Centre for Climate Change Economics and Policy

Grantham Research Institute on Climate Change and the Environment

Walking alone?
How the UK's carbon targets compare with its competitors'

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This policy paper is intended to inform decision-makers in the public, private and third sectors. It has been reviewed by at least two internal referees before publication. The views expressed in this paper represent those of the author(s) and do not necessarily represent those of the host institutions or funders.

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Contents

1 Introduction

Great economic or political advances rarely occur without bold and committed leadership from one country, or a small number of countries.

Yet, national governments are fundamentally cautious; they prefer to watch their counterparts closely, and move in packs. There are understandable reasons for this. While first-movers can reap benefits, moving too far ahead means taking risks, which can be costly. Leadership can be risky because, when breaking new ground, there are fewer precedents to learn from. Leadership may also entail incurring unique or higher costs than later-movers, with potential implications for economic competitiveness. In those areas of policy where the main benefits of a single country's action materialise only with sufficient collective action, these risks and costs are more salient. Climate change is one such area.

The UK has long styled itself as a leader on climate change policy action and the UK Government has been criticised for moving faster than other countries and, in doing so, imperilling our economic competitiveness for scant climatic gain (EEF, 2013). This 'unwarranted leadership' critique has resounded most recently in the debate over the review of the UK's fourth carbon budget (see Box 1).

It is timely, therefore, to systematically examine this critique. Doing so raises three fundamental questions:

- is UK climate change policy more ambitious than that of its competitors?
- to the extent it is, then, what is the impact of climate change policy on UK competitiveness, and;
- is that policy leadership warranted (e.g. on the basis of international equity or macroeconomic considerations)?

The main focus in this policy paper is on the first question, although it also touches on the third question insofar as international equity considerations are relevant to the UK's climate change policy ambition. The second question on competitiveness is the subject of a separate policy paper (Bassi and Zenghelis, 2014). For the purposes of this paper, we define the UK's 'competitors' as the Member States of the European Union (EU), other developed countries, and major emerging (and high-emitting) countries, such as China, India, Republic of Korea, Brazil, Mexico and South Africa.

In order to consider the relative ambition of UK climate change policy, this policy paper examines three indicators. First, we compare the UK's commitments concerning future quantities of emissions reductions with those made by competitor countries (section 2). These international commitments carry varying legal force, are expressed in different ways, reflect different assumptions, and vary in their credibility. Nonetheless, an attempt at standardisation is made that allows us to make a broad comparison of the UK's emissions reduction ambitions with its competitors.

Second, we compare the breadth, scope and depth of climate change legislation and policy in UK and its competitor countries, drawing on a recent survey of climate change

policy and legislation in 66 jurisdictions around the world (65 countries and the EU; Nachmany et al., 2014).

Third, we examine the cost of carbon in the UK and its competitor countries. Again, direct comparisons are difficult due to the differing nature and sectoral scope of measures that impose an explicit or implicit carbon cost on businesses and households across different countries. We therefore draw only on existing, methodologically robust, comparative studies.

The final section summarises our conclusions.

Box 1: The review of the fourth carbon budget

The Climate Change Act 2008 commits the UK to reducing its greenhouse gas emissions to at least 80 per cent below 1990 levels by 2050. Under the Act the Government is required to set rolling, legally binding, five-year carbon budgets to ensure the UK says on the most cost effective emissions reduction pathway towards the 2050 target. The budgets also provide a level of predictability for UK businesses and households, better enabling them to plan and invest for a low-carbon economy (CCC, 2014). Four carbon budgets have so far been enacted, covering the period 2008–2027.

The Committee on Climate Change — an independent expert body that effectively acts as custodian of the Climate Change Act — is required under the Act to advise the Government on its carbon budgets.

The Committee's advice on the fourth carbon budget, covering 2023–2027, was issued in December 2010 and recommended that the UK reduce its greenhouse gas emissions by 50 per cent, relative to 1990, by 2025. The budget was legislated by the Government in June 2011 at the level recommended by the Committee. The Government requested that the fourth carbon budget be reviewed in 2014.

The Act prescribes that, once enacted, a carbon budget can only be changed if there is a significant change in the circumstances upon which the budget was set, demonstrable on the basis of evidence and analysis. When the Committee completed its review of the fourth carbon budget, it concluded in December 2013 that there had been no change in circumstance that would justify lowering the ambition in the budget. It therefore recommended that the budget remain unchanged. This advice is currently being considered by the Government, with a formal decision expected later this year.

In July 2014 the Government has announced that it will not be amending the carbon budget (DECC, 2014).

2 How UK emissions reduction commitments compare

The fourth carbon budget commits the UK to reduce its greenhouse gas emissions by 50 per cent below 1990 levels by 2025 (the mid-point of the 2023–2027 carbon budget period). In this section we compare the UK's 2025 target with the quantified emissions

reduction or limitation commitments of its competitor countries. We do not cover sectoral targets, like vehicle efficiency and/or CO_2 standards, as these fall outside the scope of this paper.

Of particular relevance is the comparison with the European Union (EU), since the EU-wide climate objectives create a legally binding framework into which the UK's fourth carbon budget must be integrated. We therefore look at EU targets first, before turning to a wider set of countries.

2.1 European Union emissions reduction commitments

In January 2014, the European Commission (EC, 2014a) proposed a new framework on climate and energy goals for 2030. The framework builds on the existing 'climate and energy package' of targets for 2020 (EC, 2010) as well as the Commission's 2050 roadmaps for energy (EC, 2011a) and for a competitive low-carbon economy (European Commission, 2011b).

The Commission's core 2030 proposal is a commitment to reduce EU-wide greenhouse gas emissions by 40 per cent below the 1990 level. The proposed framework also includes an EU-wide target to produce 27 per cent of energy consumed from renewable energy sources. However, unlike the 2020 renewable target, the Commission did not intend that the 2030 target be translated into mandatory national commitments. The Commission's proposal also includes renewed ambitions for energy conservation, although no target for energy efficiency improvement has been set.[1]

The Commission's proposal is still under negotiation,[2] and has recently been criticised by the European Parliament for being 'short-sighted and unambitious', especially with regard to its renewables and energy efficiency objectives (EP, 2014). The Parliament resolved to support instead three 2030 targets: a 40 per cent emissions reduction below 1990 levels, a 30 per cent renewable energy target, and a 40 per cent energy efficiency target. A comparison between the 2020 goals included in the climate and energy package and both the Commission's and Parliament's 2030 proposed targets, as well as the domestic targets in place in the UK, are shown in Table 1.

[1] Further specifications are expected to be included in the review of the Energy Efficiency Directive (2012/27/EU), due to be concluded at the end of 2014.

[2] The European Council is expected to consider the framework at its spring meeting on 20-21 March 2014, and may resume further talks during its summit in June. A final legislative text may be signed off towards the end of 2014, after the EU parliamentary elections in May and a changeover of Commissioners later this year (Reuters, 2014).

Table 1. Comparison between 2020 and 2030 targets

Targets	2020 Package	2030 EU Commission's proposal	2030 EU Parliament's resolution
GHG reduction (vs 1990 levels)	**-20 per cent** (-30per cent if international agreement)	**-40 per cent**	**At least -40 per cent**
ETS sectors	-21 per cent (vs 2005 levels) Annual cap reduction of 1.74 per cent in 2013-2020	-43 per cent (vs 2005 levels) Annual cap reduction of 2.2 per cent in 2020-2030	Same as 2030 EU Commission's proposal
Non-ETS sectors	-10 per cent (vs 2005 level)	-30 per cent (vs 2005 levels)	Same as 2030 EU Commission's proposal
Effort sharing (non-ETS): UK	-16 per cent (vs 2005 level)	TBC	TBC
Renewables	**20 per cent** of gross final energy consumption	**27 per cent** of gross final energy consumption; mandatory at EU level only	**30 per cent** of gross final energy consumption
National targets: UK	15 per cent of gross final energy consumption	No national targets mandated by EU legislation	TBC
Energy Efficiency	**-20 per cent** annual consumption of primary energy **(voluntary)**	**No target** - TBC in the review of the Energy Efficiency Directive	**-40 per cent** annual consumption of primary energy
National targets: UK	18 per cent (voluntary)	No national targets mandated by EU legislation	TBC
Other features	Legal framework for carbon capture and storage (CCS)	New governance system based on national plans. New set of indicators to assess policy progress and impacts (e.g. on trade)	

Note: targets are mandatory unless otherwise specified

Source: 2020 Package data based on EC (2014b); 2030 EU Commission's proposal data based on EC (2014a); 2030 EU Parliament's resolution data based on EP (2014) ; UK energy efficiency target based on HM Government (2012)

Assuming the 40 per cent emissions reduction target for 2030 is adopted,[3] it would need to be divided among EU-member states as part of the EU's internal effort sharing arrangements. How exactly the target would be shared has not yet been determined. However, the approach taken for the 2020 climate and energy package provides an instructive precedent.

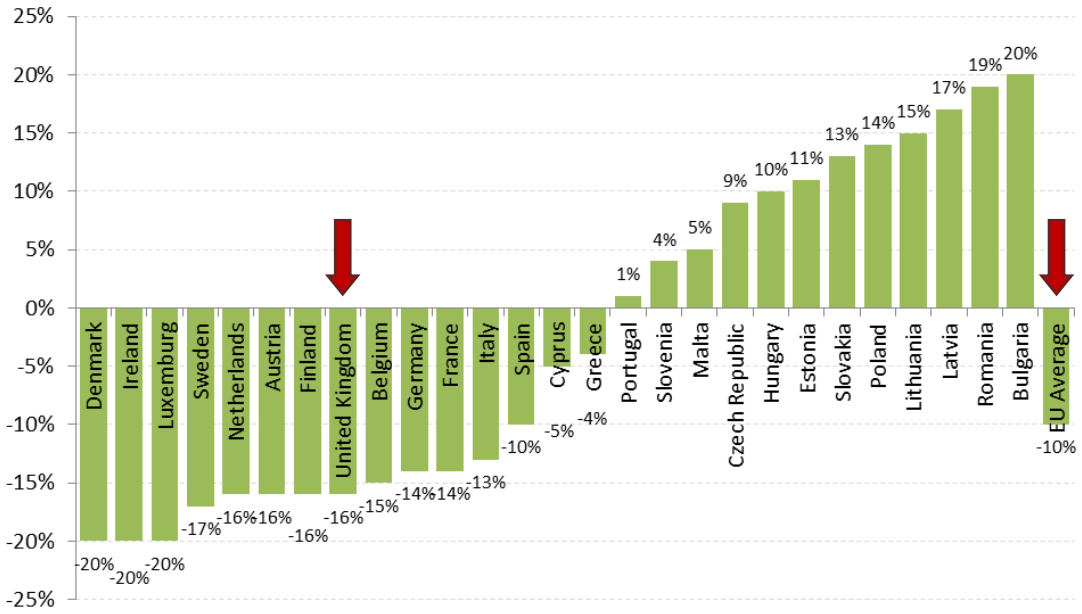
In the 2020 package the EU emission reduction target of 20 per cent was divided into, on the one hand, the sectors covered by the European Union Emissions Trading System (EU ETS) and, on the other hand, non-EU ETS sectors. For practical reasons, these separate contributions were expressed in terms of emissions reductions relative to 2005 levels — the year the EU ETS commenced operation.

[3] This is a reasonable assumption for present purposes, given the agreement between the European Commission and Parliament regarding the 40per cent 2030 target.

The 2020 target for non-ETS sectors was then further differentiated into national targets according to the relative GDP per capita of Member States. The average 2020 target for non-ETS sectors was set at 10 per cent from 2005 across the EU, but for countries with a GDP above the EU average, like the UK, the national contribution was higher, reflecting considerations about relative wealth and cost-effectiveness. The UK's national contribution to the non-ETS 2020 target was 16 per cent.

Figure 1 shows how the UK domestic target compares with those of other countries. This provides a rough guide as to the relative effort expected of the EU's wealthier members.

Figure 1. EU Member State greenhouse gas emissions reduction in 2020 (relative to 2005 levels), non- ETS sectors



Source: Based on EP and Council (2009)

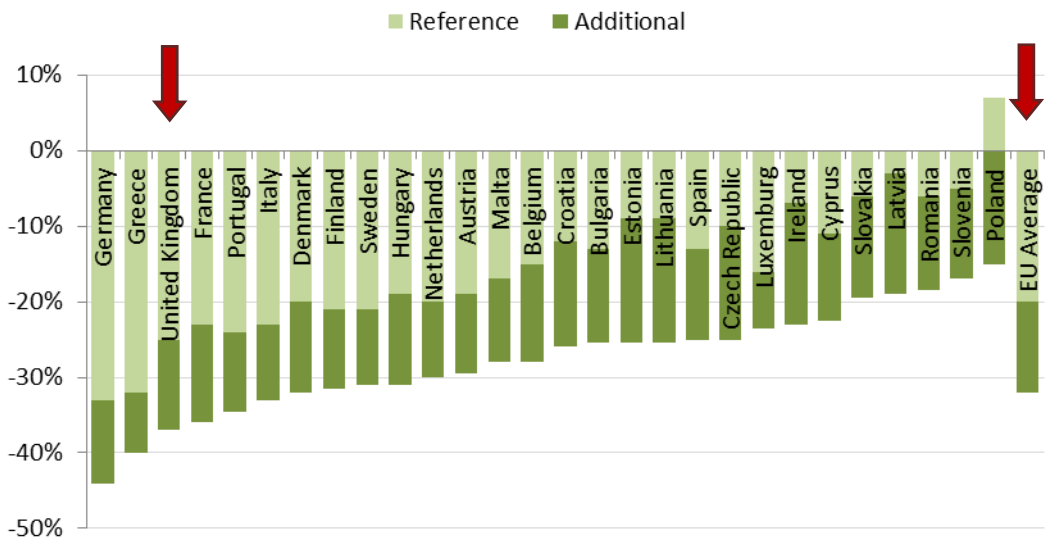
The 2030 proposal is also split into an ETS and a non-ETS component. The 40 per cent emissions reduction target by 2030 would imply that the annual reduction in the 'cap' on emissions from sectors covered by the EU ETS would be increased from the current 1.74 per cent to 2.2 per cent after 2020 (i.e. the cap would tighten more quickly post-2020).[4] Under the Commission's proposal, emissions from sectors outside the EU ETS would need to be cut by 30 per cent below their 2005 level, and this effort would be shared among EU member states.

UK GDP has not changed significantly relative to the EU average since the 2020 package was agreed. Therefore, if national contributions are determined using a similar approach to that used to allocate effort for the 2020 targets package, the UK's targets will again be

[4] The European Commission's Communication is accompanied by a legislative proposal for a market stability reserve for the European Union Emissions Trading System (EU ETS) starting in 2021 (EC, 2014c). The market stability reserve will consist of an automatic adjustment of the supply of auctioned allowanced downwards or upwards, based on a pre-defined set of rules, in order to improve the resilience of the EU ETS to market shocks and enhance market stability.

significantly higher than the EU average for the non-ETS sector, alongside countries like Denmark, the Netherlands, Germany and France. Figure 2 shows an indicative split for the non-ETS emissions, as estimated in the Impact Assessment (EC, 2014d) accompanying the European Commissions' 2030 proposal. Contributions are split between 2030 reference emission reductions (in light green in Figure 3), which reflect existing policies and trends, and the additional reductions (in darker green) required to meet the 40 per cent target.[5]

Figure 2. EU Member State greenhouse gas potential emissions reductions in 2030 (relative to 2005 levels), non-ETS sectors



Source: Based on European Commission (2014d)

How might the UK's targets, as apportioned under the EU's effort share arrangements, compare with the targets contained in the fourth carbon budget? At the time the budget was set, it was calculated to be consistent with the EU 2011 'Roadmap for moving to a competitive low carbon economy in 2050' (EC, 2011b). The roadmap envisaged emissions reductions of around 40 per cent by 2030 relative to 1990 across the EU — the same 2030 target that the Commission has now actually proposed – which suggests that the fourth carbon budget may be broadly consistent with the latest EU proposals. In fact, in the case of the ETS sector, analysis by the Committee on Climate Change (CCC, 2013a) shows that the projected UK share of the EU ETS cap is exactly as anticipated in the fourth carbon budget.[6]

The implications of this analysis are two-fold. First, there is a clear case for aligning the UK's greenhouse gas ambitions with those of the EU, given how closely UK targets are embedded in EU-wide policy. But, second, the UK's fourth carbon budget looks broadly

[5] The Impact Assessment (EC, 2014c) refers to these additional emission reductions as to the '2030 policy scenarios deviation from the reference scenario level'. For the 40 per cent reduction scenario two estimates are made, a minimum and a maximum deviation. In Figure 3 we have taken the average between these two.

[6] The projected UK share of the EU ETS cap under the Fourth carbon budget is 690 $MtCO_2$. The estimated UK share consistent with the EU Roadmap's overall 40 per cent target is 650 $MTCO_2$

consistent with, and unlikely to be more stringent than the UK's EU-determined fair share of the EU's 2030 target. Therefore, the fourth carbon budget does not mean that that the UK is 'going it alone' with its climate change policy**.** The emissions reduction target it sets is likely to be in line with those that will be allocated to other leading EU Member States as part of the effort sharing arrangements for the proposed new framework on climate and energy goals for 2030.

2.2 International emissions reduction commitments

We now compare the UK's fourth carbon budget target with the economy-wide, quantified emissions limitation and reduction targets pledged by other countries in the context of ongoing international climate change negotiations within the United Nations Framework Convention on Climate Change (UNFCCC).

The comparisons most relevant to the UK are with other countries listed in Annex I to the UNFCCC (roughly a list of 'developed' countries). These countries were allocated legally binding emissions reduction or limitation targets under the Kyoto Protocol, reflecting countries' 'common but differentiated responsibilities and respective capabilities' — a measure of international equity — as interpreted by UNFCCC members at the time. However, given the growth in wealth and emissions outside Annex 1, we also make comparisons with key developing countries, including major trade partners such as South Korea, South Africa, Brazil, China, India and Mexico, among others.

Since the 15th Conference of the Parties to the UNFCCC (COP15) in Copenhagen in 2009, countries have been pledging their emissions reduction or limitation targets with the expectation that these will be a central component of a new international treaty or other legal instrument expected to be agreed at the 21st Conference of the Parties (COP21) in Paris in late 2015.[7] A recent survey of 65 countries and the EU, which together account for almost 90 per cent of global greenhouse gas emissions (Nachmany et al., 2014; discussed below in section 2) found that 38 jurisdictions have made commitments as part of this process, mostly for the period 2020-2025, including 19 of the 20 surveyed Annex-I jurisdictions (all except Turkey). Moreover, 20 jurisdictions have reflected their targets in domestic legislation. A few countries are also envisaging longer term targets, up to 2050.

These pledges are set out in Table 2. They vary in their form and assumptions, making comparison difficult. Targets can be defined as a reduction in greenhouse gas emissions relative to either a historical base year (in which emissions are known) or a forward-looking, business-as-usual scenario (which is projected). They may be absolute or relative to other socio-economic trends, such as GDP or population growth. To facilitate comparison, Table 2 also translates the UK's commitments under the third and fourth carbon budget – which are absolute, statutory targets over a five-year period – into the metrics chosen by competitor countries.

The information in Table 2 shows that UK's carbon targets are broadly similar to those of other European countries and, as we have seen above, consistent with EU-wide effort

[7] Many of these pledges were included in the table annexed to the Copenhagen Accord (UNFCCC, 2010a) or subsequent iterations of that table (e.g. including in the Cancun Agreements: UNFCCC, 2011). For Annex I countries' quantified economy-wide emissions targets for 2020 see UNFCC (2010b)

sharing rules. The UK's targets are, however, more ambitious than some industrialised countries outside Europe in the short to medium-term, for example the United States. Nevertheless, it should be noted that despite less strict goals in the short and medium-term, Barack Obama has announced a target to reduce carbon emissions by 83 per cent by 2050, relative to 2005 levels (Bassi and Bowen, 2014). This is more aggressive than the UK's target to reduce carbon emissions by 80 per cent by 2050, relative to 1990 levels (i.e. a reduction of 76 per cent by 2050 compared with 2005).

Table 2 also shows that developing countries — particularly large, rapidly industrialising, high-emitting developing countries — are increasingly willing to make quantified emissions reduction or limitation pledges. This reflects a growing acknowledgement of mitigation responsibility by developing countries, particularly from 2009 onwards, and perhaps a corresponding weakening of the 'firewall' that historically separated Annex I from non-Annex I countries. However, when comparing developing country pledges and commitments with those of the UK, it is important to remember that the UK, as one of the world's richest countries, is expected to shoulder appropriately 'differentiated' commitments relative to those countries.

Table 2. Climate change targets: country commitments pledges to UNFCCC/flagship legislation

Type of Target (countries)	**Key examples**	**UK equivalent** (if UK targets were expressed in same way)
Absolute emissions reduction below historical base-year level (Australia, Canada, Dominican Republic, Ethiopia, EU [e.g. Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Sweden], Japan, Maldives, New Zealand, Norway, South Africa, Switzerland, Ukraine, USA, Vietnam)	Australia: 5-25 per cent* reduction below 2000 levels by 2020	26 per cent below 2000 by 2020
	USA: 17 per cent reduction below 2005 levels by 2020, 83 per cent reduction below 2005 levels by 2050	24 per cent below 2005 by 2020 76 per cent below 2005 by 2050
	Canada: 17 per cent reduction below 2005 levels by 2020	24 per cent below 2005 by 2020
	Denmark: 40 per cent reduction below 1990 by 2020, conditional	34 per cent below 1990 by 2020
	France: 30 per cent reduction below 1990 by 2020, conditional	34 per cent below 1990 by 2020
	Germany: 40 per cent reduction below 1990 levels by 2020	34 per cent below 1990 by 2020
	Norway: 30-40 per cent below 1990 by 2020; carbon neutrality (i.e. 100 per cent below) by 2030	34 per cent below 1990 by 2020 50 per cent below 1990 by 2025
	Poland: 30 per cent reduction below 1990 by 2020	34 per cent below 1990 by 2020
	Sweden: 30 per cent from 1990 by 2020, carbon neutrality by 2050	34 per cent below 1990 by 2020 80 per cent below 1990 by 2050
	Maldives: Carbon neutrality (i.e. 100 per cent below 1990 levels) by 2020	34 per cent below 1990 by 2020
	Costa Rica: Carbon neutrality	34 per cent below 1990 by 2020

Type of Target (countries)	Key examples	UK equivalent (if UK targets were expressed in same way)
	(i.e. 100 per cent below 1990 levels) by 2021	
Reduction in GHG emissions intensity of economic output (China, India)	China: reduce emissions intensity of GDP by 40–45 per cent below 2005 by 2020	39 per cent below 2005 levels by 2020
	India: Reduce emissions intensity of GDP by 20 per cent-25 per cent below 2005 by 2025	58 per cent below 2005 levels by 2025
Emissions reduction below a business as usual (BAU) scenario (Brazil, Chile, Indonesia, Israel, Mexico, South Africa, South Korea)	Range: -20 per cent to -38.9 per cent (Vs. BAU) by 2020	N/A

* The 5 per cent reduction is unconditional. Higher amounts are conditional on the level of action by other countries and on agreement regarding other relevant matters, including flexibility and accounting rules. Australia's climate policy is currently under review [tbc: What are the plans for the targets? Will they be kept].

**The UK has also a planning assumption of 60 per cent reduction below 1990 by 2030, expressed by the Committee on Climate Change in its original fourth carbon budget advice. There will be no formal 2030 target until fifth carbon budget for 2028-2032 is legislated in 2016.

Source: Nachmany et al., 2014

What stands out among developing countries are the commitments made by China. They are expressed as greenhouse gas intensity targets (that is, emissions per unit of GDP) and are similar to, if not slightly more ambitious than, the UK targets translated into the same metric (assuming UK GDP growth of 2-2.5 per cent going forward). China is by far the largest emitter of greenhouse gases and its per capita emissions are now approaching EU levels. However, average income per person in China is still less than one sixth of that in the UK.

Overall, Britain's carbon targets put it into the 'leading pack' of large developed country emitters. All but one of the UK's competitor countries have quantified emissions reduction or limitation targets (the exception being Turkey), and only a small number of developing countries have made no quantifiable commitment at all. The leaders of the pack are four countries that aspire to become carbon neutral within the next few decades: the Maldives by 2020, Costa Rica by 2021, Norway by 2030 and Sweden by 2050.

3 How UK climate change policy and legislation compares

Whereas section 2 examined countries' quantifiable emissions reduction and limitation targets, this section considers countries' domestic climate change policy and legislation more broadly. The aim is to provide a richer understanding of the trends in regulatory commitment by governments worldwide to tackling climate change. We draw heavily on a recent study by the Grantham Research Institute and GLOBE International (Nachmany et al., 2014), which surveys climate change laws and policies in 66 jurisdictions (65 countries plus the EU). The focus is on trends in the *breadth* (number of countries taking

regulatory action), *scope* (sectoral coverage or type of measure) and *depth* (normative force and institutional architecture) of countries' actions.

3.1 Breadth in climate change legislation and policy

In terms of legislative *breadth,* the GLOBE study finds that the 20 of the Annex I jurisdictions (19 countries and the EU) covered in the study have passed an aggregate of 194 climate laws,[8] compared with 293 laws in the 46 non-Annex I countries covered. Of these nearly 500 laws, roughly 60 per cent were legal acts passed by parliaments and 40 per cent were executive orders or policies. On average, a typical country passes a climate law every 18-20 months. This suggests that in most countries — and certainly the UK's competitor countries — climate change has become a serious legislative concern and regulatory steps are taken to address it.

Moreover, 62 of the 66 jurisdictions have passed unifying climate change legislation, or 'flagship laws', that define their approach to climate change. Some flagship laws are aspirational, rather than binding, and not all of them have the statutory force of an act of parliament; in some countries the main climate policy is an executive order or government white paper. Nevertheless, most of the UK's competitors have, like the UK, put in place a firm statutory basis for their national action to tackle climate change. Table 3 lists the flagship climate laws of some of the UK's key competitor countries.

Table 3. Selected competitor countries and their flagship laws

Jurisdiction	Flagship climate change law
EU	Climate and Energy Package (2008)
France	Grenelle I and II (2009 / 2010)
Germany	Integrated Climate and Energy Programme (2007, rev. 2008)
Italy	Climate Change Action Plan (2007)
Japan	Law Concerning the Promotion of Measures to Cope with Global Warming (1998, rev. 2005)
Netherlands	New Energy for Climate Policy: The Clean and Efficient Programme (2007)
New Zealand	Climate Change Response Act (2002)
Australia	Clean Energy Future package / Clean Energy Act (2011)
USA	Clean Air Act (1963, rev. 1976, 1990)*
Brazil	National Policy on Climate Change (2009)
China	12th Five-Year Plan (2011)
India	National Action Plan on Climate Change (2008)
Mexico	General Law on Climate Change (2012)
South Africa	National Climate Change Response Policy White Paper (2011)
South Korea	Framework Act on Low Carbon Green Growth (2009)

** The US Clean Air Act was not originally established to address climate change. However, on 15 December 2009, the Environmental Protection Agency finalised an "endangerment finding" under Section 202 of the Clean Air Act, which requires it to regulate pollutants for their effect as greenhouse gas emissions for the first time. See: http://www.epa.gov/climatechange/endangerment/*

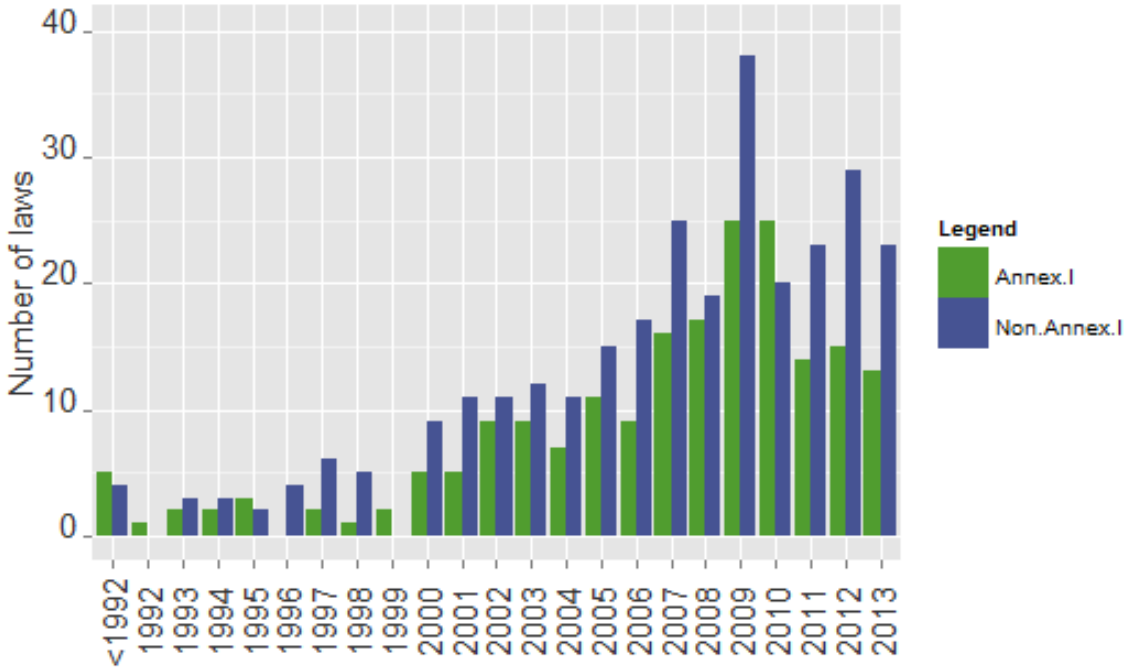
Source: Nachmany et al 2014.

[8] The GLOBE study defines laws as "Legislation, or regulations, policies and decrees with a comparable status, that refer specifically to climate change or that relate to reducing energy demand, promoting low carbon energy supply, tackling deforestation, promoting sustainable land use, sustainable transportation, or adaptation to climate impacts." Only federal legislation has been taken into account.

There is an upward trend in climate change regulatory action generally, and flagship laws in particular. Figure 3 shows the number of climate change laws passed in aggregate each year since 1990. The peak is around 2008-2010 — the same time as the UK's Climate Change Act —a period during which many developed countries passed their flagship climate change legislation. These countries have now turned to focus primarily on implementing these laws. More recently, legislative activity has been driven mainly by non-Annex I countries — there were 18 new flagship laws passed in 2012-13 and 14 of these were passed in non-Annex I countries— further demonstrating the growing acknowledgement of responsibility for climate change action among developing countries in the post-Copenhagen period that was noted earlier.

The upward trend notwithstanding, reversals are possible. Canada reversed its Kyoto Protocol commitment, Japan has lowered its post-2012 ambition, and the new Australian Government has flagged its intention to attempt to repeal Australia's carbon pricing legislation in the second half of 2014. Reversals are, however, exceptional: the overwhelming trend is for new climate laws each year to add to the 'stock' of laws that countries are already implementing.

Figure 3. Climate change legislation over time



Source: Nachmany et al.(2014)

Care should be taken when interpreting the number of laws per country. It is not on its own a good indicator of the quality of a country's regulatory environment, or its ambition on climate change action. Legislative approaches differ and what is primary legislation in one country may be an implementing regulation in another. More generally, a large number of laws can be a sign of an excessive regulatory burden as much as of an enabling business environment. This issue may be pertinent for the UK and its 22 climate change laws (see Box 2).

Box 2: Climate change legislation and policy complexity

The UK has 22 climate change laws — one of the highest counts worldwide. The number of laws per country is not on its own a good indicator of the quality of a country's regulatory environment on climate change or any other issue. Nonetheless, it may be indicative of previous findings that the UK has a relatively complex climate policy landscape that is subject to frequent revisions.

Different climate change related policies tend to overlap and have sometimes created unexpected and/or undesirable interactions (Bassi et al., 2013). Notably, energy users can be subject to different measures and be charged for carbon dioxide emissions several times over (see also section 4 below). There is no single carbon price applying to all users and fuels, but rather a complex set of prices exists which tend to change over time, when one or more pieces of legislation is revised.

Some overlaps may be unavoidable, for example when more than one policy is required to tackle different market externalities, such as greenhouse gases and research and development failures (Bassi et al., 2013). Others, however, are less justifiable and can create unnecessary burdens. Interactions of this type can reduce policy effectiveness and transparency.

Other countries experience similar large variability across tax rates, either due to the interaction of different policies or because several exemptions apply. An analysis of nine European countries, for instance, shows that Greece has the largest variation across domestic carbon prices, nearly twice the level of variation found in Spain, the country with the most consistent set of rates (Vivid Economics, 2012; OECD, 2013).

3.2 Scope of climate change legislation and policy

The *scope* of the UK's 22 climate-related laws is wide, covering energy supply, energy demand, transportation, adaptation, carbon pricing, and research and development (along with detailed institutional arrangements to implement these laws). Table 4 shows the number of UK laws addressing each of these areas (some laws address more than one issue, and legislation that merely implements EU law has not been included).

Table 4. Categorisation of UK laws

No. of Laws	Pricing carbon	Energy Demand	Energy Supply	REDD+ and LULUCF	Transportation	Adaptation	Research and Development	Institutions/ Administrative Arrangements
22	4	13	14	0	5	1	3	2

Note: a law may fall into more than one category; excludes legislation that merely implements EU laws.

The sectors covered and types of mechanisms used in UK climate law are similar in scope to its competitor countries. In most Annex I countries, most of the above categories are covered, with the exception of adaptation and land/forestry sector measures (REDD+ and LULUCF). Of the 66 jurisdictions examined in the GLOBE study, 60 have legislation

covering energy supply, 54 have legislation covering energy demand (especially energy efficiency) and 27 price carbon (again, most laws can be categorised under more than one category). From this analysis (subject to concerns discussed in Box 2), there is nothing to suggest that the scope of UK coverage is unreasonably ambitious relative to its competitors.

3.3 The depth of climate change legislation and policy

An excellent indicator of a country's commitment to tackling climate change is the extent to which its objectives and policies impose specific, legally binding obligations and the extent (if any) to which institutions are accountable for implementing or overseeing the achievement of those obligations (and the quality of those institutions) – referred to here as the *depth* of legislation and policy.

The UK Climate Change Act — with its mandatory emissions reduction targets, rolling carbon budgets, institutional architecture (the Committee on Climate Change) and regular climate change risk assessments — is widely regarded as a model of legal and institutional *depth* (Lockwood, 2013). The Act establishes a clear framework for medium-to long-term future action that provides businesses and households with greater predictability so that they can plan their economic affairs.

All of the UK's competitor countries have governmental departments (either central or arms-length) that oversee the formulation and implementation of climate change legislation and policy, and provide roadmaps for the accomplishment of targets, often to 2030 or 2050. Brazil has an Inter-ministerial Commission on Climate Change, composed of 9 ministries; South Africa has an Inter-ministerial Committee on Climate Change; Australia has a Climate Change Authority, and Denmark has a Climate Council. In the United States, the Environmental Protection Agency is instrumental in climate policy, and the EU established in 2010 a Directorate General on Climate Change (DG Climate), which has assumed the climate responsibilities previously held by the DG Environment in the European Commission. Recently, China has strengthened its top-level planning on climate change, appointing the Premier as the leader of the National Leading Group for Addressing Climate Change, and placing provincial governors at the head of sub-national groups.

All pieces of flagship legislation in the UK's competitor countries include institutional arrangements, whether existing or new, to support the meeting of targets and to provide a framework for climate change policy action. In Australia, 6 of the 9 laws have institutional aspects to them, as do 5 of the 12 laws in Germany, 12 of the 14 laws in Brazil, 3 of the 5 laws in China, 6 of the 10 laws in India, 4 of the 8 in Japan and 9 of the 15 laws in South Korea.

Overall, the UK's strong institutional framework, which supports its climate action, is often seen as a leading institutional model. Some object that domestically it has perhaps not produced the level of political certainty its creators had hoped for (Lockwood, 2013), but internationally it has 'strengthened the UK's position … to help raise the ambition and urgency of collective action to tackle climate change' (DECC, 2013b). Australia's Climate Change Authority, for example, was modelled on the UK Climate Change Committee, although the future of that body is uncertain, as was the Danish Climate Council (RTCC, 2014). Nevertheless, it is clear that the UK does not operate in a vacuum.

Many competitor countries have equivalent provisions suited to their institutional contexts. So while the UK's institutional arrangements can be described as robust and inspiring, the UK cannot be described as 'alone' in making them.

4 How UK carbon prices compare

In this section we compare the UK's climate change measures with those of other countries by reference to the price of carbon imposed on each economy. Carbon prices provide a direct and tangible means of comparing the ambition and economic effects of climate policy. They are also an important starting point for evaluating the impacts of policy on competitiveness across different economies. The issue of competitiveness, in the context of the fourth carbon budget review, is discussed in a companion paper (Bassi and Zenghelis, 2014).

Pricing carbon is at the core of climate change policy (see Box 3). Carbon prices can be imposed *explicitly*, in the form of a carbon tax or emissions trading system, or *implicitly,* in the form of costs imposed by climate change regulation. The UK has several instruments in place that result in an explicit or implicit carbon price. These include energy taxes like the Climate Change Levy, discounted rates embedded in the Climate Change Agreements, and the CRC Energy Efficiency Scheme. The UK is also part of the European Union Emissions Trading System (EU ETS), and has recently introduced a carbon price floor for electricity generators involved in emission trading.

The UK is not alone in this. A large number of countries have also introduced a wide range of climate policies that apply an implicit or explicit carbon price. The GLOBE study (Nachmany et al., 2014) indicates that at least 27 jurisdictions have a form of carbon pricing legislation in place[9], including the European Union (EU) and several non-EU European countries, as well as other developed and developing countries including Canada, China, Japan, India, Mexico and Russia.

[9] Some carbon pricing mechanisms apply only to smaller areas within a jurisdiction, such as domestic carbon taxes in a number of EU Member States or emission trading between some Canadian regions.

Box 3. Climate change externalities and carbon prices

The case for carbon pricing rests on the economic analyses of externalities – circumstances where the effect of production or consumption of goods and services imposes costs or benefits on others, that are not reflected in the prices charged to the final consumers (Bowen, 2011). As those who produce greenhouse gas emissions are imposing potentially huge costs on other people over time, policy can intervene to impose a price on their externalities. This price signal is typically enforced through carbon taxes or similar instruments, such as levies on energy consumption (which can be translated into a carbon price) or the trading of emission allowances. Empirical evidence shows that higher energy prices can reduce energy demand (e.g. Agnolucci, 2009; Adeyemi and Hunt, 2007) and induce energy-saving technical progress (e.g. Popp, 2002; Aghion et al., 2010). Additional policies are also needed to tackle other market failures,[10] particularly to promote low-carbon innovation and appropriate infrastructure investment. These include, for example, targets and/or subsidies for renewable sources and energy efficiency technologies, support for the development of adaptation measures and so forth. These policies on their own, however, may not be able to bring about the necessary reductions in emissions. Without carbon pricing, for instance, measures that increase energy efficiency can make energy use cheaper, generating a 'rebound' effect where an increase in energy demand offsets emissions reductions (Bowen, 2011). Some form of carbon pricing is therefore an essential element of an optimal policy portfolio.

Because domestic policies are typically heterogeneous and can overlap (see Box 2 above), it is not always easy to compare the effective carbon prices in place across the world. A few studies have attempted such comparison, with differing results due to differences in methodology. For example, methods may differ in which policies they take into account and how prices are averaged across fuels (like electricity, gas, coal) and energy uses (residential, industrial, or sector-specific). The main findings of three studies (OECD, 2013; Vivid Economics, 2012; Australian Productivity Commission, 2011) are summarised in Figure 4 and shown in more detail in Appendix 1. The figure shows that the UK tends to impose carbon prices in the middle-to-high range, although several countries impose higher carbon prices, at least in some sectors.

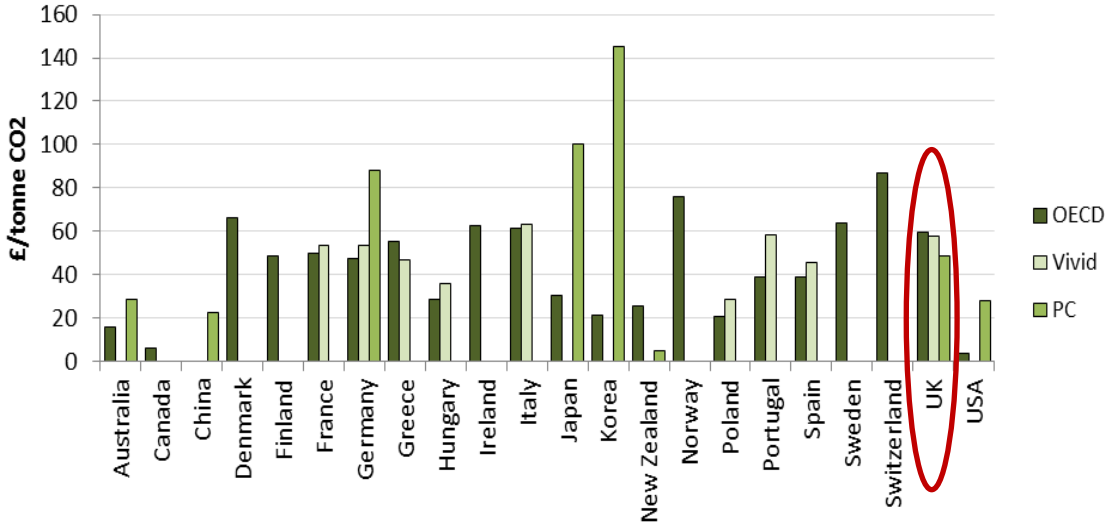
The OECD (2013) carried out a systematic comparative analysis of energy taxes in OECD countries in 2012. It focuses on taxes levied directly on energy consumption.[11] The analysis shows substantial differences across and within countries. Countries differ in the range of energy products that are taxed, in tax base definitions and in tax rate levels and rebates, with average carbon prices across fuels ranging from around £2/tCO_2 in

[10] There is a vast literature on the various market failures related to climate change, in particular in relation to innovation and research & development, network effects and technology spillovers, uncertainties and asymmetric information, and interactions of environmental and labour market imperfection. For an overview, see for example (Bowen, 2011) and references therein.

[11] The analysis does not include taxes that that may be related to energy use but that are not imposed directly on the energy product, such as vehicle taxes, road user charges or taxes on emissions such as NOx and SOx which do not have a fixed relationship to fuel volume.

Mexico to £76/tCO_2[12] in Luxembourg. Inconsistencies exist also within each country, as large disparities are encountered in the carbon prices applied to different energy products and uses. The lowest carbon prices are in Australia, New Zealand and the Americas (Chile, Canada, Mexico and the United States). Slightly higher rates are found in Central European and Asian OECD member countries. The UK sits around the mid-point, while the highest rates are found in European countries with explicit carbon taxes, like Denmark, Iceland, Ireland, Norway, Sweden and Switzerland. These are also countries where carbon prices tend to be more consistent across energy products.

Figure 4. Estimated carbon prices in selected countries, averaged over energy products and users (£/tCO_2)



Source: Based on OECD (2013); Vivid Economics (2012); Productivity Commission (PC, 2011)

A study by Vivid Economics (2012) compared average carbon taxes across fuels in nine European countries: France, Germany, Greece, Hungary, Italy, Poland, Portugal, Spain and the UK. Despite a different method, the price estimates are similar to those estimated by the OECD (2013). This study, too, reveals significant differences across countries, although price disparities within the EU are less pronounced than in other regions. In the countries under analysis, average carbon prices range from £28/tCO_2 in Poland, to £63/tCO_2 in Italy.[13] The UK is in the mid-upper end, with an average carbon price of £58/tCO_2.

The Australian Government's Productivity Commission (PC, 2011) also estimated effective carbon prices in several countries. The analysis included both explicit carbon prices from emission taxes and tradable permits, as well as implicit prices embedded in other measures, such as regulations of technologies, renewable energy targets, or subsidies for low emissions technology. Because it included a wider set of policies, prices are generally higher than the estimates discussed above. Lower bound estimates range

[12] Using an average exchange rate of €1 = €0.811 in 2012
[13] Using an average exchange rate of €1 = £0.811 in 2012

from £5/tCO_2 in New Zealand to £145/tCO_2 in South Korea.[14] The UK carbon price is again somewhere in the middle, at around £48/tCO_2.

Many government bodies, businesses and other organisations also use shadow prices of carbon (i.e. theoretical prices to be used in project appraisal) to guide their investment. These can also offer a useful benchmark when comparing carbon prices, as they are an indication of future expectations, even if policies are not yet enforced. In the UK, the shadow carbon price used for policy appraisal by the Department on Energy and Climate Change (DECC, 2013a) is around £4/tCO_2 for the sectors covered by the EU ETS, and around £60/tCO_2 for all other sectors in 2014. DECC expects both EU ETS and non-ETS carbon prices to reach £76/tCO_2 in 2030.

Elsewhere, the US Environmental Protection Agency (EPA, 2013) and other federal agencies have used a carbon price ranging from £7-70/tCO_2 [15] in 2015 for policy assessments, rising to £10-103/tCO_2 in 2030. Several private companies in the United States have also adopted some form of shadow pricing for business planning, ranging from £4-36/tCO_2[16] (CDP, 2013). A number of large energy companies in Canada have used shadow carbon prices of £8-38/tCO_2[17] (SP, 2013). Thus, even in countries like the United States, which currently has no nation-wide explicit carbon tax or trading scheme,[18] some public and private bodies are expecting and planning for higher carbon prices in the future.

This wide set of estimates reveals how difficult it is to define the boundaries of carbon pricing. Indeed, these values may not reflect all the nuances of domestic carbon policies and should be considered as only indicative.

For the UK, for instance, the OECD (2013) study only takes into account the carbon price embedded in the fuel duty and in the Climate Change Levy — the two main policies applying to transport and industry. The former is analytically more complex to translate into a carbon price, because transport policies usually aim to address externalities other than carbon emissions, such as congestion. The addition of other policies — like the EU ETS, Renewables Obligation, feed-in tariffs, the CRC Energy Efficiency Scheme and others — would have resulted in a multi-layered, often higher carbon price estimate, depending on which energy users are affected and how policies overlap. However, a similar bias probably applies in other countries too, it should not necessarily be expected that the UK's relative position has been understated in that study.

Studies by Advani et al. (2013) and by Bassi et al. (2013), for instance, illustrate how UK carbon prices tend to differ across households and business sectors, as well as across different fuels when a number of climate change related policies are taken into

[14] Using an average exchange rate of AUS$1 = £0.644 in 2011.
[15] Using an average exchange rate of US$1 = £0.607 in January 2014
[16] As above
[17] Using an average exchange rate of C$1 = £0.557 in January 2014
[18] Some emission trading systems are in place at regional level, namely the California's cap-and-trade system (AB32), and the Regional Greenhouse Gas Initiative (RGGI) between Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. California is also part of the Western Climate Initiative, a cap-and–trade programme with four Canadian regions.

account.[19] So, for example, in the case of electricity, carbon prices can range from about £39/tCO_2 for energy intensive industries to about £69/tCO_2 for medium-sized firms, and are around £6/tCO_2 for households. Other fuels, like gas, coal and LPG, are often taxed less than electricity.

Similar variations are found in other countries. Switzerland, for example, has a carbon price on heating and process fuels of around £24/tCO_2[20], but businesses adopting binding emission reduction targets can be exempted (Ecofys, 2013). Businesses are also exempt if they participate in the Swiss emissions trading system,[21] in which case they are either subject to the carbon price set by the market or are eligible for free allowance allocations.

Concerns over competitiveness, related to unilateral climate change policies, should be seen in the broader context of energy price differentials. Carbon pricing is in fact but one component, and often a relatively small one, of total energy prices. For example, in the EU, in 2013 the average electricity cost for a medium industrial energy user[22] was around £0.13/kWh. Of this, taxes (including carbon prices and excluding VAT and other taxes recoverable in future periods) were around £0.03/kWh. By comparison, the cost of electricity for similar users in the UK was £0.12/kWh, and taxes accounted for only £0.01/kWh[23] (Eurostat, 2014b). Thus, while carbon policies can represent a non-negligible cost for households and businesses, it is energy wholesale prices and network costs that constitute the largest share of energy bills. Existing evidence suggests that the current level of carbon prices in countries with climate change policies, including the UK, has not led so far to competitiveness losses (see Bassi & Zenghelis, 2014; and references therein).

Despite the variations across estimates in the various studies, two robust conclusions can be made. First, most of the UK's competitor countries impose carbon prices on businesses and households — the UK is far from acting alone in pricing carbon. Second, UK carbon prices are in the middle-upper range of competitor country prices. Some countries have lower carbon prices than the UK, but several countries have carbon prices that are at a similar level, or higher than, those in the UK.

The relative position of the UK compared to its competitors may well change in the future. While the UK has a policy commitment to a rising carbon price (through the carbon price floor), it is unclear what carbon price other countries may adopt in the future. While it is not possible to make predictions, the legislative analysis outlined in section 3 suggests that increasing numbers of countries are adopting climate change related policies which may result in a form of carbon pricing, and that more ambitious

[19] These include four policies resulting in an explicit carbon price, namely the EU ETS, the Climate Change Levy, the Climate Change Agreement and the CRC Energy Efficiency Scheme, and two policies leading to an implicit carbon price, the Renewable Obligation and the Feed-In Tariffs.

[20] In national currency, the CO_2 levy in early 2014 was CHF 36. The average exchange rate in January 2014 was: 1CHF = £0.673.

[21] In 2013 the Swiss ETS involved approximately 50 firms emitting around 6 million tonnes of CO_2 [ref: http://www.bafu.admin.ch/emissionshandel/10923/index.html?lang=en]

[22] According to Eurostat (2014a), a medium standard industrial consumer has an annual electricity consumption between 500 and 2 000 MWh

[23] Using an average exchange rate of €1 = £0.849 in 2013

policies may be implemented in the future. Projections by the Committee on Climate Change (2013b), for instance, estimate significantly higher carbon prices in the UK than other countries in 2020, but show convergence through the 2020s, the extent of which depends on the carbon price scenario chosen.

5 Conclusions

This policy paper has sought to answer the question: is the UK's fourth carbon budget likely to put Britain ahead of its competitors when it comes to climate change policy? The analysis provided here finds that the UK remains a global leader in the way it tackles climate change, but it is by no means acting alone.

Three different approaches are used to reach this conclusion.

The analysis first compared the UK's fourth carbon budget target of a 50 per cent reduction in emissions below the 1990 level by 2025, with the greenhouse gas emissions reduction and limitation targets that have been adopted at the European Union (EU) level and in other countries. The conclusion is that the UK's fourth carbon budget target is likely to be consistent with the target proposed by the European Commission and Parliament, once the EU's internal effort-sharing arrangements are taken into consideration. Previous EU greenhouse gas targets have been met by allocating individual targets to Member States based on effort-sharing according to the general principle that the richest countries per capita should reduce their emissions fastest.

Beyond the EU, all but one of the UK's main trading partners and competitors (Turkey) has a quantified greenhouse gas emissions reduction or limitation targets. While the UK's target is higher than in many of these other countries, it is not the highest. One surprising comparison is with China. When expressed as a percentage reduction in the emissions intensity of economic output, China's target is on a par with, and perhaps even slightly more ambitious than, the UK's.

Secondly, the analysis compared the UK's climate change legislation with the climate-related legal instruments of other countries. We find a wide breadth of climate change legislative activity across the world — the GLOBE survey of 66 jurisdictions found that 62 of them have legal provisions that establish the basis for action against climate change, as the UK has in the Climate Change Act — suggesting that climate change has become a core legislative concern. Moreover, the sectors covered and types of mechanisms used in UK climate law are similar in scope to competitor countries. We also find that most other countries have created high-level institutions for overseeing the implementation of climate change legislation and policy.

Finally, the analysis considered the carbon prices imposed on firms and households in competitor countries, explicitly or implicitly. While measuring and comparing carbon prices is difficult and highly sensitive to the methodology used, this review of three comparative studies found that the UK's carbon prices are in the middle to upper end of the global range. In this context, it is worth emphasising that carbon pricing is often a relatively minor component of total energy prices.

The overall picture is one in which the UK is part of a leading group of countries taking legislative action to tackle climate change. This leading group includes most of the UK's main trading partners.

Climate ambition has to be assessed relative to a country's economic capabilities and international responsibilities. Analysis here has shown that developed countries typically have more ambitious targets, more extensive legislative and institutional arrangements, and higher carbon prices. This is an unsurprising finding given that virtually every country has endorsed the principle of 'common but differentiated responsibilities'. However, we find increasingly ambitious commitments — especially post-2009 — across the major emerging (and high emitting) economies. Increasingly, countries like Brazil, China, India, Mexico and others are committing, planning, legislating, regulating and pricing greenhouse gas emissions to a significant degree.

The UK is ahead of its competitors in one aspect: its forward planning. Few other countries are preparing for the 2020s to the same degree as the UK is through the fourth carbon budget. Such longer term thinking is laudable and a deliberate feature of the Climate Change Act. It provides greater certainty and forward guidance for investors. Of course, it also makes it difficult to gauge how the UK's targets for the 2020s will eventually compare with its competitors'. However, there is no indication from the past decade that the UK's trading partners will not in due course adopt targets similar to ours for the next. The European Union in particular is already preparing to do so. Climate policy is not without its reversals, of course, and there can be no certainty that all other countries will implement their plans. This is the price of planning ahead.

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Appendix 1 — Estimated carbon prices in selected countries

Table A1. Estimated carbon prices in selected countries, £/tCO$_2$

Country	OECD	Vivid	PC	
			Min	Max
Australia	16		28	64
Austria	47			
Belgium	37			
Canada	6			
Chile	13			
China	0		23	37
Czech Republic	26			
Denmark	66			
Estonia	21			
Finland	49			
France	50	54		
Germany	47	54	88	113
Greece	55	47		
Hungary	29	36		
Iceland	62			
Ireland	63			
Israel	59			
Italy	62	63		
Japan	30		100	185
Korea	21		145	258
Luxembourg	76			
Mexico	2			
Netherlands	71			
New Zealand	25		5	6
Norway	76			
Poland	21	28		
Portugal	39	58		
Slovak Republic	27			
Slovenia	55			
Spain	39	45		
Sweden	64			
Switzerland	87			
Turkey	32			
UK	**59**	**58**	**48**	**128**
USA	4		28	32

Source: OECD (2013); Vivid Economics (2012); Australia productivity Commission (APC, 2011)

Keywords

Energy Policy