 471	665 330
Italy	543 001	549 237	554 611	561 290	*561 790*	577 411	582 520
France	584 585	568 023	*561 436*	561 660	556 084	561 093	562 635
Australia	*482 047*	492 629	504 196	517 407	520 073	520 199	529 230
Spain	341 618	369 927	384 246	384 552	402 060	408 169	427 905
Ukraine	410 056	408 020	395 095	398 950	400 479	416 017	413 411
Poland	403 512	401 582	386 181	382 787	370 239	*382 639*	388 063
Turkey	256 090	256 321	278 924	260 963	268 849	284 135	293 810
Netherlands	227 573	215 447	*214 433*	216 206	214 932	215 697	218 086
Romania	145 111	129 326	131 842	136 569	142 672	148 622	154 626
Belgium	152 817	146 902	147 411	146 841	145 090	*147 530*	147 873
Czech Rep.	150 081	142 009	149 165	149 497	144 090	147 583	*147 111*
Greece	126 844	126 729	131 756	133 288	*133 017*	137 284	137 633
Austria	82 589	80 784	81 263	85 130	*86 843*	92 511	91 299
Portugal	77 371	84 619	*82 178*	83 728	88 198	83 682	84 546
Hungary	84 477	84 146	81 875	*84 546*	81 556	84 334	83 924
Finland	72 225	71 704	69 965	*75 366*	77 505	85 660	81 435
New Zealand	67 467	69 129	70 315	73 065	*73 618*	75 606	75 088
Belarus	75 257	71 800	69 788	*68 172*	68 145	69 815	74 364
Sweden	73 278	69 940	68 389	69 067	*70 073*	70 907	69 854
Denmark	77 146	74 032	69 585	71 152	70 330	*75 541*	69 620
Ireland	65 815	67 362	*68 729*	70 550	68 985	68 361	68 460
Bulgaria	68 736	64 259	64 254	64 852	62 119	67 731	*67 511*
Norway	52 930	53 874	53 500	54 730	53 469	54 332	54 931
Switzerland	52 263	52 505	*51 655*	52 506	51 493	52 529	53 019
Slovakia	52 387	51 167	49 378	52 499	50 516	51 091	*51 025*
Croatia	24 304	25 311	25 268	26 424	27 609	29 192	29 432
Estonia	21 407	19 577	19 662	19 416	19 524	21 387	21 322
Lithuania	21 819			20 356	19 588	17 224	20 193
Slovenia	19 214	18 621	18 822	19 746	19 939	19 666	*20 059*
Luxembourg	8 397	9 144	9 688	9 966	10 964	11 433	12 722
Latvia	11 377	10 577	9 929	10 660	10 581	10 705	*10 746*
Iceland	3 421	3 614	3 545	3 515	*3 536*	3 459	3 112
Liechtenstein						264	271
Monaco	118	119	117	119	117	111	104
Total	**21 622 580**	**21 276 761**	**22 044 233**	**21 984 403**	**21 570 218**	**21 715 552**	**22 089 280**

Source data: UNFCCC (2006)

patchy and limited response to controlling emissions. In addition, the political economies of the ex-socialist Economies in Transition (EITs) included as Annex B countries underwent major upheavals during the early 1990s, the economic and environmental outcomes of which became tied intimately to the political process underpinning the targets set by the Kyoto Protocol (Böhringer and Finus 2005; Grubb 2003). In each case, trends in emissions or trends in the rate of change in emissions are used rather than the annual data themselves. The general consensus from the Kyoto discussions was that annual data

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were too dependent on variations in economic cycles, weather fluctuations (which drive energy demand) and relative fuel price movements. This was the primary reason, along with the avoidance of tying Kyoto metrics to US electoral cycles, for the adoption of five-year emissions measurement periods in the Protocol.

National climate programmes

Parties to the Kyoto Protocol were obliged under Article 7 and subsequent decisions to submit a Demonstrable Progress Report by 1 January 2006, which was to include descriptions of policies, measures and trends in greenhouse-gas emissions, to demonstrate progress towards their Kyoto targets. These reports are used along with the fourth National Communications from Annex B Parties (USA and Australia) that have chosen not to abide by the compliance obligations of the Kyoto Protocol but remain parties to the UNFCCC, as the most authoritative reporting of national policies, measures and trends. National communications are reports that Parties must submit periodically to demonstrate compliance with the various obligations of the UNFCCC.

Of the 38 countries and the European Community (comprising in 1998 15 member states) that have emissions targets defined in Annex B of the Kyoto Protocol, 29 specified in their progress report that they had developed a defined and coherent climate change programme to assist in achieving their emissions targets. In addition, the USA and Australia have identified climate programmes in their fourth National Communication to the UNFCCC. Those that had not specified a Programme by 2005 were: The Russian Federation (2006); Ukraine (2006); Romania (2006); Norway (2005); Belarus (2006); Croatia; Monaco; Estonia (2005); Lithuania (2006); and Liechtenstein (2006).

The majority of these are former EIT countries whose 2004 emissions and projected emissions to 2012 remain well within their Kyoto assigned amount because of industrial contraction in the 1990s, providing their rationale for not developing a specific national climate programme. Norway and Liechtenstein provide a somewhat different justification; both argue that they have integrated climate policies into their wider economic policies rather than creating a separate programme (Norway 2005; Liechtenstein 2006). For example, Norway was the first country to impose a widespread carbon tax through its CO_2 tax of 1991.

Of the 29 countries with self-defined national climate programmes, eight initiated their programme in 2003 or 2004, providing insufficiently long time-series data to examine the impact of individual programmes on national emissions. These are: Spain (2006); Poland (2006); Czech Republic (2005); Denmark (2005); Bulgaria (2006); Belgium (2006); Slovenia (2006); and Latvia (2006). The remaining 21 countries had explicitly packaged and instigated a suite of policies and measures (and in some cases political intentions) by 2002 under the banner of a national climate programme. Australia (2006), Austria (2006), Belgium (2006), Canada (2006), European Commission (2005), Finland (2006), Germany (2006), Greece (2006), Hungary (2005), Ireland (2006), Italy (2006), Japan (2006), Netherlands (2006), Poland (2006), Portugal (2006), Slovakia (2005), Sweden (2005), Switzerland (2005), UK (2006), United States (2002).

These policies and measures inevitably vary by country but share similar attributes: energy taxes; voluntary or negotiated agreements with businesses; mandatory or voluntary moves towards emissions trading; incentives to promote renewable energies; demand-side measures to reduce energy use in domestic sectors; and wider attempts at education and advocacy. Neumayer (2004) demonstrated the importance of geographical factors in determining cross-country differences in per capita CO_2 emissions, which presumably also reflects variations in their capacity to reduce emissions at different economic (and political) costs. Separately, numerous policy and economic analyses have considered which available policy tools can be used to manage and reduce greenhouse-gas emissions commensurate with the threat from climate change advised by the scientific community (IPCC 2001; Stern 2007). The choice of instruments has been described classically as one between managing quantities or managing prices (Weitzman 1974; Roberts and Spence 1976; Menanteau *et al.* 2003; Quirion 2004). However, the political reality is that the policy process neither conforms to neat economic theories nor provides perfect matches between objectives and policy instruments; it is inherently messy coupling piecemeal solutions and politically convenient strategies (Helm *et al.* 2003). While variations clearly exist in the design and calibration of instruments to suit individual economies, detailed analysis of these variations is not appropriate or attempted in this paper, as the focus is whether the entire self-defined package of policies is having the impact on emissions hoped for or expected by the governments that designed them, rather than detailed critiques of individual strategies. The implications of this are revisited in the discussion.

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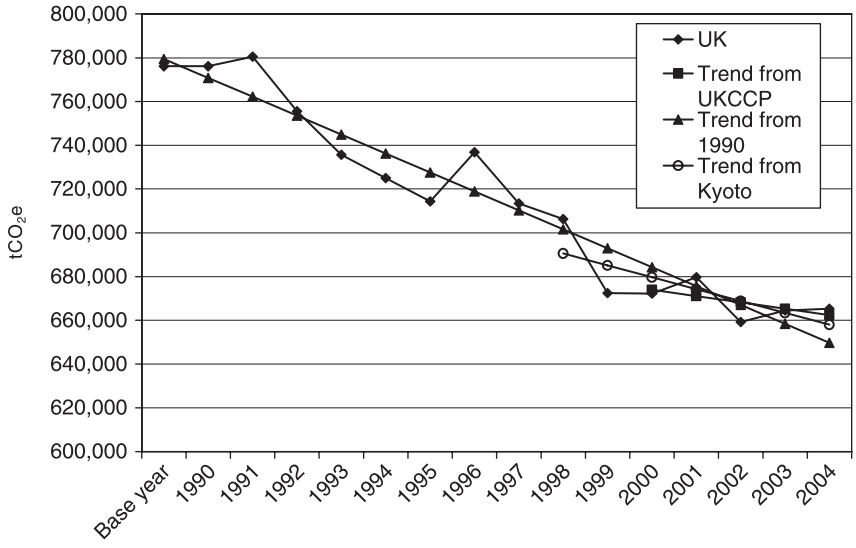

Figure 2 Actual emissions and trends in emissions in the UK from 1990, from 1998 and from the date of inception of the UK Climate Change Programme (UKCCP) in 2000

Analysing the emissions data

The data can be characterised in a simple way initially by examining the emissions trends for each country (a) since 1990 and (b) since the Kyoto Protocol was opened for signature, expressed as the change in greenhouse-gas emissions per year (ΔtCO_2e/year). These can then be compared with emissions trends since the inception of respective national climate programmes. This provides an indicative measure of whether – in the case of rising emissions – implementation of the programme has reduced the rate of emissions increase per year or – with falling emissions – whether implementation has increased the rate of reduction.

For the purposes of this paper, the trend of a simple linear regression line through the data was used, though more detailed regression techniques do not change the findings. The slope of the regression line, *b*, is:

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2} \quad (1)$$

where *x* is years and *y* is total emissions (excluding LULUCF) in those years.

The results produce a figure in tonnes of CO_2 equivalent per year (tCO_2e/year), which represents the annual change in emissions of the best fit linear regression line for: (a) 1990–2004; (b) since 1998; and (c) since the national climate programme was implemented. These trends can also be compared against the 'distance-to-target' required to match the emissions target set out in Annex B of the protocol.

Figures 2 and 3 show this process for the United Kingdom. In Figure 2, the trend since 1990 is for falling emissions at 8749 tCO_2e/year; since 1998 of falling emissions at 5422 tCO_2e/year; and since the introduction of the national climate programme, falling emissions at 2896 tCO_2e/year. Since annual changes in emissions volumes vary considerably across different countries – ranging from nearly 80 000 tCO_2/year for the USA to a few hundred tCO_2e/year for Switzerland and Iceland – the results can be better understood by normalising the data. This is derived as a percentage by dividing the rate of change in emissions per year with the actual 2004 emissions, where negative numbers denote an emissions reduction. For the UK, the relevant emissions trends are shown in Figure 3 and are:

- From Kyoto baseline (1990–2004): –1.31 per cent per year.
- Since Kyoto was opened for signature (1998–2004): –0.81 per cent per year.
- Since inception of national climate programme (2000–2004): –0.44 per cent per year.

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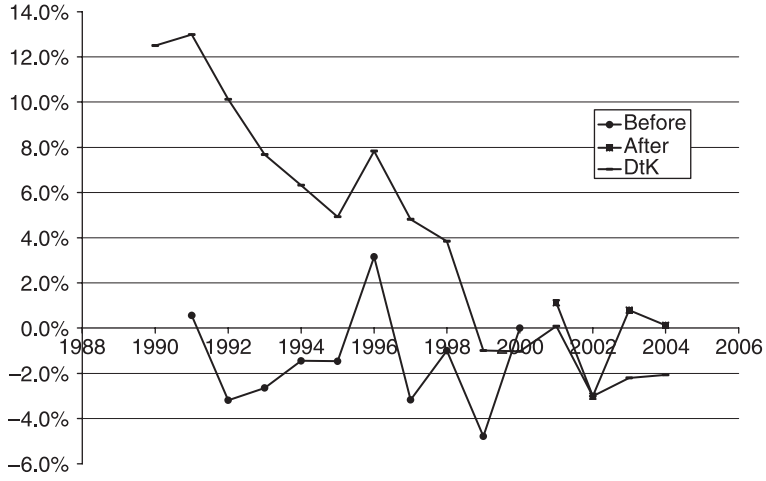

Figure 3 Comparison of rate of change in emissions (excluding LULUCF) before and after inception of the climate programme in 2000 normalised as % of 2004 emissions and distance to Kyoto target (DtK) (as % of 1990 emissions)

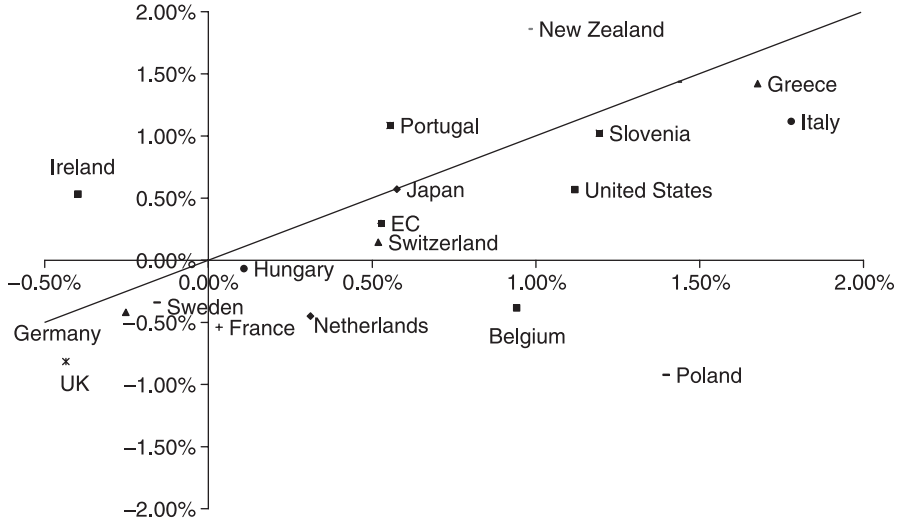

Figure 4 Rate of change in selected national emissions since 1998 compared with rate of change since implementation of national climate programme (as % of national 2004 emissions)

In other words, earlier years saw substantially larger emissions reductions than recent years in the UK. It is important to note that this does not identify the causality of these trends, merely that they occurred.

This process can be extended to all countries with specified national climate programmes. Figure 4 plots emission trends from 1998 against trends since the inception of each national climate programme. The rate of change in emissions per year (as a % relative to 2004 emissions) since the implementation of the national climate programme is shown on the x-axis, where:

$$\% = (\Delta tCO_2e/\text{year [from year climate programme implemented]}) / tCO_2e_{[2004]} \quad (2)$$

Data points to the left of the origin (i.e. negative %) indicate a falling trend in emissions since the programme was implemented; those to the right

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(i.e. positive %) indicate a rising trend. The rate of change in emissions per year (as a % relative to 2004 emissions) since 1998 is shown on the y-axis, where:

$$\% = (\Delta tCO_2e/\text{year [from 1998]}) / tCO_2e_{[2004]} \quad (3)$$

Again, data points lying below the x-axis indicate that the trend in emissions in these countries since 1998 is downwards, while those lying above the x-axis indicate that the trend in emissions in these countries since 1998 is upwards.

The diagonal line drawn through the origin divides the countries that have improved emissions trends (either reduced emissions growth or a higher rate of reduction) from those with worsening trends (increased emissions growth or smaller reductions) since implementing their national climate programmes. Data points above (to the left of) the diagonal line indicate improved emissions trends since the implementation of the national climate programme; those below (to the right of) indicate a worsening trend over this period. Data for Iceland are not shown in Figure 4, since the data points (–6.81%, –1.43%) would require rescaling of the x-axis and obscure other trends.

These data provide a useful indication of relative trends; however, the statistical significance of each can be examined using t-tests to assess whether the means of two datasets (average rate of emissions change before and after programme inception) are statistically different. This is done by regressing the percentage change in emissions on a dummy variable set to 1 for the year of inception of the national climate programme onwards. To ensure sufficient degrees of freedom, observations are taken from 1990, with the null hypothesis that there is no change in the average rate of change in emission per year before and after the national climate programme was introduced. Table 2 shows selected results from this analysis. Only for Luxembourg is there a statistically significant difference at the 95 per cent confidence level (and assuming unequal variance in the two datasets) and, in fact, Luxembourg's emissions *increased* since its climate programme was introduced, having previously fallen.

Although these data still do not prove a causal link between national emissions trends and the implementation of specific packages of policies, the main trends can be summarised as follows:

1 Of the 21 Parties with defined national climate programmes, ten countries experienced reducing

Table 2 Selected examples of testing for difference in mean rate of change in emissions before and after programme inception

t-Test: two-sample assuming unequal variances	US		Japan		Germany		Canada		UK	
	Before	After	Before	After	Before	After	Before	After	Before	After
Mean rate of change in emissions (normalised as % of 2004 data)	0.01047	0.00869	0.00358	0.00079	–0.01782	–0.00178	0.01940	0.011342	–0.01401	–0.00243
Variance	0.00018	0.00005	0.00066	0.00041	0.00036	0.00016	0.00024	0.00040	0.00051	0.00036
Observations	12	3	8	7	10	4	10	4	10	4
Df	6		13		8		5		7	
t Stat	0.3194		0.2347		–1.8396		0.7269		–0.9768	
P(T≤t) two-tail	0.7602		0.8181		0.1031		0.4999		0.3612	
t Critical two-tail	2.4469		2.1604		2.3060		2.5706		2.3646	

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emissions from 1990 to 2004, of which only seven also had reducing emissions between 1998 and 2004: UK, Germany, Sweden, Hungary, France, Netherlands and Poland. None of these has exceeded a rate of change of emission reductions per year of 1 per cent; Iceland is the only other country with a trend for reducing emissions since 1998.

2 Only four Parties have reduced total emissions (excluding LULUCF) both since the Kyoto Protocol was opened for signature and over the period since climate programmes were implemented: Sweden, Germany, the UK and Iceland.

3 Only four Parties have seen improved emissions trends after implementing national climate programmes: New Zealand, Portugal, Ireland and Iceland; those of the other 17 have worsened;

4 In only one country is there a statistically significant difference between the average rate of change in emissions before and after the introduction of a national climate programme using data stretching back to 1990 – and in this case, Luxembourg's emissions *rose* rather than fell.

The following section now examines the implications of these findings for evaluating countries' progress towards meeting their Kyoto obligations.

Discussion

Three main factors mean that care must be exercised when drawing inferences between the emissions trends identified in the analysis and the effectiveness of national climate programmes: (i) the timescales over which emissions trends have been measured relative to the speed with which measures may take effect; (ii) non-climate policy drivers of emissions changes; and (iii) the effects of constituent policies within national climate programmes. These factors are now considered in turn.

Timescales and time series

In this paper, the date of inception of national climate programmes has been taken as contemporaneous with the inception of constituent policies. While this might be appropriate up to a point for measures like emissions trading or fiscal instruments, some policies are 'slow-burn' measures and all will take some time to take full effect. For example, changes in building regulations (e.g. BMU 2005) may reduce emissions substantially over the lifetime of the measure but provide little change in emissions in early years. In other cases, climate programmes provide statements of intent or pledges rather than start-dates for specific policies. Finally, measures like emissions trading and taxes may exert a relatively swift influence on investment decisions but involve a time-lag effect before investments produce major emissions reductions.

The data used here compare climate programmes operating for between 3 and 7 years with emissions data extending 15 years at maximum. This limited time series, coupled with extensive inter-annual variances in national emissions (particularly during the 1990s), makes inferences about the success or otherwise of national programmes premature. Nevertheless, there is minimal evidence that existing programmes have yet materially reduced the distance-to-Kyoto target for liable parties. This may indicate that the policy toolkits and approaches being applied have limited potential to reduce emissions or are taking effect too slowly to bring about the emissions cuts required within the timeframes they were designed to achieve them. There is also the possibility that the effects of major emissions reductions gained from non-climate-policy factors – discussed in the next sub-section – (e.g. the UK dash for gas) may make national climate measures seem more effective than they really are.

Other drivers of emissions changes

In examining national climate programmes in relation to whether they have (a) changed emissions trends before and after programme inception and (b) made a material difference in distance to Kyoto targets, the analysis does not consider wider drivers of emissions changes such as economic cycles, weather patterns, relative fuels prices and non-climate policy related factors. Thus, the approach taken provides valid scrutiny of whether climate programmes are contributing towards Kyoto targets but cannot adjudicate whether programmes are successfully controlling what might otherwise be much higher emissions if they had not been implemented. The lack of statistically significant differences between average before-and-after rates of emissions change suggests that this is not the case, but it remains too early to argue that programmes are not having a beneficial impact even if they are not yet contributing significantly to moving liable Parties towards their Kyoto targets.

Constituent policies in national climate programmes

The paper has also not considered the detailed policies and measures contained within each national

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programme, which typically encompass a variety of existing policies and measures spanning various sectors (industry, power generation, transport etc.), as well as pledges to develop new ones. Either way, the timing of emissions reductions and policy implementation rarely appear to coincide. Glachant (2000), when studying the implementation of non-climate EU environmental directives, found that the pervasiveness of policy interactions hampered the identification of simple links between policy implementation and outcomes in many cases. Similarly, country-level analysis masks potential variations in the impact of individual sectoral interventions.[2]

More detailed examination of the more 'successful' climate programmes – those that improved emissions trends relative to 1998: Iceland, Ireland, Portugal and New Zealand – supports this view. The package of measures announced by New Zealand in 2002 included policies for energy, transport, industry, agriculture, waste and forestry. However, a cornerstone of the package, the future introduction of a carbon tax and negotiated agreement package in 2007, was subsequently dropped following a review of the programme in 2005. Equally, projections for future emissions remain on a rising trend, suggesting that the apparent success of the climate programme to date may owe more to serendipity – fortunate timing and limited time-series data – than the strategic outcome of the climate programme (New Zealand 2006). Similarly, the Portuguese climate programme was implemented against a backdrop of inter-annual variability in emissions caused by: significant fluctuations in hydroelectric power generation; slowing national economic growth since 2000; and the introduction of natural gas into the energy supply infrastructure from 1997 (Portugal 2006). Ireland is also currently reviewing its climate programme, which it argues has seen major policy changes in recent years. Its projections suggest a rising trend, with a fall in emissions to 2004 being a blip in this trend (Ireland 2006). Iceland provides an unusual case since almost its entire stationary energy supply is renewable; again its projections suggest rising emissions from transport and fishing industries, with falling emissions in the early 2000s not reflected in future years (Iceland 2006).

As well as highlighting the difficulties of making causal connections between national emissions trends and national climate strategies, this combination of evidence suggests that many national programmes may have limited ability to influence emissions trends towards national targets and that this, along with government predictions on economic growth, is reflected in future emissions projections. The limited ability to date of national programmes to adjust emissions trends towards those required to meet international obligations appears to afflict governments of all political persuasions and across countries with very different economic portfolios, geopolitics and physical geographies. Geographical variability in per capita emissions highlighted by Neumayer (2004) notwithstanding, governments also share a political economy concern to ensure national measures do not penalise the competitiveness of key domestic sectors by moving too far ahead of other countries (including those without binding targets). This has led typically to an incremental policy process involving the expedient use or packaging of policy tools and limited stringency in these tools (Helm *et al.* 2003; Ekins and Etheridge 2006).

Another important shared characteristic of this dynamic, however, seems to be a tendency for governments to make inflated claims about links between policy and emissions trends (see also Bailey this issue). The projected success of policies at reducing emissions is usually assessed internally by governments against baseline (business-as-usual) projections, making the quality of the baseline of particular importance in determining the impact of programmes. Yet baselines remain dependent on a number of external assumptions, many of which are subject to uncertainty and interpretation, such that emissions outcomes may be as dependent on underlying economic situations and data presentation as climate policies (Kerr *et al.* 2003). Despite this, differences in emissions between 1990 and the most recent inventories have often been used – particularly by governments keen to proclaim their aptitude at managing emissions – to suggest that they are a direct consequence of policies and measures undertaken in that country when most programmes were not enacted until several years after this date.

For example, the revised UK Climate Change Programme states in its executive summary

> The Government has led the way with innovative policies, such as the Climate Change Levy and agreements, Renewables Obligation and Energy Efficiency Commitment. Equally, we have built on our experience of domestic policy to foster greater action at the international level – most notably with the successful introduction of the EU Emissions Trading Scheme which draws many elements from our domestic emissions trading scheme. The combination of these measures has had a substantial impact on

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> greenhouse gas reduction in the UK. It is for this reason that the UK is one of very few countries on track to meet our commitment under the Kyoto Protocol to reduce emissions of greenhouse gases by 12.5 per cent below 1990 levels by 2008–12. (Defra 2006a, 3)

Yet comparison of the UK's emissions inventory and the timing of its policies show that the UK had already exceeded its Kyoto target by 1999 (Defra 2006b) – before the specified policies were implemented. While these policies may have been successful, it is not for 'this reason that the UK is . . . on track to meet our commitment under the Kyoto Protocol'.

Similarly, the summary of the German National Climate Protection Programme states

> All in all greenhouse-gas emissions were brought down by as much as 18.5% by the year 2003 as against 1990 levels . . . Worth noting is in particular the turnabout which took place in the traffic sector. Here, emissions were brought down by 15 million tonnes between 1999 and 2003 in Germany, which contradicts the development within the European Union. The instruments by which this was achieved are amongst others the ecological tax reform and the strengthening of the public transport system. (BMU 2005, 1)

Yet in the period 1999–2003, when the German government was lauding itself for bringing down transport emissions, Germany's total emissions (excluding LULUCF) rose slightly (UNFCCC 2006). These data have been taken further to suggest that not only can targets be met, but that the use of a particular policy framework demonstrates to others that it is possible to grow an economy and reduce emissions. King states

> It is a myth that reducing carbon emissions necessarily makes us poorer. Tackling climate change can create economic opportunities and higher living standards. Between 1990 and 2002, the United Kingdom's economy grew by 36 per cent, employment increased by 4.8 per cent, and our greenhouse-gas emissions fell by 15.3 per cent. (2005, 38)

In other words, political statements are being made about the success of climate policies and programmes operating over a short period of time by relating them to longer timeframes associated with a notional 'distance-to-target'. Such conflated claims of success obfuscate effective assessment of individual government programmes and may inhibit rational decisionmaking by governments about the scope, scale and overlap of economic instruments needed to meet future emissions targets. Instead, the emissions data reflect an accumulation of policy, economic and land-use choices made by stakeholders within a national economy over much longer periods. Some of these will have been or will be amenable to government action; others will depend on external economic factors such as oil and gas prices or global economic growth.

Conclusions

This article has examined the extent to which national climate programmes – packages of policies defined by governments – have been contributing toward the achievement of national emissions targets set out in the Kyoto Protocol. The quantitative analysis provides limited evidence that climate programmes have produced a significant impact to date in adjusting national emissions trends towards meeting national targets, though important caveats mean that it is premature, and potentially misguided, to argue that climate programmes are not having any beneficial impact. In particular, the analysis cannot resolve whether the lack of identifiable impact reflects the limited time programmes have been in operation, a lack of willingness to impose sufficiently stringent policy tools or policy tools sufficiently stringently, or the extent to which performance is influenced by other economic factors.

What is clear is that many governments are suggesting that their projected closeness to, or achievement of, Kyoto targets is a direct consequence of the effectiveness of their climate programmes. Yet just as this analysis cannot prove causality, so political claims about the success of climate policies operating over a short period by relating them to the longer timeframe associated with the Kyoto Protocol are not supported by the evidence. It is difficult to be sure about the motivations behind these claims, though uncertainty and data limitations are likely to play a part. Equally, the political stakes attached to national climate programmes, both nationally in terms of 'proving' chosen strategies are not undermining competitiveness and internationally in terms of asserting the moral high ground and cajoling other nations toward firmer commitments (for both environmental and competitiveness reasons), may be influencing government reporting. Whatever these motivations, such claims obscure objective political analysis of the real successes and failures of current policy frameworks and have potentially

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worrisome implications for long-term climate policy. As Bailey notes in the introduction, the Kyoto targets to 2012 are modest in relation to the emissions cuts required before the middle of this century and political strategising of this nature has the potential to inhibit informed discussion of policy options and, potentially, to delay the introduction of more stringent measures if these become necessary.

Finally on a methodological note, the analysis highlights the capacity of comparative geographical analysis to assist in identifying common trends in climate policy implementation and to provide important insights into which policies and policy mixes are more or less successful in reducing emissions, as well as improving understanding of geographical variations in emissions. Each of these has an important contribution to make in identifying and thinking through the practical challenges facing governments in respect of climate policy implementation.

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Notes

1 Because Kyoto contains various flexibility mechanisms, strictly speaking individual countries are not bound to absolute emissions targets under the Kyoto Protocol. Rather, they have a net target which reflects their free allocation of Kyoto emission allowances plus any purchases/sales from other eligible carbon instruments.

2 For instance, policies targeting energy-dependent industries in the UK are reported to have exceeded expected emissions reductions, but have been offset by continued increases in transport emissions (Ekins and Etheridge 2006; see also Anable and Shaw this issue).

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