REPORT 2013:02

National Climate Policy Ambitiousness:
A Comparative Study of Denmark, France, Germany, Norway Sweden and the UK

CICERO
Senter for klimaforskning

CICERO Report 2013:02

National Climate Policy Ambitousness: A Comparative Study of Denmark, France, Germany, Norway, Sweden and the UK

Elin Lerum Boasson

September 2013

CICERO Senter for klimaforskning
P.B. 1129 Blindern, 0318 Oslo
Telefon: 22 85 87 50
Faks: 22 85 87 51
E-post: admin@cicero.uio.no
Nett: www.cicero.uio.no

CICERO Center for International Climate and Environmental Research
P.O. Box 1129 Blindern
N-0318 Oslo, Norway
Phone: +47 22 85 87 50
Fax: +47 22 85 87 51
E-mail: admin@cicero.uio.no
Web: www.cicero.uio.no

Tittel: Ambisiøs Nasjonal Klimapolitikk: En komparativ studie av Danmark, Frankrike, Norge, Storbritannia, Sverige og Tyskland. **Forfatter(e):** Elin Lerum Boasson	**Title:** National Climate Policy Ambitiousness: A Comparative Study of Denmark, France, Germany, Norway, Sweden and the UK **Author(s):** Elin Lerum Boasson
CICERO Report: 2013:02	**CICERO Report:** 2013:02
Finansieringskilde: Finansdepartementet	**Financed by:** Ministry of Finance
Prosjekt: Prosjekt 30602	**Project:** Project 30602
Prosjektleder: Elin Lerum Boasson	**Project manager:** Elin Lerum Boasson
Nøkkelord: Klimapolitikk	**Keywords:** Climate Policy
Sammendrag:. Denne rapporten undersøker hvor ambisiøs klimapolitikken i Danmark, Frankrike, Norge, Storbritannia, Sverige og Tyskland er. Relevant EU politikk er også presentert. Tre dimensjoner som kan brukes til å vurdere grad av klimaambisjoner presenteres: Marked, Minimere samfunnskostnader og Teknologisk Utvikling. Hver dimensjon består av konkrete kriterier som de seks landenes virkemiddelpakker vurderes opp mot. Fire klimapolitiske områder analyseres: utslippsreduksjonsmål, regulering av drivhusgasser, tiltak for å fremme fornybar energi og energieffektivisering. De seks landene kommer svært ulikt ut når de tre kriteriesettene brukes for å vurdere klimapolitikken deres. Storbritannia og Tyskland kommer best ut, på en delt førsteplass, når teknologiutviklingskriteriene brukes. Danmark kommer på andre plass og Frankrike på tredje. Norge er best når virkemiddelbruken vurderes opp mot minimering av samfunnets kostnader, mens Sverige er best sett i forhold til markedsdimensjonen.	**Abstract:** This report explores how and to what extent the climate policies of Denmark, France, Germany, Norway, Sweden and the UK can be called ‘ambitious’. Relevant EU climate policies are also presented. The report develops three dimensions of ambitiousness: Market, Minimizing Societal Costs, and Technology Development. The climate policy portfolios of the six countries are ranked along these three dimensions, with three sets of specific criteria. Four climate policy areas are examined: emissions-reductions targets, emissions regulations, renewable energy policies and energy-efficiency policies. Applying different criteria for measuring level of ambition results in radically different rankings for the countries studied. The UK and Germany perform best with respect to technology development, with Denmark in second place and France on third. Norway is best as regards minimizing the social costs while Sweden ranks highest on the market dimension.
Språk: Engelsk	Language of report: English

Rapporten kan bestilles fra:
CICERO Senter for klimaforskning
P.B. 1129 Blindern
0318 Oslo

Eller lastes ned fra:
http://www.cicero.uio.no

The report may be ordered from:
CICERO (Center for International Climate and Environmental Research – Oslo)
PO Box 1129 Blindern
0318 Oslo, NORWAY

Or be downloaded from:
http://www.cicero.uio.no

Contents

1 Introduction[1]

Many European governments present their countries as climate policy leaders and models for others. Norway argues that the national climate policy is among the most ambitious in the world, Denmark claims that it is a success example, Germany asserts that its ‘Energiewende’ can show the way for energy transformation in the whole of Europe, and the UK presents its Climate Law as a model for climate governance. However, others may not always agree with policymakers’ flattering descriptions of their own achievements. This report explores and discusses the ambitiousness of national climate policy of six European countries, asking: *how and to what extent are the climate policies of these six countries ambitious?*

Opinions about ambitiousness in climate policy vary across countries, professions, political parties and societal groups. National climate policy is a relatively new issue for political scientists and no strong comparative tradition exists. Thus far, single case studies dominate, and they have few commonalities when it comes to how climate policy is categorized and measured in terms of ambitiousness. It is hardly possible to develop one list of criteria for judging ambitiousness that can achieve widespread acceptance. Instead, this report develops three dimensions of ambitiousness, and ranks the policy portfolios of Denmark, France, Germany, Norway, Sweden and the UK. These countries have developed a whole range of climate measures, and we find commonalities as well as differences. All countries are members of the European Union (EU) and/or the European Economic Area (EEA) and are thus required to implement the EU’s climate regulations and directives. The relevance of new EU policies will be assessed in relation to the EEA agreement, and thus far close to all EU climate policies are have been included in the EEA agreement. This report gives an overview of EU climate policy, but since the EU influences most national policies, it does not make sense to compare the ambitiousness of EU and national policies systematically.

Due to resource constraints, it is not possible to provide in-depth descriptions of the full array of the national climate-policy measures. Instead, this report focuses on some core aspects of climate mitigation: climate-policy objectives, emissions regulations, renewable energy policy, and energy-efficiency policy. If climate adaptation, carbon capture and storage (CCS), sectors

[1] This paper has been prepared at CICERO’s in response to a project commissioned by the Norwegian Ministry of Finance. The views and opinions expressed here are those of the author and do not necessarily reflect the official policies or positions of the Ministry of Finance. Civil servants in the ministry, particularly Marte Sollie, have provided valuable input to the report. Many colleagues at CICERO have also provided important feedback: warm thanks to Knut Alfsen, Steffen Kallbekken, Thorvald Moe and Arild Underdal. Any errors and misinterpretations are mine alone.

such as transport, waste, agriculture or land use had been included, the conclusions might well have been different.

This report takes stock of the climate policy situation at the entrance to 2013, and does not assess how previous climate policies have affected today's emission levels. The mapping of the climate policies is based on extensive consultation of various documents, particularly national reports submitted to United Nations Framework Convention on Climate Change (UNFCCC), national reports to the EU on energy efficiency and renewable energy, parliamentary reports available in English, and political science books and articles.

This report will first take stock of relevant political science research and specify three dimensions of ambitiousness. Then follows background information about the six countries, before their climate policy portfolios are described, issue-area by issue-area. Fourth, the countries are compared; similarities and differences are assessed and discussed, and finally some conclusions are offered.

1.1 List of Acronyms and Abbreviations

CCS	Carbon Capture and Storage
CO2	Carbon Dioxide
COP	Conference of the Parties (UNFCCC)
EEA	European Environment Agency
EPBD	Energy Performance of Buildings Directive
ETS	Emissions Trading System
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gases
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation (UNFCCC)
OECD	Organization for Economic Co-operation and Development
OSPAR	Oslo and Paris Conventions
TwH	Terawatt Hours
UK	United Kingdom
UNCCC	United Nations Framework Convention on Climate Change

2 Climate Policy Ambitiousness

2.1 Taking stock of research on climate policy ambitiousness

Even though 'ambitiousness' is a crucial concept in the literature on national climate policy, it is seldom clearly defined. National climate policies may assume many different characteristics and may vary along several dimensions. Assessments of climate policy have tended to have 'the level of ambition' as their explanatory focus (e.g. Underdal 2002; Wurzel and Connelly 2011; Christoff and Eckersley 2011). However, few authors have developed specific criteria for assessing ambitiousness – perhaps because single case studies have dominated, and there has been no common, comparative research programme on climate policy in political science.

Questions of climate policy have attracted increased scholarly interest in the past decade. We find rich literatures on emissions trading (e.g. Skjærseth and Wettestad 2008; Meckling 2011), the political economy of climate change (e.g. Newell and Paterson 2011), global climate negotiations/politics (e.g. Aldy and Stavins 2009; Hoffmann 2011) and EU climate policy (Jordan et al. 2010; Boasson and Wettestad 2013). National climate policy has been assessed in a range of recent books, such as Harris (2007), Wurzel and Connelly (2011), Watanabe (2011) and Christoff and Eckersley (2011). These contributions present and discuss interesting empirical cases – without, however, discussing how ambitiousness could or should be conceptualized and defined in empirical studies. This lack of theory-oriented and comparative analysis means that there are few analytical tools available for assessing the ambitiousness of different national climate-policy portfolios.

The existence of deep disagreements concerning climate-policy design makes it particularly challenging to develop good measurement criteria. Such disagreement is not unique to studies of climate policy: this is very often the case with environmental policy as well (see Andresen et al. 2012). Scholars of international environmental policy have explicitly discussed how to measure ambitiousness. Even though their subject is international environmental regimes, not national climate policy, this literature is relevant. It shows that the ultimate proof of the ambitiousness of a policy lies in its ability to solve environmental problems, and the effectiveness with which this happens. Ultimately, we want to know how much climate policies have achieved – in particular, the extent to which they have succeeded in reducing GHG emissions. We are interested in identifying how much a policy has contributed to whatever progress has been made (see Mitchell 2008).

Measuring ambitiousness is challenging even when the result of the policies, and not the policy as such, is taken as the starting point. The literature discusses various measurement methods are discussed in the literature, with particular attention to two. First, the researchers may construct a no-policy counterfactual and compare the actual situation after the international environmental regime, or the national climate policy in our case, is implemented with this counterfactual (Hovi et al. 2003:77; Young 2001). Counterfactuals, often referred to as 'business as usual scenarios', are inherently difficult to construct: no-one can possibly be certain what an alternative would or could look like in the absence of a given policy.

Second, process tracing can be used to examine the relationship between a policy and actual environmental performance (Hovi et al. 2003:77; Young 2001). This is easier said than done. Measurement is tricky, because climate policy is only one out of whole range of factors that influence the development of emissions. Moreover, since countries rely on differing energy sources and varying industry structures, they will face differing abatement costs and technical challenges.

It is not clear towards which goal actual progress should be measured. For instance, is achieving short-term reductions in emissions more important than shifts from fossil fuel-based energy systems towards renewable energy systems, eventually leading to reduced emissions? Moreover, the truly global nature of climate change makes it impossible for single countries to do much to solve the problem on their own.

Environmental policy ambitions can be determined by comparing policy outcomes with scientific advice, but disagreement concerning appropriate levels of carbon emissions makes it intrinsically challenging to use scientific advices as a yardstick for ambitiousness in climate policy. Science holds that we must cut emissions drastically, but the pace and timing of reduction efforts is contested (see Solomon et al. 2007). Nonetheless, given the overwhelming extent of the climate challenge, most national climate policies appear far from sufficiently ambitious for putting the scientific advice into practice. In order to assess national climate policy we will have to specify some kind of national measurement standard, but disagreement runs deep about the suitability of various possible standards. Are, for instance, national emissions reductions and funding of emissions reductions elsewhere are of similar value? Are high- or low-cost reduction measures more appropriate?

More importantly, both counterfactual and actual performance measurement requires that the policy to be evaluated has been operating long enough to yield results. We cannot expect policies and measures to achieve actual mitigation immediately: it may take a decade or more before the effects of a climate policy can be assessed. The six countries explored in this report have introduced a range of policy changes during the last decade and it is far too early to assess the results of these policies. In other words, we cannot assess the ambitiousness of current policies by measuring their effects – so neither of the methods discussed in the regime literature are suitable for our purposes. Moreover, since different sectors and different countries face different challenges in achieving low-carbon societies, it would be highly demanding to develop a standard for level of ambition that can cover more than one country or even more than one sector. In order to create a foundation for comparative research, we will have to capture other and less normative dimensions of policy outcomes.

Rather than trying to develop a one-dimensional ambitiousness standard, with a coherent set of criteria, this report develops three different dimensions of ambitiousness in climate policy. This will enable us to capture the variance in national climate-policy portfolios without becoming enmeshed in the underlying disagreements on ideal climate-policy design.

Specifying Three Dimensions of Ambitiousness

Based on the IPCC assessment report on mitigation, I distinguish three different aspects of ambitiousness to guide assessment of ambitiousness in climate policy (see also Metz et al. 2007). These are presented in Table 2.2 (a) Market Approach, (b) Minimizing Societal Costs, and (c) Technical Development. Business economists are likely to give weight to (a), governmental economists to (b) and engineers to (c). Hence they represent three different professional logics, providing different policy recipes and evaluation criteria against which policy success can be measured.

The market approach (a) assumes that commercial organizations possess perfect informa¬tion and are capable of acting strategically on this information (Fligstein 2001:13). Firms are expected to strive to maximize their profits in a medium- to long-term perspective. In this perspective, governments should work to ensure that low-carbon investments are the most profitable option. Measures should be market-based, to encourage market actors to compete in developing the most profitable low-carbon projects (Sims et al. 2007:306). Thereby the 'best' projects will be developed, and actors able to develop the most profitable projects will be rewarded with the greatest profits. Emissions trading systems as well as green certificate schemes for renewable energy are basically designed in line with this logic (see Commission 2005; 2008). This dimension of ambitiousness sees the climate-policy challenge from the business perspective: profit-maximising organizations tend to prefer a combination of negative measures (e.g. a price on CO2) and positive ones (e.g. state aid) in order to make the transition smoother for companies.

Table 2.2 Three Dimensions of Climate-policy Ambitiousness

Ambitiousness dimension⇨ Components ⇩	Market	Minimizing societal cost	Technical development
Strategic concern	Allowing corporate actors maximize corporate profits.	Minimizing societal costs.	Enhancing technical development.
Role of commercial organizations	Engaging in strategic competition aimed at maximizing corporate profits	Engaging in all endeavours that yield profit.	Inventing, developing and refining promising technologies.
Appropriate climate-policy strategy	Market-based support schemes that favour the most profitable low-carbon solutions.	Raising the price of technologies with negative societal effects. Support to projects requiring the lowest level of state aid.	Fostering a wide range of technologies by introducing various technology-specific measures.
Climate-policy objectives	Low carbon solutions are the most competitive	Implement lowest-cost mitigation measures first	Transform the energy system
Governmental measures	Market measures (e.g. emissions trading and green certificate schemes)	Emissions trading. CO_2 tax. Cost-efficient state funding.	Governmental industry development. Technology standards.
Number of measures	Combination of negative and positive incentives	As few as possible	Many measures

Also the 'minimizing societal cost' dimension (b) is founded on the assumption of rational economic actors. However, according to this view, corporations will not seek out the most profitable projects, but will engage in all endeavours that can yield profits (Stiglitz and Walsh 2006:158). This strategy will aim at ensuring that conventional industries shift to a low-carbon economy in ways that involve a minimum of societal costs (Gupta et al. 2007:751). Cost minimization is best ensured by emplacing an extra cost on the undesirable effects of conventional production, such as CO2 emissions. This may be done by introducing a tax or an emissions trading system, but designs that allow considerable free allocations will not be in line with this logic.

Subsidizing investments in low-carbon products is a second-best option. This should be done only for budding technologies still in need of basic research. Support schemes should be designed to ensure that such subsidies go only to those projects that require the lowest level of support in order to break even, and not to any projects that are profitable already at the outset. That in turn necessitates comparing the cost structures of all possible projects, to identify which projects need the least support. The government has the upper hand, as it determines not only the criteria but also which actors will receive support. This approach values simplicity in policy development; there should be as few regulations as possible.

The third dimension is based on technological rather than economic criteria. It is assumed that industrial change hinges on technological innovation and its sub¬sequent refinement. Commercial organizations will aim to enhance technological develop¬¬ment, and the government should ensure good and stable conditions that enable them to do so. It is the technical quality of the alternatives to conventional production that determines the support levels, so different technologies will receive different levels of support. Moreover, in this logic, support schemes are designed to ensure long-term stability, so that commercial actors may use the time and resources needed to refine those technologies in which they have greatest expertise (Sims et al. 2007:306). Feed-in tariff schemes that guarantee producers of renewable energy access to the grid, a fixed level of operational support and varying levels of support for different technologies fit well with this approach (Commission 2005; 2008). The incentives for competitive behaviour and cost minimization are weak. Technology standards, such as emission limits or energy performance requirements, also fit this logic. Complex and encompassing climate policy portfolios are seen as an appropriate response to the many-faceted challenge of climate change.

2.2 Measuring Ambitiousness: Method and Operationalization

Having presented the three dimensions of ambitiousness, we move on to specify the criteria. The five countries studied here will first be given scores on the four sub-issues: climate policy objectives, emissions regulations, renewable energy policy and energy-efficiency policy. A climate policy measure will be given varying scores on ambitiousness depending on which dimensions tare taken into account. Countries will be given a sub-issue ranking only on the dimension that fits their policy profile the best. For instance, a country that has an emissions-regulation profile well in line with the technology-development dimension will be ranked according to this dimension only. This approach enables us to capture underlying patterns in the countries' policy profiles, but it is a crude simplification and it underlines policy differences rather than policy similarities across countries.

The sub-issue rankings will be summarized into the overall scores for the different countries. Countries with inconsistent policy profiles in one issue-area could have been scored on several ambitiousness dimensions at the same time. However, such an approach would have made it very hard to develop a well-balanced coherent mark for the national climate policy portfolios in total. For instance, a country that had been ranked along several dimensions would have received more high scores than a country that had been ranked along only one dimension. Whichever approach is taken, it will be impossible to rank and score ambitiousness with a high degree of accuracy. This report suggests a measurement method that highlights how different criteria result in radically different ranking of countries.

Table 2.3.1 specifies the criteria for ranking Emissions Reduction Targets in terms of ambitiousness. This operationalization is based onn Table 2.2, in chapter 2.2.

Table 2.3.1 Criteria for Assessing GHG Emissions Reduction Targets

Ambitiousness dimension⇨ Criteria ⇩	Market	Minimizing societal cost	Technical development
Geographical focus	Global	Global	National
Target structure	Flexible	Flexible	Detailed interim-targets leading up to 2050

It is not possible to delineate between the two economic dimensions of assessing emissions-reduction target as to ambitiousness: both dimensions favour a global perspective on emissions reductions and a flexible target structure that enables the country to take the development of global commitments into account. Measures that do not immediately result in significant emissions reductions but that may underpin future emission reductions (e.g. construction of renewable energy plants, or infrastructure for electric cars) are not important in this perspective. The focus here is on short-term targets, not long-term ones. In contrast, national targets and development of detailed interim targets leading up to 2050 are favoured by the technology-development view on ambitiousness. This perspective accords just as much attention to long-term plans as to immediate reductions in emissions reductions, and is thus less precise than the economic criteria.

Table 2.3.2 Criteria for Assessing GHG Emissions Regulations

Ambitiousness dimension⇨ Criteria ⇩	Market	Minimizing societal cost	Technical developments
Number of measures	Not important	Few	Many
Favoured measure	Combinations of voluntary agreements and GHG emissions pricing	GHG emissions pricing adjusted to ETS	Emissions performance regulations and energy taxation

Turning to GHG emissions regulation, the three perspectives differ when it comes to the number and kind of measures that are favoured. Criteria for Assessment of Emissions Regulations are presented in Table 2.3.2. According to the market view, the number of measures is not very important, as long as the corporate actors are given economic incentives as well as softer measures, such as voluntary agreements. We would not expect much general energy taxation, because it does not target GHG emissions directly, and we would not expect much direct regulation, since this reduces the leeway of market actors.

In an ideal world, the Minimizing Societal Cost dimension would favour GHG pricing as the only emission regulation. Since ETS has failed to produce a high carbon price and only parts of the emissions are included in ETS, it would be acceptable to develop some additional national measures, in order to create a significant price on carbon and other greenhouse gases. A high ranking according to the Minimizing Societal Cost dimension requires that GHG emissions pricing measures are dominant, and that national measures are carefully adjusted to ETS. Turning to the Technology Development view on ambitiousness, here we would expect extensive use of energy taxation combined with various kinds of emissions performance regulation. This is in line with the view that several instruments must be combined in order to get a good mix of emissions regulating measures. The three sets of criteria are presented in Table 2.3.2.

Policy on renewable energy has many elements, but this report focus exclusively on target-setting and support schemes for renewable energy electricity. That means that also the ambitiousness criteria are based solely on these two elements. Table 2.3.3 shows the differences in criteria for the three dimensions.

A policy on renewable energy will get a high market ambitiousness score if it employs green certificate schemes; moreover, having ambitious short-term targets is an advantage in order to create stable conditions for the functioning of the scheme. By contrast, targets for the year 2050 are less relevant to this perspective. The minimizing societal cost perspective is special in rejecting an active policy on renewable energy. This perspective highlights GHG emissions pricing as the core policy measure that should guide the use of renewable energy sources. Hence, all kinds of target-setting are seen as negative. Moreover, if renewable energy should get any support, that should be done in a way that ensures that no projects that are profitable at outset receive funding, and that only the least costly projects are realized. Neither feed-in nor green certificate schemes fit these criteria, because subsiding renewable energy can contribute to lower average prices on energy, which in turn can lead to higher demand for energy. In such instances, the net impact on emissions will be reduced. And, turning to technology development, detailed short- medium- and long-term objectives are regarded as important; feed-in schemes are the favoured support measure.

Table 2.3.3 Criteria for Assessing Renewable Energy Policy

Ambitiousness dimension⇨ Criteria ⇩	Market	Minimizing societal cost	Technical development
Measures	Green Certificate Scheme	No support measures (rely instead on emissions pricing)	Feed-in schemes
Target structure	Short- and medium-term targets	No targets	Detailed short-, medium- and long-term targets

Lastly, criteria for good energy-efficiency policies are presented in Table 2.3.4. According to the market view, clear short-term targets are advantageous. Further, countries should combine energy taxation with state aid measures; industry should be included in a tradable white certificates scheme or voluntary agreements, and the energy certification of buildings should be designed as a market measure. The 'minimizing of societal cost' view on ambitiousness stands out due to the importance it accords to simplicity in policy strategy. The prime position along this perspective is to rely on GHG emissions pricing and develop as few additional measures are possible. However, as it is acknowledged that not all good energy-efficiency measures are profitable, this perspective will accept support schemes that ensure that support goes only to such energy-efficiency measures as are profitable for society, but not profitable for individual persons or corporations. This goes for buildings as well as industry. Information measures (such as energy certification) are to be introduced only if they involve large gains and small costs: for instance, it will make sense to introduce energy certification only if the societal gains exceed the costs involving in issuing the certificates.

The technology-development dimension favours state aid measures based on technical criteria, such as rules whereby all who undertake the same technical improvements of their building are eligible for the same support. Also important are stringent energy requirements in building codes and detailed, targeted information and training measures. The latter refers to energy certificates that provide building owners and residents with detailed advice.

Table 2.3.4 Criteria for Assessing Energy Efficiency Policy

Ambitiousness dimension⇨ Criteria ⇩	Market	Minimizing societal cost	Technical development
Measures	Tradable white certificates and voluntary agreements, energy certification designed in order to influence price developments in markets	Preferably no measures. Cost-efficient state aid and low-cost information measures if profitable energy-efficiency measures remain un-realized.	State aid based on technical criteria, energy requirements in building codes, and detailed, targeted information and training measures.
Target structure	Short- and medium-term targets	No targets	Detailed short-, medium- and long-term targets

Along all of the three dimensions we can envisage policy with varying strength. For instance, the cap in the missions trading scheme may be high or low, the renewables quota in a green certificate scheme can be high or low, a CO2 tax can be set high or low, much or little money can be available in a state aid scheme, the technology standards can be strict or slack, and so forth. This report will not delve into questions concerning strength, but only take this into account in the cases when several countries score on the same dimension for a certain sub-issue of climate policy.

3 National climate policy portfolios: empirical mapping

3.1 Background information

Before we dig deeper into the climate policy portfolios of the countries in focus here, important background information about their GHG emissions and energy systems is necessary. All six clearly face differing carbon mitigation challenges: Table 3.1 shows huge variation in total GHG emissions. This should come as no surprise, given the significant variation population size and size of the economies, but also other factors play into this.

Not only do Germany and the UK have high total emissions, they have also reduced their emissions radically more than the other four since 1990. Much of these emission reductions stem from non-climate policy related factors, but Germany and the UK have also adopted forceful policies. All the six, except Norway, have reduced their emissions since 1990. Germany and the UK are in a class of their own, but also Denmark has impressive figures with more than 10% reductions.

Table 3.1 Climate Emissions and Energy Situations in the Six Countries and the EU

	Total GHG Emissions in 2010, in 1000s*	2010 GHG emissions indexed to 1990**	CO_2 per capita 2010***	CO_2 per GDP 2010, kg of CO_2 in 2005 USD ****	Industry contribution to GDP %*****	Energy Dependence – all products 2010 % ******	Share % of renewables in gross final energy 2010 ******
Denmark	61	89	8.48	0.18	30.7	- 18.2	22.2
France	522	93	5.52	0.16	19	49.3	12.9
Germany	936	75	9.92	0.26	27.1	59.8	11.0
Norway	54	108	8.01	0.12	45.1	- 517.4	61.1
Sweden	66	91	5.07	0.12	26.6	36.5	47.9
UK	590	77	7.78	0.21	23.8	28.3	3.2
EU Total	4720	85	-	-	-	52.7	12.5

Sources:
*Eurostat 2013a
** Eurostat (2013b)
***IEA 2012 (CO_2 emissions/population),
**** IEA 2012 (using exchange rates)
*****Gallagher et al. 2011 ,
******Eurostat 2012:28 and
******Eurostat 2012:72.

France and Sweden have significantly lower CO2 emissions per capita than the other countries, probably due to low CO2 emissions from their electricity production (primarily due to nuclear energy). Germany has the highest per capita emissions by far, but Denmark, Norway and the UK also have much higher emissions than France or Sweden. Note that Norway has rather high per capita emissions, despite the low emissions relating to electricity production. Measured in terms of CO2 intensity, emissions are low in Norway. Being a prosperous country with a high share of renewables and a resource-efficient economy contributes to that.

Germany has a radically higher CO2-intensive economy than the other countries, with figures more than twice as high as those of Sweden and Norway. This reflects the fact that Germany has been the industrial motor in Europe, with a large share of Europe's energy-intensive industry and substantial volumes of fossil fuel power production. Industry activity also plays an important role in the Swedish and Danish economies, but their industries are 'cleaner' than those of Germany. We should also note that because petroleum activity is included in industry, its contribution to Norway's GDP is high.

When it comes to energy dependence, Norway is clearly the outlier. Thanks to its vast oil and gas exports, the country exports five times more energy than it consumes. Denmark is the only EU country with a small energy surplus, but this is minor compared to Norway. All the other countries are energy importers. Decreasing energy dependence is a major political concern in the EU, and these figures tell us why. EU imports half of its energy, Germany imports 60% and France imports 50%. Sweden and the UK import some 30% each.

Lastly, the share of renewable energy varies from 3% in the UK to 61% in Norway. However, Norway would have had a lower figure if energy use at the petroleum installations were included. Having close to 100% renewable share in electricity consumption contributes substantially to the high figure. Sweden is close to Norway with 48%, while Denmark has 22% and Germany and France have 11% and 13%. France has some old hydropower while the German figure is dominated by new renewables. The UK's renewable energy figure is very low, indicating an especially challenging situation.

All six countries face challenges when it comes to mitigation of climate change. Most must deal with two challenges in conjunction: reducing their energy dependence, and replacing fossil fuel (and nuclear) in their electricity consumption with renewable energy. The exception is Norway, which already has a high renewables share, and petroleum extraction as its economic driver. Germany faces the most severe challenges in transforming its industry and energy system to a carbon-constrained world, but also the UK, Denmark and France find themselves in difficulties. Sweden and Norway start the low-carbon transition from better positions, although in Norway the petroleum sector constitutes a considerable part of the economy and contributes to carbon emissions both domestically and abroad.

The impacts displayed in Table 2 represent impacts to the setors before adaptation takes place. In principle, they describe the situation that economic agents face after climate change has take place, but before they have taken any action to adapt. In practice, this is only a part of the story, however, because each of the 11 sectors in GRACE are aggregates of many sub sectors. Some of the adaptation that takes place within each sector should be included in the estimates in Table 2. For example, if climate change leads to a shift from crop yields to livestock in agriculture, this shift ought to be implicit in the impacts estimate because the production function is an expression for the maxium output for the sector aggretate at a given combination of prices.

3.2 Emissions Reduction Objectives

The six actors frame their overarching climate policy strategies differently. (See Table 3.2.) Not only have they adopted different short and long-term objectives, some focus solely on national emissions development while others also aim to ensure emission-reduction activities elsewhere.

Table 3.2 GHG Emissions Reduction Targets

	Kyoto/Burden-sharing targets %	2020 – % target from 1990	2030 target %	2050 target %
Denmark	- 21	- 40	-	-
France	0	- 22.5		- 75
Germany	- 21	- 40	- 80 from 1990	- 80-95 from 1990
Norway	+ 1	- 30	Carbon neutral if global deal	Carbon neutral
Sweden	+ 4	- 40, some abroad	Carbon neutral	No net-emissions
UK	- 12.5	- 50 by 2025		- 80 from 1990

Sources: Sources for the targets are found in the text below
* European Parliament and Council (2009),
** EEA (2012)

For the EU, climate and energy policy was once a matter of minor political importance on the agenda, with issues like the internal market, enlargement and monetary policies ranking far higher (Boasson and Wettestad 2013). After a decade of severe political conflicts and primarily symbolic policy outcomes in the 1990s, climate policy soared from being 'just another' part of EU environmental policy to become a high-profile policy area in its own right. Especially from 2005 onwards, the pace of developments has been rapid indeed. By the end of the decade, many new and ambitious targets had been adopted, complemented by a broad palette of specific, binding policies. Climate policy has emerged as a vital area of EU governance.

EU climate policy can be defined in many different ways. The EU itself tends to include emissions trading (ETS), the burden-sharing agreement, renewable energy, energy efficiency, the energy performance of policy of buildings, energy labelling, eco-design, emissions targets for cars, environmental aid guidelines and the fluorinated gases regulation as EU climate policies. Also other EU policy areas may influence national efforts to mitigate climate change, but they are not discussed explicitly in this report.

The EU has adopted three '20% by 2020' targets: a 20% reduction in GHGs by 2020, increasing to 30% if other OECD countries follow suit, a binding EU-wide 20% target for the use of renewable energies, and a non-binding 20% improvement in energy efficiency. The greenhouse gas target and the renewable energy targets are binding, whereas the energy-efficiency target is only indicative. The following sections of this report present national targets and measures derived from these overarching EU targets.

The 20% GHG target is to be met through the EU ETS, as well as the non-ETS sectors. This will be done by a 21% reduction in EU ETS sectors and a reduction of around 10% compared to 2005 for sectors not covered by the EU ETS. The ETS covers CO2 emissions (above certain capacity thresholds) from power stations and other combustion plants, oil refineries, coke ovens, iron and steel plants and factories making cement, glass, lime, bricks, ceramics, pulp, paper and cardboard. Aviation was added in 2012. The EU effort-sharing agreement covers all other sectors, and provides emissions limits for all EU member states (European Parliament and Council 2009; Lacasta 2010). Some Eastern and Central European members are allowed to increase their emissions, but most member states are required to reduce their emissions substantially.

EU climate policy both constrains and enables national climate policy developments. Some areas of climate policy are fairly centralized, allowing EU member states and EEA countries little leeway, whereas in other areas the EU presents a framework or gives encouragement to national policymaking. The ETS is far more centralized than any other EU climate policy measures. Moreover, some EU climate policies encourage member states to develop national technology development measures, while others encourage the use of economic criteria and market measures. The EU has embarked on a process of setting 2030 targets, but we cannot say how long it will to reach agreement on this. These EU developments should be kept in mind when we move on to assess the national objectives.

Denmark was given one of the highest emissions-reduction targets in the effort-sharing agreement that the EU developed as its main measure for following up the common Kyoto commitment. Denmark is on track to meet this commitment (Energistyrelsen 2010). In the 1990s, Denmark was a frontrunner in European climate policy development. It reversed many of its policies in the period around year 2000, but has since revitalized its climate policies. The minority coalition government that took office in 2011 announced that they would lead by example and established 40% reduction in GHG emissions by 2020 as an overarching objective (KEB 2011:1). This implies a 20% reduction in non-ETS sectors.

In 2012, all parties in the Danish parliament (except the Liberal Alliance Party) reached agreement on future energy policy. This agreement, slightly less ambitious than proposed by the government, is projected to contribute to 34% reduction of GHG emissions by 2020 (KEB 2013). Various task forces and assessments have been initiated in order to promote the policy steps needed to reach the 2020 target, and the government is expected to propose a climate policy action plan in the near future. Denmark has not developed targets for 2030 or 2050 targets, but when Denmark held the EU presidency it proposed that the EU should adopt a 40% 2030 target and a 60% 2040 target (Information 2012). Rather than developing detailed carbon targets, Denmark has developed specific targets for transformation of its national energy system. This will be explored in greater detail in the coming chapters.

France did not develop many national climate policies in the 1990s, but its policy portfolio started to grow after 2000. In 2003, President Chirac announced 'a factor four' reduction target: a 75% reduction in its CO2 emissions by 2050 (Szarka 2008). This objective was incorporated in law in 2005, making France one of the first countries to undertake a legally binding commitment to a long-term emission reduction target (Szarka 2011:116).

Every second year France publishes a national programme for tackling climate change, synthesizing existing regulations with implications for climate emissions (GLOBE International 2013:170; UNFCCC 2011:5). France initiated an original and interesting national climate policy process in 2007: the 'Grenelle de l'environnement' process, named after the Grenelle Agreements negotiated between the government and the unions during the unrest and events of 1968. The Grenelle working group on climate change involved labour unions, trade associations, environmental groups, professional bodies, regional authorities and other governmental organizations (MEDDE 2009:6). This resulted in some principles and measures adopted in 2009, and more detailed policies adopted in June 2010. Emissions reductions and energy-efficiency improvements in the building sector are main priorities (GLOBE International 2013:171). In all, some 16,900 stakeholders were involved in the Grenelle process (UNFCCC 2011:13).

The Grenelle process resulted in substantive new climate policymaking. The French government expects it to lead to policy measures that will enable them to cut emissions by 22.8% between 1990 and 2020. The key role played by local municipalities is a special feature of French climate policy strategy. Since 2004, 200 local authorities have developed climate plans. The Grenelle process strengthened the requirements for local authorities by requiring localities with more than 50,000 residents to emplace climate and energy plans (PCETs) by the end of 2012 (UNFCCC 2011:11).

Thus far, most French climate policy developments have been rooted in EU law, but the new socialist government has signalled more independent climate policymaking (GLOBE International 2013:171). Soon after taking office in 2012, it initiated a new debate on energy transition. A national commission with broad participation was established, to develop a new energy bill; this bill will be decided in the course of 2013. The new government has also announced that it will support a 40% EU reduction target for 2030 and 60% by the year 2040 (Business Green 2013).

In 1990, Germany adopted as a target to cut its CO2 emissions by 25% by the year 2005. Although this was later reduced to 21% in EU negotiations, Germany still had a very high target compared with other EU countries. From the outset it was clear that a significant share of the reductions would be related to other features than climate policy: re-unification and the related closures and restructuring of East German industry brought a dramatic decrease in emissions (Hasselmeier and Wettestad 2000). Germany has also developed a broad climate policy portfolio, with technology-specific feed-in support to renewable energy as a central component. Preliminary EU assessments indicate that Germany will overachieve its burden-sharing target for the Kyoto period (European Commission 2012).

Energy system transformation is at the core of German climate policy strategy, not emissions developments as such. Germany's climate policy strategy is known as 'Energiewende'; according to the government, this strategy is 'about designing and implementing a long-term overall strategy for the period up to the year 2050.' BMU (2012:3). Nuclear power phase-out has played a crucial role in the development of this strategy. Germany's first coalition government to involve the Green Party in 2000 implemented the feed-in law and a nuclear phase-out. The Conservative coalition under Chancellor Merkel reversed this nuclear consensus in 2010, commonly referred to as 'the phase-out of the phase-out', thereby allowing the country's nuclear plants to run for an additional 8 to 14 years, depending on their age (Gawel et al. 2012:3; Schreurs 2012:30). Then the Fukushima nuclear accident in 2011 made it crucial to re-evaluate nuclear power – and, in a spectacular policy U-turn, another phase-out was introduced in 2011, aimed at terminating all nuclear power in Germany by 2022. One plant is to be shut down in each of the years 2015, 2017, and 2019, and the remaining six are to be taken off line in 2021 and 2022 (Schreurs 2012:37).

Greenhouse gas emissions are to be cut by 40% by 2020, with 1990 as the base year (FMENCNS 2011:4). Further, plans foresee a 55% reduction by 2030, a 70% reduction by 2040 and 80–95% reduction by 2050. These objectives are supplemented by a range of detailed renewable energy and energy-efficiency targets, presented in the following sections.

Norway started to develop a national climate policy already in the late 1980s. Ever since, cost efficiency and the 'double regulation' principle have been central in all parliamentary reports on Norwegian climate policy: if an area is covered by a general measure (such as CO2 tax or ETS) it should not be covered by additional measures as well (Boasson 2011; Innst. S. nr. 145 2007 – 2008). In practice, this has not hindered the emergence of a range of new measures relating to renewable energy, energy efficiency and CCS.

A high share of renewables in electricity production and increasing emissions from offshore industry pose special challenges as regards cutting. In 2008, a range of new targets were adopted, and the parliament decided that the Kyoto target should be overachieved by 10% (Innst. S. nr. 145 2007 – 2008). Emissions reductions were to be ensured primarily through requirement of external allowances. Further, Norway was the first country to declare that it aimed for carbon neutrality by the year 2050. A vast majority in the parliament agreed that this be moved forward to 2030, if an ambitious global climate deal could be developed. In 2008 it was also agreed that two thirds of Norway's emissions reductions shall stem from within Norway, when land use and land use change is included, while the remainder can be realized abroad. It was also decided that if a new international climate agreement were achieved, that would necessitate a new assessment of the Norwegian objectives.

In 2012 came a new parliamentary report on climate policy (St. meld. St. 21 2011–2012). It included various new measures, including a climate and energy fund for development of technology and industrial transformation, but, despite the formulations in the 2008 political agreement, it did not introduce new strategic objectives. Instead, reference was made to the agreement from 2008, stating that it was still valid. Lack of specific references to the 'two thirds' target has created uncertainty as to whether it remains valid. The Minister of the Environment continued to refer to this target in public, but it is not specifically mentioned in official documents (see VG 2012 and Miljøverndepartementet 2013). Representatives from the Ministry of Finance who have provided input to this report have made it clear that they do not regard the two-thirds target as a guiding objective today.

In 2012 Norway signed a second Kyoto commitment period in line with the 2020 target of reducing emissions by 30% compared to 1990 levels. This implies that emissions on average (2013–2020) should equal 84% of 1990 emissions. Official documents repeatedly declare that Norway is to become a low-carbon society. Exactly what this means in practice is not specified, but it probably means the same as the carbon-neutral target set for 2050.

Norway has put considerable effort into influencing the global climate negotiation, but accords less attention to EU climate policy in its own strategic policy climate documents. For instance, the global negotiation situation is discussed in length in St.meld. 21 2011–2012, but few other EU policies than ETS are mentioned. Norway has launched a Climate and Forest Initiative, aiming at supporting efforts to slow, and eventually reduce GHG emissions resulting from deforestation and forest degradation in developing countries (REDD+), and has granted 3 billion Norwegian kroner annually for this project. Emissions reductions from these efforts are not to be counted towards the Norwegian targets, but come in addition.

Sweden started to develop a climate policy in the early 1990s (Nilsson 2005a). In 1996, the government presented the creation of a 'Green People's Home' as a new mission for the Social Democratic Party, just as creation of a welfare state and a 'People's Home' had been its historic mission. Stricter taxation and a range of support schemes for renewable energy development were introduced. The EU effort-sharing agreement allowed Sweden to increase its emissions by 4%, but the government later decided to aim for a 4% reduction (Nilsson 2005b).

Initially, carbon taxation, and promotion of renewable heating and biopower plants were the core features of Swedish climate policy (Nilson 2005a, 2005b). Transformation of the energy system, not emissions reductions as such, was central in the national climate strategy in the period 2000–2010. Market measures gradually became important in the Swedish climate strategy, and a tradable green certificate scheme for renewable electricity was introduced in 2003.

In 2006, then-prime minister Göran Persson headed a commission on fossil fuel independence, which issuedg the report 'Making Sweden an Oil-free Society' (Swedish: På väg mot ett oljefritt Sverige). This came with recommendations for breaking Sweden's dependency on oil. The Social Democratic government headed by Persson stepped down after the 2006 elections, and the new government declared that it wanted to 'lead Sweden swiftly out of the fossil fuel based society', but it had more of a global focus than a strict strategy for transforming the country's energy system.

In 2009, the Swedish parliament adopted a 40% carbon commitment for 2020 (Miljödepartementet 2009). This implied a reduction of 20 million tons, of which some 7 million tons were to be acquired thorough climate measures outside of Sweden. The Swedish International Climate Investment Programme invests in Clean Development Mechanisms (CDM) and Joint Implementation (JI) projects on behalf on the Swedish government. In 2011, the Swedish government initiated a process towards the development of a new climate policy strategy, and commissioned an assessment for 'a Sweden without climate emissions in 2050' (Naturvårdsverket 2012). This provided a basis for discussions in a consultative group led by the environmental minister and consisting of environmental organizations, business and researchers. The report focuses mainly on future Swedish measures and Swedish positions in EU discussions, but it also argues that acquirement of emission allowances in international markets is necessary in order to achieve the long-term objective.

The UK was initially rather lax when it came to climate policy development. The EU burden-sharing agreement required a 12.5% emissions cut by 2020 as compared to 1990. This necessitated adopting some new policy measures, but economic policies in the early 1990s had already ensured substantial emissions reductions (see Boasson and Wettestad 2013). However, the Labour Party that took office in 1997 had a strong commitment to climate change, and eventually the UK developed a range of original climate policy measures. Its Climate Change Act is the most remarkable piece of policy. It regulates the development of short- and long-term binding GHG commitments, committing the UK to reduce GHG emissions by 80% from the 1990 baseline by 2050. The UK was the first country to develop such legally binding, long-term carbon emissions-reduction targets (Rayner and Jordan 2011). The Climate Change Act makes it the duty of the Secretary of State to ensure that the net UK carbon account for the year 2050 is at least 80% lower than the 1990 baseline (Climate Change Act 2008: 1.1).

The target as well as the percentage may be amended by the Secretary of State for Energy and Climate Change, if accepted by both Houses of Parliament.

The Climate Change Act requires extensive carbon budgeting and creates a Climate Change Committee, consisting of experts outside the government (Climate Change Act 2008). The Committee recommends carbon budgets to the government, which must then decide whether to adopt them. If it does not do so, the government must give an account of why it is rejecting the Committee's advice. Recommendations from the committee for the first three carbon budgets 2013–2017 and 2018–22) were agreed by the government in 2009 (Lockwood 2013:12). The first budget period (2008–2012) covered the first Kyoto period, and set a cap of cap 22% below 1990 baseline. The second budget period, from 2013–2017, requires emissions in this period to be 28% below baseline. The 2018–2022 budget requires emissions to be 34% below baseline. The fourth carbon budget, agreed in 2011, requires emissions reduction of 50% as against 1990 levels by 2025 (CCC 2011).

The UK has developed a broad climate policy portfolio and has recently updated and changed many central policy measures. 'Cost-efficiency' is a central term in the climate policy documents, but there has been a shift from the dominance of market measures to greater use of direct state aid and technology-specific mechanisms (HM Government 2011). Moreover, while emissions trading used to be the most important element in UK climate policy, energy efficiency has now taken centre stage.

3.3 Emissions Regulations

This section presents the emissions regulation profiles of the six countries. Table 3.3 shows the various kinds of measures that constrain, or aim at constraining, GHG emissions. The ETS is in many respects the most important carbon regulation in Europe, but is not included here since it is administered at the EU level and applies to installations in all six nations.

Table 3.3 describes energy taxation as well as carbon taxation, which are closely linked in most countries. Some energy taxes are motivated by climate concerns, but other justifications are also possible. For instance, fiscals concerns have been important for energy taxation in the Nordic countries (see Klok et al. 2004). The implicit tax rate on energy is the ratio between energy tax revenues and final energy consumption calculated for the calendar year. Energy tax revenues are measured in euros (deflated) and the final energy consumption as toe (tonnes of oil equivalent) (Eurostat 2013). ETS costs come in addition to this. Costs of renewable energy support schemes that are paid directly by the consumer are not included.

Table 3.3 Emissions Regulations

	Implicit tax rate on energy, 2010, ton o.e. *	Carbon tax rates, EUR **	Voluntary agreements	% emissions in ETS 2011**	Non-ETS target*	ETS- interventions	Emissions performance regulations
Denmark	289	82	Yes	38.3	- 20	No	No
France	147	61	No	21.9	- 14	No	Ban on fraching
Germany	183	58	Yes	49.1	- 14	No	No
Norway	156	93	No	36.4	-	-	Flaring and CCS requirements
Sweden	214	79	Yes	31.6	- 17	No	No
UK	264	73	Yes	40.2	- 16	Carbon Price Floor	450g/kWh emission limit

Sources:

* Eurostat 2013, per tonne of oil equivalents.
** OECD 2013:31, tax rate (EUR per tonne CO_2).

Other sources are found in the text below.

The EU conducts emissions regulation through the ETS, which is based on the idea that all large point-source emitters of CO2 must have allowances equivalent to their annual emissions. More than 10,000 'installations' in the power-producing and power-consuming/energy-intensive industries (such as refineries, steel and cement) are targeted (European Commission 2008). Companies may buy and sell these allowances as deemed necessary. The availability and distribution of allowances are shaped by state regulations, which will influence how the market forces will work and hence what the carbon price will be. All types of emissions-trading systems are based on market thinking, but the degree of market streamlining can vary significantly (see OECD 2006). This applies particularly to allocation methods, where the auctioning of allowances is a more 'market-aligned' method than free allocations.

The 2009 ETS Directive goes a long way towards establishing a Single European Market for carbon emissions. The ETS post-2013 establishes auctioning as the main allocation method (see section 15 in the preamble to Directive 2009/29/EC, European Parliament and Council 2009b). Some 40% of allowances will be auctioned in 2013, rising to around 70% by 2020. This means that the distribution of allowances will increasingly be based on market criteria (like willingness and ability to pay), with a corresponding reduction in the influence of technical and political considerations. These changes will reinforce the overall character of the ETS as a transnational market measure. The carbon price is currently very low, at some 3–4 euros. This applies for all countries assessed in this study, except the UK, which has its own national carbon floor price.

Denmark has a long tradition of energy and environmental taxation, introducing its first energy tax in 1917, and a range of energy taxes in the late 1970s (Klok et al. 2006). A drop in world fuel prices led to significant tax increases in 1986. Due to climate concerns, a CO2 tax was introduced in 1993, but industry was reimbursed for some or most of the costs. The revenues from the CO2 tax were earmarked for renewable energy. The CO2 tax for households as well as industry increased several times during the ensuing two decades. Denmark adopted a green taxation reform in 2009, prior to the Copenhagen climate summit (Energistyrelsen 2011:14). The structure of energy taxation was changed in order to improve interaction with the ETS. The justification was to ensure a similar carbon-related burden between ETS and non-ETS sectors and avoid overlap between the Danish carbon tax and the EU ETS (OECD 2013:89). The reform increased the rate of most energy and CO2 taxes, and the rates have not been changed since.

Table 3.3 shows that Denmark still has the highest level of energy taxation of all the countries assessed in this report. The carbon tax is also high: only Norway has a higher carbon tax rate. The energy tax is levied on fossil fuels and electricity (OECD 2013:89). Carbon taxes apply to all energy products used by businesses, at rates based on the emissions associated with the use of each fuel. Biofuels are not taxed. The carbon tax element is not levied on fuels used by sectors subject to the EU ETS. As a general rule, fuels used for power generation are therefore not taxed. However, a CO2 component is still levied on electricity consumption through the energy saving tax. Table 3.3 shows that less than 40% of Danish GHG emissions are covered by the ETS, while the country has the toughest non-ETS target of the five EU member states assessed in this report.

Denmark has a tradition of voluntary energy-efficiency agreements with industry. About 60% of total energy use in trade and industry in Denmark is covered by voluntary agreements (Bertoldi and Rezessy 2010). The agreement between the government and the energy industry requires the energy companies to undertake specific measures to reduce customer energy end-use (Energistyreselsen 2011:11). The most recent agreement with the energy industry requires energy savings to increase by 75% by 2013–2014 compared to 2010–2012, and by 100% in 2015–2020 (Dansk Energi 2013). In November 2012, the Danish business association for electricity and the Danish Ministry for Climate, Energy and Buildings signed the most recent agreement. Such agreements are quite detailed as to the precise actions that signatories are required to undertake specific activities (Bertoldi and Rezessy 2010). Only electricity consumption is covered, so as to not overlap with the ETS.

France has shown a consistent preference for uniform application of emission reduction measures in the EU, and in the 1990s it took part in the coalition that supported adoption of an EU carbon tax (Szarka 2011:118). In fact, the idea of a national carbon tax had been launched already in the mid-1990s, but the French constitutional court ruled against it, and it was never adopted (Szarka 2008:129). Ten years later, the Grenelle process agreed on introducing a carbon tax at 17 euro in 2010 (MEDDE 2009:10). This gave rise to new discussions with the constitutional court, which called for the inclusion of industrial installations that were granted ETS allowances for free (EuroActive 2010). Eventually, the government abandoned the entire tax, 'for reasons of national economic competitiveness' relating to the financial crisis (GLOBE International 2013:171). The French government announced that it would push for an EU carbon border tax instead.

As a result, French energy and carbon taxation is lower than in most of the other countries studied here, with the exception of Germany. Fuels used for generating electricity are not taxed (OECD 2013:101). Heat consumption is not taxed, and electricity consumption is taxed variously: residential users pay a lower tax rate than the standard rate applied to industrial users. Only 21% of French emissions are included in EU ETS. This relates to the dominance of nuclear power. France also has a modest target in the burden-sharing agreement, minus 14% by 2020.

The French prohibition of hydraulic fracturing (commonly known as fracking) has an emissions-regulating effect, although it was only partly backed by climate concerns (GLOBE International 2013:172). France has a tradition of voluntary agreements (AERES 2007). The agreement between the government and industry expired after the introduction of the ETS and the French government now merely supports voluntary action, requiring companies with more than 500 employees to report a carbon balance (UNFCCC 2011:17).

Germany first introduced energy taxes in in 1999/2002. From Table 3.3 we see that Germany has a middle position when it comes to energy taxation (EEW 2013a), as well as the lowest GHG tax level of the six countries. Biogasoline and biodiesel are generally taxed at the same rates as petrol and diesel, but a partial refund is offered (OECD 2013:107). Electricity is taxed, with differential tax rates applying to electricity used by different sectors. Certain steel and chemical processes are exempted from paying the standard tax rate on energy products.

Almost 50% of the German emissions are included in ETS, the highest figure of the six countries assessed in this report. In addition, the effort-sharing agreement requires 14% GHG emissions reductions by 2020. Germany's voluntary agreements coexist with the ETS and energy taxation. In 2010, 70% of industrial energy use in Germany was covered by voluntary agreements (Bertoldi and Rezessy 2010). These agreements set specific CO2 emissions targets for signatories. Germany separates EU ETS emissions from the voluntary agreement targets. The voluntary agreements focus on the targets and are combined with lucrative tax rebates, not specific actions to be implemented.

Norway adopted a CO2 tax in 1991, and has since had as an overarching objective that Norway is to be a frontrunner country in adopting measures that can contribute to cost-efficient emissions reductions (St. meld. 21 2011–2012: 95). Table 3.3 shows that Norway has the highest carbon tax by far, while the energy taxation level is relatively low. The carbon tax varies from sector to sectors. Norway joined the European Emission Trading System (ETS) in 2008 and included aviation in the ETS from 2012. Tax rates have been revised, accounting for the interaction between CO2 taxes and the ETS (OECD 2013:175). Norwegian petroleum activity pays CO2 tax, even though this is included in ETS. When Norway became part of EU ETS it lowered the CO2 tax for petroleum extraction in order to compensate for the price on ETS allowances. In 2013 the CO2 tax was doubled from NOK 200 to NOK 400. Table 3.3 shows that 36% of Norwegian emissions are covered by the ETS. Norway is not included in the effort-sharing agreement. After the expansion of the ETS in 2013, almost 50% of Norway's emissions are covered by the ETS, so that in total 80% are included in the ETS or/and covered by a carbon tax (St. meld. 21 2011–2012).

Norway introduced a tax on electricity consumption as early as in 1951 (OECD 2013:175). A basic tax on mineral oils was introduced in 2000, but natural gas for certain purposes has a much lower level of taxation (St. meld. 21 2011–2012:95). The tax rates are differentiated, with households paying a much higher rate than industry. Norway has adopted two notable direct regulations of carbon: a flaring requirement offshore and a CCS requirement at new gas power plants (St. meld. St. 21 2011– 2012).

Norway has a state aid scheme for industry energy efficiency, not directly related to carbon emissions (Enova 2013a). Enova is a state en¬ter¬¬prise that primarily offers state aid to piecemeal low-cost energy-efficiency improve¬ments. Based on cost- efficiency principles, Enova has a range of support measures directed at industry: introduction of energy management programmes, pre-project funding and general support for energy-efficiency measures in industry and boiler plants. It also supports the replacement of fossil-fuel boilers in buildings (both households and the service sector).

According to the Swedish government, energy and carbon taxation are important climate measures (see Miljödepartementet 2009). However, from Table 3.3 we see that Sweden has a lower tax rate on energy than Denmark and the UK, and a lower carbon tax than Norway and Denmark. On the other hand, Sweden has passed legislation that will reduce tax expenditures in its energy and CO2 taxes (OECD 2013:209). Industry and agriculture used to pay 30% of the standard tax rate on heating fuels, but this will increase to 60% as of 2015. In relation to the CO2 component, the tax refunds granted for diesel used as propellant in agricultural and forestry will decrease in 2013 and further in 2015. The CO2 tax is structured to complement the EU ETS. Consequently, the CO2 tax does not apply to plants covered by emission trading: it applies only to smaller plants. As the consumption of electricity does not generate CO2 emissions, it is not taxed (OECD 2013:207).

Only 31% of the Swedish emissions are included in the ETS. However, Sweden has a rather tough target in the effort-sharing agreement: 17%. As will be discussed later, renewable energy and energy-efficiency measures are the most important measures to be applied in order to meet the non-ETS obligation.

Since 2004, Sweden has had a voluntary agreement with energy-intensive industry on energy efficiency (Næringsutskottets betenkande 2012/13:NU4). Half of total industrial electricity use in Sweden is covered by this agreement. Industry actors that have introduced energy programmes are exempt from electricity taxation. As in Denmark, the Swedish voluntary agreement is quite specific about the precise actions that signatories are to undertake (Bertoldi and Rezessy 2010). In order to participate, industrial actors must be be engaged in energy-intensive manufacturing. Recently, this agreement was altered: those industrial actors that participated before the year 2012 will still be exempt from taxation, but new actors will not be allowed to opt in (Næringsutskottets betenkande 2012/13:NU4).

The UK has a broad and mixed portfolio of emissions-regulating instruments. In the late 1990s the government launched an eco-tax reform, introducing a national emissions trading scheme as well as other economic climate instruments (Rayner and Jordan 2011:97). The current Cameron government appears to be just as committed to carbon pricing as the former Labour government: it has stated that '[p]utting a price on carbon is at the heart of the Government's strategy for enabling the UK to reduce emissions over the long term' (HM Treasury 2011). However, several non-market-based measures for emissions regulation coexists with measures that create a price on carbon. As of 2012, the EU ETS, the climate change levy, climate change agreements and the emission performance standard were the central measures for reducing emissions in the UK.

Some 40% of UK emissions are covered by the EU ETS, and the country has a relatively high non-ETS target: minus 16 percent. (CCC 2012:18). When the coalition government entered office in 2010 they promised a floor price for carbon (HM Government 2010:16), which was introduced on 1 April 2013. The floor will start at around £16 per tonne of carbon dioxide (tCO2) and follow a linear path to target £30/t CO2 by 2020 (both in 2009 prices) (HM Treasury 2011:5). Carbon price support rates for 2013/2014 will be equivalent to £4.94/tCO2. Indicative rates for 2014/2015 and 2015/2016 are £7.28/tCO2 and £9.86/tCO2 respectively. The government has argued that the price floor will raise the price of electricity and hence reduce the need for national public support to renewable energy (HM Treasury 2011: 8). However, this measure may also distort the development of a harmonized European market for emission allowances.

Table 3.3 shows that only Denmark has higher tax rates on energy than the UK. The British carbon tax – the climate change levy – is also comparatively high. This levy was introduced in 2001 and applies to electricity and gas (whether liquefied or in the form of gas) consumed by British industry (Pearce 2005). Table 3.3 does not reflect the new rates that were introduced from 1 April 2013. The rate is significantly higher for electricity (0.524 pence per kilowatt hour) than for gas (0.182 pence per kilowatt hour) although it is highest for other liquid petroleum products (1.172 pence per kilogramme, all prices applies from 1 April 2013). Fuels used to produce electricity are not currently subject to the Climate Change Levy (OECD 2013:226)

Industries involved in voluntary climate-change agreements with the government are allowed to receive up to a 65% discount from the Climate Change Levy in return for meeting energy-efficiency or carbon-saving targets set by the Department of Energy and Climate Change (DECC) (Environment Agency 2013). As in Germany, the voluntary agreements focus on targets, not on specific measures, and industry is given tax rebates (Bertoldi and Rezessy 2010:8). In order to avoid double-counting in relation to the ETS, the targets in the voluntary agreements are adjusted accordingly. The introduction of the carbon price floor on 1 April 2013 entailed changes in the levy as well as in the voluntary agreements: the agreements will be extended to 2023, and the discount on electricity for participants will increase from 65 to 80% from April 2013 (HM Treasury 2011:5).

Upon entering office, the coalition government promised to establish an Emissions Performance Standard that would prevent the construction of new coal-fired power stations unless equipped with sufficient CCS facilities to meet the emissions performance standard (HM Government 2010:16). The Energy Bill proposed in 2012, still under parliamentary debate, sets a statutory limit of 450g/kWh on the amount of annual CO_2 emissions allowed from new fossil fuel-generating stations. Power stations under the 450g/kWh-based level would then be subject to that level until 2045 – a process known as 'grandfathering', which provides long-term certainty to gas investors. The idea is to provide a regulatory backstop on the amount of carbon emissions new fossil fuel plants can emit, and help to deliver on the government's commitment to prevent the most carbon-intensive power stations from being built. Much of the technical detail of this regime is likely to be set out in secondary legislation after consultation. The emissions performance standard is a form of indirect state steering, leaving it to the commercial actors to develop and adopt technological solutions that ensure that emissions are below the threshold set by the government.

3.4 Renewable Energy Policies

Table 3.4 summarizes core figures in the national renewable energy policies of the six countries. It describes medium- and long-term targets, EU targets, and the voluntary targets that the countries have taken on. The national electricity support schemes are also presented.

Briefly put: feed-in schemes are designed to ensure long-term stability, so that commercial actors may spend the time and resources needed to refine those technologies in which they have greatest expertise (Sims et al. 2007:306). Feed-in schemes have two central design features: a purchase obligation, and a fixed tariff payment per unit of renewable electricity guaranteed over a long period (Jacobs 2012:43). The incentives for competitive behaviour and cost minimization are weak. In contrast, green certificate schemes are market-based, encouraging market actors to compete in developing the most profitable low-carbon projects (Commission 2008). In practice, the design of feed-in schemes as well as certificates can vary in many ways, but we will not go into detailed discussion here.

Table 3.4 Renewable Energy Policies

	EU 2020 target % of energy consumption	Voluntary 2020 targets	2050 target % of consumption	Electricity support scheme
Denmark	30	35	100	Feed-in premium
France	23	23	-	Feed-in tariffs
Germany	18	18	80	Feed-in tariffs
Norway	67.5	67.5	-	Green Certificates
Sweden	49	50	-	Green Certificates
UK	15	15	Decarbonization target postponed	Feed-in, Contracts of Difference

Sources: See text below

EU has radically stepped up its engagement in renewable energy policy during the last decade, greatly enhancing its importance for national policymaking in this issue-area. The Renewable Energy Directive (2009/28/EC) is the core of EU policy on renewable energy (European Parliament and Council 2009a). It provides Brussels with substantial authority as well as more incentives for technology development than the use of market measures.

The aim is to increase the overall share of energy from renewable sources in gross final consumption of energy to 20% by 2020. Various types of renewable energy, in the form of electricity or heat applied for stationary purposes or for transportation, count towards fulfilment of the target. With regard to transport, '[e]ach member state shall ensure that the share of energy from renewable energy sources in all forms of transport in 2020 is at least 10% of the final consumption of energy in transport in that member state' (Article 3). If the overall volume of energy consumption is reduced, the size of the renewable energy percentage will increase. This implies that energy-efficiency improvements will contribute to achievement of the target. Most importantly, mandatory national targets are set for all member states. These individual targets are developed on the basis of the economic strength of each member state – not its technological potential for producing renewable energy. The various national renewable energy action plans show that member states have planned significant increases in energy efficiency, but are also heading for a shift in the annual increase in production of renewable energy from 22 TWh/year for the period 2000–2008 to 52TWh/year for the period 2008–2020 (EURELECTRIC 2011: 19).

The Renewable Energy Directive clearly leans towards technology development. All member states are obliged to reach national targets for the share of renewable energy; further, 'special attention can be given to sectors that suffer disproportionately from the absence of technological progress and economies of scale and therefore remain under-developed, but which, in the future, could significantly contribute to reaching the targets for 2020' (2009/28/EC, Preamble 20). Each member state is obliged to report to the Commission on how it has 'structured its support scheme to take into account renewable energy applications that give additional benefits in relation to other comparable applications, but may have higher costs (…)' (2009/28/EC, Article 22). Clearly, the Directive is geared towards developing a range of new renewable energy technologies, even though this may entail high costs.

It introduces three flexible mechanisms, designed for 'facilitating cross-border support of energy from renewable sources without affecting national support schemes' (Preamble 25). First, there is a mechanism to enable member states to make arrangements for statistical transfer to other member states, so that renewable energy produced in one country can be counted towards the target of another (Article 6). Second, the joint projects mechanism serves the same purpose, but involves collaboration throughout the planning process (Article 7). Third, the joint support scheme mechanism enables member states to 'decide, on a voluntary basis, to join or partly coordinate their national support schemes. In such cases, a certain amount of energy from renewable sources produced in the territory of one participating Member State may count towards the national overall target of another participating Member State' (Article 11).

These mechanisms give member states some flexibility with respect to achieving their targets and enable the development of cross-national schemes, whether market-based or not. As we shall see, some actors have promoted the development of 'green certificate' schemes that oblige energy producers to offer their customers a certain quota of renewable energy and create a market of securities that the energy producers can buy if they do not provide the renewable energy quota themselves (see European Commission 2008j). However, the Renewables Directive does not require member states to develop such green certificate schemes or other market measures. The three mechanisms may facilitate various kinds of cross-border collaboration – but whether this underpins the development of a pan-European green certificate scheme or technology-development steering methods will depend on how the member states employ these mechanisms. Thus far, very few countries have set about using the mechanisms (Ragwitz et al. 2012).

The Directive gives the Commission substantial possibilities to control and redirect national policies. Member states are instructed to develop 'an indicative trajectory tracing a path towards the achievement of their final mandatory targets' (Preamble 18). There is a detailed description of how the national renewables targets are to be measured; each member state is also obliged to adopt a national renewable energy action plan and report to the Commission every second year (Articles 4, 5). In June 2009 the Commission issued a highly detailed template for reporting, covering all kinds of administrative procedures, support measures, information campaigns and the like (European Commission 2009). The national action plans are to be evaluated by the Commission, which may interfere in almost any detail relating to a member state's national policy on renewables (Article 4). However, it is up to the member states to decide how and to what extent they will exploit the opening for flexibility offered by the mechanisms.

Denmark has increased its new renewable energy production dramatically during the last decade. By 2010, 22% of Danish electricity consumption stemmed from wind power, and the government plans to more a double this share by 2020 (KEB 2011:22). Denmark has put efforts into the establishment of district heating, but electricity has recently gained increased interest. The current government argues that electricity is central for a low-carbon transition (KEB 2011:10).

Denmark has as a long-term objective of achieving 100% renewables by 2050. To this end, the government has developed a range of sub-targets (KEB 2011:5, 19; KEB 2013):

- 35% of energy consumption from renewables by 2020 (higher than the EU objective)
- 50% of traditional electricity consumption to be based on wind power by 2020
- ending coal-based electricity production by 2030
- ending oil-based heating by 2030
- 100% electricity and heating supply based on renewable energy in 2035: no use of gas for electricity and heating, but leaves out transport.

Traditionally, Denmark has applied feed-in tariffs to support the development of renewable energy. Around the year 2000 there were discussions of shifting to a more market-based scheme. Eventually, Denmark continued with a feed-in premium scheme, introducing some more market-based elements. Denmark now applies a combination of fixed and sliding premiums. A maximum remuneration level (electricity price + fixed premium) is defined for most technologies, to avoid windfall profits (Ragwitz et al. 2012: 13). For instance, the cap on support for land-based wind power is 60 øre/kWh (KEB 2011:11). Moreover, the support level will be reduced by one unit for every unit the electricity price increases from 35 øre/KWh (KEB 2011:11). For offshore wind, the premium level is determined by a tendering process.

Denmark also has technology-specific support for various types of bioenergy and renewable heating. Recently, the support level for manure-based biogas production was stepped up (KEB 2011:10). This support will be reduced in line with the development of the natural gas price. Further, the government has initiated a range of task forces and assessment processes that will be finalized during 2013. Among the subjects to be assessed we find: the conditions for use of bioenergy and biogas in Denmark, future use of gas infrastructure, the role of district heating in the energy system, and the portfolio of energy transformation measures (KEB 2011:11, 15). Moreover, Denmark regulates the use of fossil fuel by banning the installation of gas- and oil-based boilers in new buildings (2013) and the installation of oil-based boilers in existing buildings (from 2015) (KEB 2011:13).

France has adopted a 23% renewable share by 2020 target (Loi Grenelle 1, 2009). This will entail doubling the production of renewable energy between 2008 and 2020, and specific targets have been developed for the various energy sources (MEDDE 2009:11). In his first major speech, President Hollande announced that France would reduce its carbon emissions substantially, in conjunction with reducing the share of nuclear power in the national energy mix from the current 75% to 50% by 2025 (GLOBE International 2013:172). The new socialist government's anti-nuclear policy has made the renewable energy objectives even more demanding.

The French feed-in scheme is a central component in the strategy for reaching these targets (Jacobs 2012). It was introduced in 2001, with several alterations since then. Initially, hydro, wind, solar, biomass and biogas were eligible for feed-in payment (Jacobs 2012:47). Over the years, several more specific bioenergy categories have been added: a new category of less-mature hydropower, including tidal and hydrokinetic power. Initially, only projects smaller than 12 MW could receive feed-in support, but the cap was later removed (Jacobs 2012:60). The tariff calculation method has changed. Initially the tariffs reflected the avoided costs for traditional electricity generation, but eventually came to represent the actual costs of generation. This has resulted in increased tariff levels (Jacobs 2012: 73–74). The duration of the tariff payment varies between 15 and 20 years (Jacobs 2012: 79). Feed-in costs are distributed evenly among all French electricity consumers, but energy-intensive industry is partly exempted (Jacobs 2012: 87-88).

The French government has launched various tenders for renewable energy projects, including several large-scale biomass tenders (MEDDE 2009:11), tenders for construction of at least one solar power station in each region (MEDDE 2009:12), and a call for tenders for large-scale solar. It also has a tendering plan for onshore and offshore wind power (UNFCCC 2011:9). According to the French government, the pre-selection of sites for offshore wind power encourages local and public authorities to install solar panels (UNFCCC 2011:14–15). In addition, Grenelle II gave individuals the opportunity to sell electricity from the photovoltaic installations on their homes by feeding it back through the grid (GLOBE International 2013:173).

Bioenergy plays a key role in French strategy on renewable energy policy. The first wood energy plan was launched in 2000 (Szarka 2008:136), involving tax credits to households that bought wood-burning stoves. The French government created a Renewable Heating Fund of 1.2 billion euros for the period 2009–2013 to promote the use of renewable and recovery heat, including solar thermal, biomass and geothermal energy (MEDDE 2009:11; UNFCCC 2011:14–15). The government also plans to modernize existing hydroelectric plants, issuing a call for tenders in which it selects operators based on energy-efficiency criteria and water quality improvement measures.

Germany has long history of renewable energy development. Deployment of renewables grew ten times faster than the OECD average from 1990 to 2010 and now accounts for 20% of electricity output (Economist 2012). Germany was among the first countries to adopt a feed-in scheme. Interestingly, German renewable energy policy is not governed by the energy ministry, as in most other European countries. Around the year 2000, Germany's Greens succeeded in getting responsibility for renewable energy transferred from the Ministry of Economics and Technology to the feed-in supportive Ministry of the Environment (ENDS 2005).

The German Energiewende has a long-term orientation, and is based on a series of detailed long-term targets. By 2020, renewable energies are to account for 18% of gross final energy consumption (BMU 2012:7). Thereafter, the German government will aim to have renewable energy sources account for the following proportions of gross final energy consumption: 30% by 2030, 45% by 2040 and 60% by 2050. By 2020, electricity generated from renewable energy sources is to account for 35% of gross electricity consumption. After this, the aim is to increase the proportion of gross electricity consumption from renewable energy sources to 50% by 2030, 65% by 2040 and 80% by 2050.

The German Renewable Energy Act is the core policy measure. Wind power support in Germany has a special incentive structure, based on a 'reference yield' (Ragwitz et al. 2010:10-11). Operators of onshore wind turbines receive a fixed level of support for the first five years after the plant has started operating. The law defines a 'reference wind turbine' as located at a site with a wind speed of 5.5 m/s at an elevation of 30 meters above sea level. Actual wind-power projects are compared with this reference turbine, and that variance generates a reference yield. If a wind turbine produces at least 150% of this reference yield within its first five years of operation, the tariff level will be reduced for the remaining 15 years of support. However, for each 0.75% the generated electricity stays below the reference yield, the higher starting tariff will be paid for two further months. Thus, wind-power plants with average wind conditions receive the higher tariff for the full 20 years, while good wind sites will receive the reduced tariff after a certain number of years. This means that the use of wind energy to generate electricity is not limited to locations with particularly good wind conditions: also sites with less favourable conditions can be exploited.

The German government has introduced some changes to the existing feed-in scheme, arguing that it will become 'more market-oriented' and that 'the further expansion of renewable energies will be driven to a greater degree by markets' (FMENCNS 2011:7). This applies particularly to photovoltaic energy. Photovoltaics currently contribute 9% of the electricity that falls under the feed-in law, but they account for 40% of its differential costs. At the same time, photovoltaics offer great potential for cutting costs and a steep technological learning curve. Introducing the "breathable cap" has substantially reinforced the annual degression in feed-in tariffs for photovoltaic power. The annual degression of 9% will now be ramped up as a function of growing market volumes, and from 2012 it may increase by up to 12 percentage points.

German consumers pay the costs generated by the feed-in scheme. Moreover, the high level of unstable renewable energy has distorted the traditional price-shaping signals in the energy market (European Energy Review 2012). These aspects have led to heated debate, even though the Energiewende still enjoys considerable public support. In the autumn of 2012, the Environment Ministry launched a broad dialogue aimed the further development of the Renewable Energy Act (Renewable Energy World 2013). But already in March, the Environment Minster and the Energy Minister together tabled a range of short-term adjustments and long-term reform elements. The short-term adjustments would reduce the support levels for several technologies, except photovoltaic. For the long term they proposed that new and existing solar and wind parks should contribute to the costs of the support programme, and that energy-intensive corporations should contribute more.

Norway had hardly any renewable energy policy prior to the year 2000 (see Boasson 2011). Until then, 100% of its electricity supply came from large-scale hydro. As of 2010, gas power was supplying a minor share of the electricity, wind power as well as small hydro had been developed and the renewable share of the electricity supply was 96.9% (OED 2012:13). With regards to the total energy consumption (electricity, as well as heating and transport), the Norwegian renewable share in 2010 was 61%, according to the accounting procedures of the

EU Renewable Energy Directive, which does not take into account energy supply at offshore installations (OED 2012a:6).

The Norwegian supports scheme for renewable electricity, introduced in 2001, was contested and failed to meet the target of 4 TWh wind power by 2010 (NVE 2012). Far more successful were the support measures for renewable heating. In the period 2002 to 2012, the government licenced district heating plants with production capacity corresponding to 4.1 TWh (OED 2012a:5).

In September 2009, Sweden and Norway agreed on the key principles for a common green certificate scheme, and in 2010 the two countries signed a binding agreement. Thus far, Norway and Sweden are the only countries that apply the flexibility mechanisms in the EU Renewable Energy Directive, opening up for the creation of common renewable energy support schemes (see Energimyndigheten 2005). The two countries have as a common objective to increase renewable electricity production by 26 TWh by 2020 (OED 2012). Each of the parties will be credited half of the new renewable electricity production from 2012 to 2020. The certificate scheme is technology-neutral and includes hydro, as well as wind and bio-power. The scheme is planned to last until 2035. Norway as well as Sweden exempts energy-intensive industry from the system. In Sweden, the scheme primarily supports bio-power and wind, while hydro dominates in Norway (Skrivarhaug 2013). The Swedish government expects an annual 4.5 million SEK in total turnover in the certificate market (Regjeringskansliet 2012:4).

The most important Swedish measure, the certificate scheme, has already been introduced. Here we might note the Swedish parliament endorsed a green certificate scheme already in 2002, and adopted the objective of increasing electric power production from renewables by 10 TWh between 2002 and 2010. In 2006, the target was raised to 17 TWh from 2002 to 2016 (Regjeringens proposisjon 2008:41). Two years later, the Swedish government raised it to 25 TWh by 2020, and this was later reflected in the joint Swedish–Norwegian certificate scheme (OED 2011). Between 2002 and 2012, 15 TWh of new renewable energy were supported by the Swedish scheme (Skrivarhaug 2013). The price for certificates has varied between 140 and 360 SEK. When Norway joined in January 2012, the price was at an all-time low of 140 SEK, but has since risen to 215 SEK.

The Swedish government has a range of additional support measures, for instance considerable annual support for photovoltaic and biogas (Regjeringskansliet 2012:5). Moreover, the Swedish parliament has set the planning objective for windpower at 30 TWh in 2020, of which 20 TWh is to be onshore and 10 TWh offshore (Regjeringskansliet 2012:4).

The renewable energy policy of the UK has traditionally been a renewable electricity policy. It has been contested and has changed several times in the last twenty years, and is now about to change again. Since the early 1990s, UK governments have tried to develop market-based support schemes for renewable energy, without much success. The Renewables Obligation introduced in 2002 failed to achieve the target of 10% electricity from renewable sources by 2010 (Rayner and Jordan 2011:101). When climate issues gained attention after 2006, policy on renewable energy shifted towards more of a technology development approach, introducing feed-in measures and other non-market measures (see Boasson and Wettestad 2013).

The EU Renewables Directive commits UK to produce 15% of its energy from renewable sources by 2020. During 2011, the share of renewable energy increased from 3.2% to 3.8% of energy consumption, but the overall renewable share is still very low (DECCb 2012:17). However, the Climate Change Committee has expressed concern that offshore wind targets will not be met, since investments were only 'one-third of the rate required annually by the end of the decade' (CCC 2012:11).

Initially, the Cameron government declared that it would set a 2030 decarbonization target for the power sectors, but this has been postponed until 2016. The government has argued that it will await the advice from the Committee on Climate Change on the fifth carbon budget, which covers the period up to 2030 (DECC 2012b:13). Although an overarching target for the sector is missing, Cameron's coalition government has introduced a series of new measures. It has launched an Energy Market Reform with Contracts for Difference and the Capacity Market as main elements. This is a follow up of the government declaration: 'We will establish a full system of feed-in tariffs in electricity – as well as the maintenance of banded Renewables Obligation Certificates' (HM Government 2010:16). Contracts for Difference is a feed-in premium scheme, and generators with such contracts will sell their electricity to the market in the normal way. The Contract for Difference will then pay 'the difference between an estimate of the market price and an estimate of the long term price needed to bring forward investments in a given technology' (DECC 2012c). Hence, the returns for generators are stabilized at a fixed level, known as the 'strike price'. Contracts for Difference will be offered for renewable energy, nuclear energy and fossil-fuel plants equipped with CCS facilities.

The aim has been to design a support scheme that removes the generators' long-term exposure to electricity price volatility, and lowers the capital costs of the necessary investment. Generators receive revenue from selling their electricity into the market as usual. In addition, when the market price is below the strike price, they will receive a top-up payment from suppliers for the additional amount. Conversely, if the market price is above the strike price, the generator must pay back the difference (DECC 2012b:14). The Energy Bill is expected to achieve Royal Assent in 2013. Neither the level of financial support that renewable technologies will attract under the new financial framework nor the details of the Contracts for Difference has yet been decided.

Contracts for Difference will replace the existing Renewables Obligation as the main financial mechanism for large-scale renewable electricity generation (DECC 2012d). When introduced in 2002, it offered a single rate of 1 Renewables Obligation Certificate (ROC) per megawatt hour of eligible renewable electricity generated. In 2009, bands of support were introduced, allowing the Renewables Obligation to offer varied support levels by technology, reflecting differing levels of costs, potential and other factors. Reviews of banding levels were set for every four years; the levels of banded support for renewable electricity generation for the period 2013 to 2017 have not yet been determined. By 2017 the revised RO package could deliver as much as 79 TWh of renewable electricity per annum in the UK (DECC 2012b:17). Renewables Obligation will be fully replaced by Contracts for Difference after 2017.

3.5 Energy Efficiency Policy

Energy efficiency is a complex issue. Energy efficiency improvements are measured in many different ways, and the EU as well as the countries studied here have adopted a whole range of measures. In the following we present the main strategies of EU and the six countries with a focus on the energy performance of buildings, energy certification of buildings in particular. Table 3.5 shows the overarching targets, the targets for buildings and the character of the certification schemes.

Table 3.5 Energy Efficiency and Energy Policy for Buildings

	Overarching 2020 targets	Overarching 2050 targets	Economic instruments, buildings	Instruments, industry	Energy Certification
EU	20% reductions by 2020	-	-	-	Market measure and advice
Denmark	12% reduction in gross energy consumption compared with 2006	New strategy awaited in 2013	Taxes, some support measures,	Voluntary agreement	Primary consultation and advice
France	Increase energy efficiency by 2.5% annually by 2030	-	Many different state aid measures	White certificates	Primary consultation and advice
Germany	Decrease primary energy use by 20% compared to 2010	Decrease primary energy use by 50% compared to 2010	Many different state aid measures	Voluntary agreement	Primary consultation and advice
Norway	Considerably lower energy use than with no measures	Considerably lower energy use than with no measures	Cost- efficient Enova support scheme	Enova, cost-efficient support	Primary market measure
Sweden	20% reduction in supplied energy		Taxes, many different state aid measures,	Voluntary agreements	Market measure and advice
UK	196 TWh lower than in 2009/11% lower than BAU		Many different state aid measures	Voluntary agreements	Primary consultation and advice (green deal)

Sources: * Eurostat 2013c, prices form second half 2011. Other references are found in the text below.

The EU has developed a rather encompassing energy efficiency policy, with the Energy Efficiency Directive, Directive 2012/27/EU (European Parliament and Council 2012) and the Energy Performance of Buildings Directive (EPBD), Directive 2010/317/EU (European Parliament and Council 2010) as core elements. Energy labelling and the Eco-design Directive are also significant, influencing appliance markets directly, but these will not be dealt it here.

The 2012 Energy Efficiency Directive establishes a common EU framework of measures, and aims to ensure achievement of the 20% headline target and 'to pave the way for further energy efficiency improvements' (Art 1.3). Member states are to set indicative national targets for energy efficiency, expressed 'in terms of an absolute level of primary energy consumption and final energy consumption in 2020', and explain how the targets have been calculated. If the member states fail to develop sufficiently ambitious policies, the Commission can bring this up for discussion.

The Energy Efficiency Directive contains a mix of market measures and technology development measures. Member states are required to set up an energy-efficiency obligation scheme (Art. 7). The Directive promotes schemes in which energy distributors and/or retail energy sales companies are designated as obligated parties required to achieve a cumulative end-use energy savings target by 31 December 2020. The target shall be at least equivalent to achieving annual savings of 1.5% of the energy sales of the companies. However, member states may opt for alternative energy-efficiency strategies, and various alternative policy measures are mentioned. Member states shall notify their plans to the Commission, which may make suggestions for modifications.

The Directive promotes a range of measures intended to provide energy costumers with good and updated information about their energy consumption – such as high-quality, cost-effective, energy audits carried out by qualified experts or supervised by 'independent authorities', individual meters and appropriate billing information (Articles 8, 9, 10 and 11). These are market measures, aimed at influencing how the energy consumers act in the energy market. However, the Directive also underlines that these measures should be implemented in a cost-efficient way – which is in line with a 'minimizing societal cost' approach.

The Energy Efficiency Directive has a strong focus on the energy performance of existing buildings. Each member state is required to establish, by April 2014, a long-term strategy for mobilizing investment in the renovation of the national stock of residential and commercial buildings and to update the strategy every third year (Art. 4). Public authorities are encouraged to lead by example, although the Directive specifies few exact requirements in this respect (Art. 5). For instance, at least 3% of the floor area of the central government's buildings are to be energy-renovated each year and public bodies are encouraged to develop energy efficiency plans and systems for energy management.

Some parts of the Energy Efficiency Directive duplicate the Energy Performance of Buildings Directive (EPBD), adopted two years prior. EPBD has primarily a technology development character, but also involves market thinking. It has five main elements: a foundation for a holistic method for calculating the energy performance of buildings; requirements directed at national building codes; obligations on the regular control of heating and cooling systems; recommendations for increased use of national financial support measures; and a general outline for national energy certification of buildings.

'Technology-development' steering is dominant in the EBPD. A holistic method for energy calculation provides the basis for all other measures. A key concept here is 'cost optimal', defined as 'the energy performance level which leads to the lowest cost during the estimated economic lifecycle' (Art. 2.14). In contrast to cost-efficiency considerations, cost-optimal calculations are to take the whole lifetime of the building into account. Such longer-term calculations will make costly measures appear more economically viable.The EPBD requires member states to apply minimum requirements to new buildings and building units, to existing buildings and building elements subject to major renovation, and to technical building systems whenever they are installed, replaced or upgraded (Art. 1).

By 2020, all new buildings are to be nearly zero-energy; public buildings must fulfil this requirement by 2018 (Art. 9). Member states must develop national plans for 'nearly zero-energy buildings', and 'take measures such as the setting of targets in order to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings'. Interim targets are to be in place by 2015. Member states are encouraged to introduce financial incentives in order to catalyse the energy performance (Art. 10). Every three years, member states shall draw up lists of existing and planned financial instruments.

In contrast to the other elements in the EPBD, the energy performance certificates have a market flair. These certificates shall indicate the energy performance of a building or a building unit, and be calculated in accordance with the methodological requirements of the Directive (Art. 11). Member states are to issue certificates for all buildings or building units that are constructed, sold or rented out, or have useful floor area of over 500 m2 (to be lowered to 250 m2 in 2015) (Art. 12). The certificate shall figure in building advertisements in commercial media, and all buildings frequently visited by the public must display the certificate in a prominent place.

Independent control systems are mandatory, in order to ensure the credibility of these certificates (Art. 18). In addition, the Commission shall by 2011 adopt a voluntary, common EU certification scheme for non-residential buildings (Art. 11). Similarly, the certificates may affect the market value of buildings. The certificates are also to include recommendations for 'cost-optimal or cost-effective' improvement. Hence, energy certification is not only a market measure: it also provides people with technical guidance on how to enhance the energy performance of their buildings.

However, the EPBD lacks clear, binding commitments, and core concepts like 'nearly zero energy' and 'cost optimal' are unclear. A draft issued in May 2011 indicates that member states will have considerable leeway to develop 'cost-optimal energy calculation methods' in accordance with their own preferences (European Commission 2011b). The Directive's definition of a 'nearly zero energy building' is highly ambiguous: a 'building that has a very high energy performance' and its 'nearly zero or very low amount of energy required should be covered to a very significant extent by renewable energy sources' (Art. 2). Member states are free to interpret what this is to mean in practice.

Denmark has a long and strong tradition as regards energy efficiency. Since 1980, the Danish economy has grown by 78%, while energy consumption has remained more or less constant (Energistyrelsen 2009). Denmark now aims for 12% reduction in gross energy consumption by 2020 compared with 2006 (KEB 2013). It aims to be one of the three most energy-efficient countries in the world by 2020. Energy taxation, presented in the emissions regulation section of this report, plays an important role in the energy-efficiency strategy. Denmark has adopted strict energy requirements in the building code; it has a long tradition of energy certification of buildings and has an encompassing voluntary agreement with the energy industry.

The Danish government highlights the energy performance of buildings as a key sector. Denmark was among the first European countries to develop energy requirements in its building codes and to offer extensive public funding for energy-efficiency measures (European Commission 1998, EuroAce 2010). Energy requirements were strengthened by 25% in 2011 (Aggerholm et al. 2010).

Denmark was an early adopter of a system for energy certification of buildings, and the EU regulation is partly modelled on the Danish system. However, the Danish system was designed primarily to function as a scheme for control of building construction, not as a market scheme. The Danish certification scheme was thoroughly revised when the EPBD recast was implemented in 2011 (Aggerholm et al. 2010). According to Danish officials 'the real benefit of the EP certificate is in the recommendations given to the building owner' (Aggerholm et al.

2010:2). The Danish scheme includes giving comprehensive advice to building owners, and also fulfils the EU Directive's requirements about disclosing the certificate when buildings are sold or rented. The certification is performed by experts, using standardized web tools. The calculation methodology for certificates is the same as with the building regulations. Of the countries studied here, only Denmark has an independent control system, designed as random sampling.

A new support scheme for green renovation was recently introduced. 500 million Danish kroner a year will be used for this scheme in 2013 and in 2014 (KEB 2011). Otherwise, the system for state support and energy advice has been changed several times during the last decade, and the government is currently assessing the need for such state activities in addition to the activities of the energy companies (Energistyrelsen 2011, Energistyrelsen 2012).

Since the mid-2000s, the French government has stated that that energy efficiency is the main objective of the country's energy policy, and that the main priorities are reducing energy consumption and GHG emissions from buildings (UNFCCC 2011:15; Szarka 2008:134). France has introduced various energy-efficiency measures during the last decade, improved energy requirements in its building codes, financial instruments directed at the energy performance of buildings, building renovation projects and tradable white certificates.

At the national level, France has set the target of increasing energy efficiency by 2.0% each year until 2015 and by 2.5% per year by 2030 (UNFCCC 2011:12). The government has also adopted reduction targets for existing buildings (38% reduction of energy consumption by 2020 compared with 2007 levels) and new buildings (all new buildings are to be positive energy buildings by 2020) and a package of regulatory, financial and information measures for fulfilling the targets (UNFCCC 2011:15–16).

New thermal regulations for the residential sector were introduced in 2005, requiring 15% improvement in the energy performance of new buildings. From 2020, all new constructions must have primary energy consumption lower than the amount of renewable energy produced in these constructions. France has also introduced energy certification. These regulations have been revised, and buildings constructed after 2012 must have a primary energy consumption of less than 50kWh/m2/year on average (MEDDE 2009:9). It is mandatory to display the energy performance certificate of buildings in real estate agencies (UNFCCC 2011:16)

France has developed several financial instruments aimed at improving the energy performance of buildings. There is a zero-interest loan programme for first-time home buyers, a 'sustainable development' and a tax credit system aimed at speeding up light-thermal renovation, subsidies for energy audits and a social housing renovation programme aimed at enabling the annual renovation of 70,000 dwellings in the period 2011 to 2020 (GLOBE International 2013:176, MEDDE 2009:9 UNFCCC 2011:12).

In 2006, France introduced tradable white certificates, or 'certificates of energy savings', as they are known in France (GLOBE International 2013:179, (MEDDE 2009:11). White certificates are energy saving obligations imposed on certain categories of energy market operators eventually coupled with a trading system for energy-efficiency measures that can result in certified energy savings (Bertoldi and Rezessy 2009). The French system obliges energy suppliers (electricity, gas, domestic fuel retailers etc.) to make energy savings. The first phase of the scheme lasted from 2006 to 2009; the second phase ran from 2011 to 2013 (UNFCCC 2011:10). The objective for energy savings was set at 54 TWh (for 2006–2009) through individual targets for suppliers. Today the scheme is considered a success, with 65 TWh of energy savings delivered during that period. The scheme covered energy suppliers but excluded transport fuel suppliers. A second phase of the energy-efficiency certificate scheme (2011–2013) includes transport fuel suppliers and sets a target of 345 TWh cumulative energy savings over the period 2011–2013.

Germany has adopted both short- and long-term energy-efficiency objectives. By 2020 primary energy consumption is to be 20% lower than in 2008, and 50% lower by 2050. This calls for an annual average gain in energy productivity of 2.1%, based on final energy consumption. Germany seeks to cut electricity consumption by around 10% by 2020 and 25% by 2050, as compared with 2008 (FMENCNS 2011:5).

By the mid-1990s, Germany had developed ambitious building codes and extensive public funding of energy improvements (European Commission 1998; EuroAce 2010). In the early 2000s, Germany introduced changes in its regulations concerning the application of primary energy calculations, a move that promoted also the use of renewable energy, not only energy efficiency (ENDS 2001; ENDS 2002). The passive house movement is strong in Germany, although actual construction of such buildings has remained a marginal phenomenon. According to officials in the German government, the first version of the EPBD 'had scarcely any effect in Germany', since the obligation for national requirements was already 'more than met in advance' (Schettler-Köhler and Kunkel 2010:9). Germany developed a range of new energy-efficiency regulations and measures in the 2005–2010 period, but few new policy elements have been introduced after 2010 (EEW 2013).

Concerning energy requirements for buildings, Germany tightened its requirements by 30% in connection with implementation of the first EPBD (Schettler-Köhler and Kunkel 2010; Schild and al. 2010). A scientific study of cost effectiveness must precede every tightening in the law, so German officials have argued that 'the basic idea of the "cost optimal level" has therefore been anticipated' (Schettler-Köhler and Kunkel 2010:10). Germany applies two methodologies for energy calculation: one list of requirements for each building component, and one holistic approach.

Germany introduced an Energy Performance Certificate scheme in 2002 (Schettler-Köhler and Kunkel 2010). The certificate scheme has been changed several times since. In line with the energy performance directive and European standards (CEN), Germany has developed a holistic calculation method, based on energy demand. An energy certificate can be issued exclusively on the basis of calculated energy demand, but consumption data may also be used. The certificate may also report the building's CO2 emissions. Energy performance certificates are mandatory at the time of sale or lease, and contain improvement recommendations (EEW 2013a).

In order to keep the costs of issuing certificates low, Germany has not established a central register; neither has the government approved any official software for the certificates. Developers are free actors on the market. The certifiers are required to include certain qualifications, with less strict requirements for residential than commercial buildings. Germany has not introduced independent control systems. Energy certificates are to be shown upon request and are not required in building advertisements (EEW 2013a).

German has an encompassing energy-efficiency state aid system (Schettler-Köhler and Kunkel 2010). In 2011, the federal government had 12 different support programmes, promoting particularly efficient new buildings, refurbishment measures in existing buildings, installation and use of solar-thermal, biomass and heat pumps, and on-site energy consulting (see BMU 2010: 85–97). Most of the programmes are administered by the Development Loan Bank, KfW Bankengruppe. All costs caused directly by the energy-saving measures are eligible for support (Schettler-Köhler and Kunkel 2010). State aid is granted on the condition that all measures are undertaken by specialized contractors. An approved energy consultant must confirm that the refurbishment contributes to energy improvements. In general, the level of support increases with the level of energy performance achieved (EEW 2013a).

There is a big market for energy performance contracts in Germany. In order to provide end-users with a better overview of the market, the recently created Federal Office for Energy Efficiency is currently preparing proposals on how to develop it further. FMENCNS (2011:11). Germany has also launched white certificate pilot project. Moreover, the recent increase in energy prices for consumers as a result of the feed-in scheme has led to greater attention to energy efficiency (Schreurs 2012:38).

The volume of the Norwegian energy policy for buildings has increased considerably since 2000. Since that year, the overarching objective has been for energy consumption to be considerably lower than if no policy measures had been introduced. In November 2012, a specific target for buildings was introduced: by 2020, measures directed at buildings shall have served to reduced their energy consumption by 15 TWh (OED 2012b).

Norway has developed four series of measures, administered by the State Housing Bank, the Ministry of Local and Regional Development, Enova and the Energy Directorate. The State Housing Bank has worked together with dwelling producers on developing low-energy buildings, granting state aid to innovative energy-enhancing techniques, and technol-ogies for building construction. Central measures are state aid and information campaigns (see e.g. Lavenergiboliger 2009). The Housing Bank grants support on the basis of technological, not personal economic, criteria (Husbanken 2003). In 2006/07, close to 40% of the loans of the Housing Bank were for dwellings with improved energy qualities (Husbanken 2006). In the early 2000s, it was set as an objective that all new buildings in 2010 should require half as much energy as that prescribed in the 1997 building code (KRD 2005:18, St. meld. nr. 23 2003–2004:19). This objective has not been updated since.

Norway's Ministry of Local Government and Regional Development (KRD) has developed a building code with technology standard characteristics. The energy requirements of the building code regulate which techniques and technologies may be applied in building construction. New energy requirements were introduced in 2007, aimed at ensuring that new and renovated buildings used 25% less energy than required in the 1997 building code (KRD 2007). The new requirements were first voluntary, but became binding for all new buildings from 2010. Whereas the previous building code had merely regulated the thermal quality of certain construction components (floor, walls, roof), the new code regulates all the features that contribute to the total energy consumption of a building. The code is based on a holistic understanding of the joint energy performance of all the characteristics of the building. A top priority is high thermal quality of the building shell, entailing a high-density construction whereby all building components (roof, floors, walls, windows etc.) must meet certain standards as to insulation. Poor thermal quality of the building shell cannot be compensated by installing in-house energy-producing equipment, like heat pumps and solar panels.

The regulations are to be made more stringent every five years, aimed at a passive house standard (or some other demanding holistic standard) in all new buildings from 2020 (Innst.S. nr. 145 2007–2008:25). In addition, 'the building design shall ensure that a substan-tial part of the heating can be covered by other energy supplies than electricity and/or fossil fuels' (KRD 2007). Oil-burning furnaces are prohibited in new buildings, and minimum 60% of the heating in buildings larger than 500m2 is to be based on other energy carriers than electricity or fossil fuels (KRD 2010). For buildings of less than 500 m2, 40% is sufficient. This requirement may be set aside if calculations show that this would lead to extra costs when the building's full lifetime is taken into account. In 2012, the parliament determined that fossil fuels were not to be used for heating after 2020 (Innst. 390 S 2011–2012:20)

A cost-minimizing state funding scheme for buildings has been developed by Enova, which is financed by an energy fund. In 2012, the Norwegian parliament decided to increase the funding of energy efficiency and district heating through Enova, by doubling the size of the energy fund from 25 billion NOK 50 billion NOK (Enova 2003b). Enova is supplied annually with profits from the fund, in 2012 receiving 996 million NOK from the fund. Thus Enova does not apply the holistic approach found in the other measures, but focuses instead on specific building components, primarily target¬ing the largest commer¬cial actors in non-residential construction (Riksrevisjonen 2010a:44). Enova has offered invest¬ment support to comprehensive energy agreements with major building developers/managers (whereby the actors commit to achieving a certain volume of saved energy) and energy-efficiency investments in build¬ings (Enova 2009a). Societal cost-minimizing criteria – not technological criteria – determine the kind of support that is given. Only those applicants that produce the highest energy surplus seen in relation to the support needed will be granted state aid (Riks-revisjonen 2010a:58–59). No projects that are profitable at the outset will be supported.

The energy certification scheme for buildings operated by the Energy Direc¬tor¬ate is a market instrument (NVE 2010; Ot. prp. nr. 24 2008–2009). Certification is required of all large non-residential buildings and other buildings that are rented or sold. The certificate will disclose information to the building market that may affect pricing signals. The energy certificate consists of two scales: one for the energy quality of the building, and one for heating solutions in the building. Calculation of the energy quality of the building differs from the holistic calculation approaches of the building code by favouring high-quality energy (electricity) over the low-quality energy provided by district heating or on-site bioenergy burners. Energy experts are to be involved in the certification of non-residential buildings; residential building certification is ensured by the building owner, facilitated by a web tool.

Sweden has a long tradition of energy-efficiency policy, stemming from the oil crisis in the 1970s (Fuglseth 2008:44). Energy intensity, measured in kWh/SEK, almost doubled between 1993 and 2010 (Regjeringskansliet 2011:13). Sweden has as an overarching objective that energy intensity, measured as supplied energy per GDP, is to decrease 20% by 2020 compared with 2008. Sub-targets for buildings have also been developed. The government aims to reduce the energy used to heat dwellings and public/commercial premises by 20% by 2020, and by 50% by 2050 compared with 1995 levels (Regjeringskansliet 2011:11). Moreover, building mass is no longer to be dependent on fossil fuels in 2020, and the use of renewable energy is to increase continuously.

As discussed in the section on emissions regulation, Swedish energy taxation initially had a fiscal motivation, but has since become a very important component of the country's energy-efficiency policy (Regjeringskansliet 2011:15–16). Moreover, Sweden introduced an energy-efficiency programme in 1997, and the funding allocated to this programme has increased gradually ever since. Since 2010, energy-efficiency activity at the municipal and regional levels has gained greater attention and more funding (Regjeringskansliet 2011:15–20). All 290 local municipalities in Sweden provide energy-efficiency consultancy, and the county municipalities have encompassing energy-efficiency strategies and activities. The Swedish state funds local as well as regional activities, and the Swedish Energy Directorate offers training and ensures coordination of local activities. In addition, various agencies under the national government offer support measures for non-fossil fuel and renewable electricity and heating systems in buildings; several information campaigns have also been launched (Regjeringskansliet 2011:27–31).

In 2011, new energy regulations in the building code were introduced, entailing 20% stricter energy requirements (Regjeringskansliet 2011:25). The Swedish system of energy certification of buildings was recently revised. The certification is performed by independent experts (Hjort et al. 2010:1). This led, inter alia, to a visual certification that was similar to the practice in most other European countries. Sweden follows the requirements as to disclosing the certificates when buildings are sold, but mainly as an information and consultancy measure (Regjeringskansliet 2011:15–26).

Turning to the UK, we note that energy-efficiency policy has gained in importance. Initially, energy efficiency played a minor role in British climate policy, with the government regarding it more as a 'no-cost option' (Rayner and Jordan 2011: 102). In the course of the past decade, however, the government has initiated many energy-efficiency measures, with a specific focus on the energy performance of buildings. Indeed, this now appears to have top priority in British climate policy. There have been many adjustments and changes also in this policy area during the last decade. Most prominently, the UK initially had a white certificate scheme, although there was not much trading in this system. This was recently replaced by other energy-efficiency measures. As of early 2013, the most important measures were the Green Deal, the Energy Company Obligation, and energy requirements in the building regulations.

Since the early 1990s, the UK has gradually upgraded the energy requirements in its national building code. New regulations were introduced in 2006, with average energy performance improvements of 20% compared to the 2002 regulations. Traditionally, British energy regulations have primarily targeted new buildings (DECC 2009:47). Responsibility for developing energy certification scheme has laid with the regional authorities in England, Scotland, Wales and Northern Ireland (Woods 2010). Hence, the country does not have one coherent scheme, but different schemes with different measurement methods and varying focus on market changes and energy consulting. However, the national government has launched the Green Deal scheme, based on some on energy certification elements but with a much stronger coupling to financial support measures.

Green Deal provides advice on energy efficiency and a funding mechanism for homeowners and landlords (see DECC 2009:47). It replaces the domestic energy-efficiency obligation and the 'Home Information Pack', which were the main policies aimed at improving the energy efficiency of existing homes in the period 2002–2012. Green Deal is the UK version of the energy certification required by the EU Energy Performance of Buildings Directive. The Green Deal scheme is designed to create a market for energy-service providers, not to influence the real estate market. The certificate as such has no prominent place in the scheme:

the objective is not primarily to ensure that the price of buildings reflects their energy performance, but rather to incentivize improvements in energy performance more directly.

Green Deal has four components (HM Government 2010:16; UK Government 2013). First, this scheme enables homeowners to get an assessment of their property to see what improvements can be made and how much could be saved on energy bills. Second, the homeowner/landlord can choose a Green Deal provider to conduct the work. Third, if the homeowner/landlord decides to go ahead with the improvements, a Green Deal Plan must be signed: this is a contract between homeowner/landlord and the Green Deal provider, specifying what work will be done and how much it will cost. The provider will then arrange for a Green Deal installer to do the work. Various measures are approved to receive funding under the Green Deal, covering insulation, heating and hot water, glazing and micro-generation (decentralized renewable energy installed on-site). Green Deal packages can include energy efficiency, renewable heat and energy-generation products together (Energy Saving Trust 2013). Green Deals also apply for commercial buildings; for the non-domestic sector, lighting, mechanical ventilation and heat recovery measures can also be covered.

Once the work is done, instalments will be paid off through the electricity bill. A total of £125m has been earmarked for the energy-efficiency incentive (EdieEnergy 2013). Although the cost of the improvements is to be repaid, this is not a conventional personal loan as the charge is attached to the electricity meter in one's home and is repaid through the regular electricity bill. If house ownership changes, the new occupant will pick up the charge while also benefiting from a more energy-efficient property. Interest will be charged on these payments, but the rate will be fixed, and the homeowner/landlord will be shown a full schedule of all payments before signing up to the plan.

As an extra Green Deal incentive to landlords, it has been decided that from April 2018, it will be unlawful to rent out residential or business premises that do not satisfy a minimum energy-efficiency standard – the intention is for this to be set at energy performance certificate rating 'E' (DECC 2013).

The Energy Company Obligation for the UK's major six energy suppliers was launched in early 2013 (Energy Saving Trust 2013). It is in three parts, all focusing on low-income and vulnerable households: the Affordable Warmth Obligation provides heating and hot water saving measures, insulation, glazing and micro-generation technologies (except PV); the Carbon Saving Obligation provides funding to insulate solid-walled properties and those with 'hard-to-treat' cavity walls; and thirdly, the Carbon Saving Communities Obligation provides insulation and glazing measures to people living in the lowest 15% of the UK's most deprived areas. Through this measure, the government aims to help 230,000 low-income households or those in low-income areas.

4 Comparative Assessment

4.1 Assessing GHG Emissions Reduction Objectives

We start with the overarching climate objectives of the six countries studied here. Table 4.1 sums up the ambitiousness criteria for the three dimensions and the country rankings.

Table 4.1 Ranking of Emissions Reduction Targets

Ambitiousness dimension⇨ Components ⇩	Market	Minimizing societal cost	Technical development
Geographical focus	Global	Global	National
Target structure	Flexible	Flexible	Detailed interim-targets leading up to 2050
Ranking	(1st Sweden) (2nd Norway)	1st Sweden 2nd Norway	1st UK and Germany 2nd Denmark 3rd France

We see that the six countries fall rather neatly into two groups: Denmark, France, Germany and the UK, which have all developed national GHG emission reduction targets; and then Norway and Sweden, which have developed carbon neutrality targets. Countries in both groups participate in the ETS, so they may all contribute to emission reductions in other countries. However, Norway and Sweden pay greater attention to emission reductions abroad, while the UK, Germany, Denmark and France have a national focus in their target-setting. Moreover, Norway and Sweden have developed rather flexible target structures, with specific year-2020 targets, but lack long-term targets. The other four have developed somewhat more detailed interim targets leading up 2050.

The Swedish/ Norwegian approach is closest to the two dimensions of ambitiousness focusing on economic criteria, Market and Minimizing Societal Costs. According to these ambitiousness dimensions, emissions should be cut where the costs are lowest for society and/or for corporate actors. Norway has declared its intention to become a low-carbon society; Sweden, too, with its GHG emissions targets also paying attention to emissions reductions abroad. Note that national petroleum independence also is part of the Swedish climate strategy. Both countries phrase their objectives in terms of carbon neutrality. Earlier, Norway specified that that 2/3 of the emissions reductions were to be achieved domestically by 2020. Sweden has declared that 7 out of 20 million in reductions by 2020 are to be effectuated abroad. This is in practice about 1/3, so the objective is rather similar to that of Norway, although the status of the Norwegian target is unclear at the moment. By 2020 Sweden aims for a 40% reduction in global emissions, whereas Norway's aim is only 30% – so Sweden appears to be more ambitious than Norway as regards achievements by the year 2020.

The emission-target structures can be said to be in accordance with both dimensions, but they are ranked according to only one of them: Minimizing Societal Costs. This is done in order to avoid double counting when we summarize the total scores of the two countries.

The technology development approach pays more attention to national reduction of emissions and the importance of leading by example: the rationale is that if a country shows that it can cut its emissions drastically, other countries will follow its example. France is clearly the least ambitious in the Technology Development group, with its lower overarching target for 2050 and less specific interim targets for reaching this target. Denmark has an ambitious 2040 target, but no long-term interim targets. The UK has developed the most detailed and specific portfolio of interim targets towards 2025, but is less specific about the period after 2025. Germany stands out here, with its interim targets for the whole period to 2050. However, the standing of the UK is strengthened by its independent expert group that regularly reviews climate policy and has a long-term view. Hence, Germany and the UK emerge as the leaders of ambitiousness in this group, followed by Denmark, with France trailing behind.

4.2 Assessing GHG Emissions Regulations

Turning to Emissions Regulations, we must bear in mind that EU ETS is the most important GHG regulatory measure in EU and EEA countries. Even though CO2 prices are low at present, there is reason to expect that the system will become more important over time as the number of allowances is gradually reduced and as economic recovery changes the price development. Moreover, there is no reason to expect that the system will fail to meet the 2020 emission reduction limit (21% reduction). This EU measure fits best with the market dimension of ambitiousness: it creates an economic incentive, but industries with special economic concerns, like the energy-intensive industries, can be granted exemptions.

All six countries, with the notable exception of France, apply a wide range of additional emission reduction measures. The UK applies measures in all categories in Table 3.3, but also Sweden and Denmark have introduced many measures. Most of the countries apply measures that are favoured by more than one of the three ambitiousness dimensions, so they do not fall as neatly into groups as they did with GHG emissions objectives. Still, a pattern emerges when we focus on the most striking and important elements of their emission reduction regulations.

Table 4.2 Ranking of GHG Emissions Regulations

Ambitiousness dimension⇨ Criteria ⇩	Market	Minimizing societal cost	Technical development
Number of measures	Not important	Few	Many
Favoured measure	Combinations of voluntary agreements and GHG emissions pricing	GHG emissions pricing adjusted to ETS	Emissions performance regulations and energy taxation
Ranking	1st Sweden	1st Norway	1st UK 2nd Denmark 3rd Germany 4th France

The market approach values a combination of voluntary agreements and GHG emission pricing. Direct regulations contrast with this approach, since they reduce the leeway available to market actors. Denmark, Sweden and the UK combine voluntary agreements and carbon taxation. However, the UK also applies a wide range of measures that clearly fall outside this dimension, so it will not be categorized it in accordance to this dimension. Swedish carbon regulations profile fits rather well with this dimension, even though its extensive use of energy taxation is an anomaly. This reservation applies even more to Denmark, with its very high level of energy taxation. Hence Denmark is not ranked in this group. Norway has the highest carbon taxation rate; but, since it does not apply voluntary agreements it would nonetheless get a low score according to this dimension, and hence is not ranked here. As mentioned, the EU ETS gets a high score on this dimension, so the EU would have been placed in this group if it had been included in the ranking. Sweden is the only country that fits with the market view, and thus achieves a number one score along this dimension.

To achieve a high ranking according to the Minimizing Societal Cost dimension, a country must use carbon taxation as the dominant measure, carefully adjusted to the ETS. Norway is the country that best fits this description, although its moderate use of energy taxation and the direct regulation of flaring and CCS use in gas power stations have hindered it in acting as a very clear leader along this dimension. Still, as the only actor that falls into this category, it is given a number one position.

Turning to the Technology Development view on ambitiousness, we will expect considerable use of energy taxation and emissions performance regulation. Moreover, use of regulatory elements from the other dimensions is less of a drawback, according to this view on climate policy. Most notably, this dimension favours complex and many-faceted regulatory styles. The UK stands out as a leader according to these criteria. It applies the full range of measures, but its relatively high energy taxation and the 450 g/kWh emission limit on electricity plants are particularly important. Denmark gets a second-best score, due to its record high energy taxation. Germany follows, but the low level of regulatory measures gives it a rather weak position. Because it has higher energy taxes than France it nonetheless gets the third place. Due to the ban on fracking, France is placed in this category, but due to its low energy taxes it is ranked last in the group.

4.3 Assessing Renewable Energy Policies

Renewable energy policy has many elements. This report has focused on target-setting and support schemes for renewable energy electricity, so the following discussion of ambitiousness will be based on these two elements.

Table 4.3 Ranking of Renewable Energy Policies

Ambitious-ness dimension⇨ Criteria ⇩	Market	Minimizing societal cost	Technical development
Kind of measure	Green Certificate Scheme	No support measures (rather rely on emissions pricing), cost-efficient state aid as a second best option.	Feed-in schemes
Target structure	Short- and medium-term targets	No targets	Detailed short-, medium- and long-term targets
Ranking	1st Sweden 1st Norway	-	1st Denmark and Germany 2nd UK 3rd France

A renewable energy policy will get a high market ambitiousness score if it applies green certificate schemes; and having ambitious short-term targets is an advantage for creating stable conditions for the functioning of the scheme. However, 2050 targets are less relevance in this perspective. Norway and Sweden are the only ones that qualify for assessment in relation to this dimension. It is not possible to distinguish between the two countries here, since they participate in the same scheme and have similar objectives. Hence they are both classified as leaders in this group.

The Minimizing Societal Cost perspective rejects an active renewable energy policy: GHG price setting should be the only regulatory measure that creates incentives for renewable energy deployment. All kinds of target-setting will influence the effect of GHG prices, established by the ETS, in a negative way. If renewable energy nonetheless should get any support it should be done in a fashion that ensures that no projects that are profitable at outset receive funding and that only the least costly projects are realized. Neither feed-in nor green certificate schemes fit these criteria. Hence, none of the actors' renewable energy policies fit with this dimension of ambitiousness.

Turning to Technology Development, high objectives, long-term objectives and ambitious feed-in schemes are important criteria. Note that the EU policy fits rather well with this dimension. Moreover, four countries fall into this category: Denmark, France, Germany and the UK, all of which have feed-in schemes. Denmark and Germany stand out here: Denmark has adopted a 2020 target more ambitious than required by the EU and a very ambitious 2050 target. Also Germany has developed detailed interim targets and ambitious long-term targets. The UK gets credit for having grand ambitions of increasing its renewable energy production. Because it lacks a formal long-term target and there is considerable uncertainty relating to the new support scheme, the UK scores lower than Germany and Denmark. France is lagging behind, without long-term targets or ambitions of gradually improving its support scheme.

4.4 Assessing Energy Efficiency Policy

We see more national creativity and variation in policy measures in relation to energy efficiency than in any other issue area. Lack of common measurement methods and modes of target-setting make it very challenging to compare the national policies, but the three dimensions nonetheless enable us to detect some patterns. Note that the energy-efficiency measures have a certain overlap with emissions regulations, especially since energy taxation and voluntary agreements play a role in both issue-areas.

Table 4.4 Ranking Energy Efficiency Policy

Ambitiousness dimension⇨ Criteria ⇩	Market	Minimizing societal cost	Technical development
Measures	Tradable white certificates and voluntary agreements, energy certification designed to influence price developments in markets	Preferably no measures. Cost-efficient state aid and low-cost information measures if profitable energy-efficiency measures remain un-realized.	State aid based on technical criteria, energy requirements in building codes, and detailed, targeted information and training measures.
Target structure	Short- and medium-term targets	No targets	Detailed short-, medium- and long-term targets
Ranking	1st Sweden	1st Norway	1st Germany 2nd UK and Denmark 3rd France

According to a Market view, clear short- and medium-term targets are advantageous, taxation should be combined with state aid measures, industry should be included in a tradable white certificates scheme or voluntary agreements and the energy certification of buildings should be designed as a market measure. Sweden has the clearest fit with this approach: a clear 2020-target, combining energy taxation with various state measures, a voluntary agreement and a certificate scheme that functions primarily as a market measure. France has a white certificate scheme that fits well with this perspective, but otherwise it has not adopted market measures. Hence, Sweden is the only country that is assessed in accordance to this category.

The Minimizing Societal Cost view stands out due the importance of simplicity in policy strategy. The prime position along this perspective involves relying on GHG pricing and developing as few additional measures as possible. However, it is in accordance with this perspective to argue that since not all good energy-efficiency measures are profitable, state aid may be granted for energy-efficiency measures that are profitable for the society, but not profitable for individual persons and corporations. This goes for buildings as well as industry. Energy certification will make sense only if the societal gains exceed the costs entailed in issuing the certificates. Hence, certification should be implemented as a market measure without extensive and costly advisory procedures. Norway's energy-efficiency strategy fits rather very well with this view on ambitiousness: an ambiguous target, cost-efficient Enova supports scheme for industry as well as individuals, and energy certification designed as a market measure.

Again, we see that Denmark, France, Germany and the UK compete for the best ranking along the Technology Development dimension. Target-setting, technology-specific state aid and energy certification designed as a consultation/advice measure fit with high ambitiousness along this dimension. We find few differences among the countries as to energy certification, with the exception of the Green Deal in the UK, which promotes energy performance consultation and explicitly combines it with a support measure. Germany stands out as particularly earnest and ambitious, with its detailed targets and extensive state aid. Denmark and the UK are close behind, and get a shared silver medal in this category. They have less specific targets than Germany, but have ambitious policy portfolios in line with the Technology Development approach to ambitiousness: Denmark has high taxes combined with detailed regulations, and the UK has developed an ambitious Green Deal programme that combines state aid with encompassing consultation services. Overall, France seems less dedicated than the three other countries.

5 Conclusions

How and to what extent can the climate policies of the six European countries studied here be said to be 'ambitious'? Table 4.2 summarizes the scores of the six, along three dimensions of ambitiousness. This ranking is not based on absolute, quantifiable figures: the positions of the countries will always be open for discussion and reconceptualization. All the same, a rather clear comparative pattern emerges

Table 5.0 Ambitiousness Profiles: Denmark, France, Germany, Norway, Sweden, UK

	Market	Minimizing Societal Costs	Technology Development	Average rating (exact average position)**
Denmark			2nd + 2nd + 1st + 2nd	*2nd (2)Technology development*
France			3rd + 4th + 3rd + 3rd	*3rd (3.25)Technology development*
Germany			1st + 3rd 1st + 1st	*1st (1.5)Technology development*
Norway	1st (1st)*	1st+1st+1st		*1st (0.75)Minimizing Societal Costs*
Sweden	1st +1st+1st (1st)*	1st		*1st (0.75) Market*
UK			1st + 1st + 2nd + 2nd	*1st (1.5)Technology development*
Leading country	*SWEDEN*	*NORWAY*	*UK*	

Sources: own data.

*The emission reduction objectives of Norway and Sweden were given top ranking on both the economic dimensions, but in order to prevent double counting this top ranking is counted only once, along the minimizing societal cost dimension, and is presented in brackets in the market dimension.

** The figures in the bracket have been produced by adding the rankings for every country and dividing by the number of sub-issues that are explored (4). The lower the figure, the better positioned the country is in terms of the dimensions on which it has been ranked.

First, we note that the countries tend to design their climate policies in line with the technology development approach: this is the dominant approach in the Danish, German, British and French climate policy profiles. The UK and Germany are the leaders of this group, with exactly the same ranking. Germany scored as the most ambitious in three areas, but ranked only third when it came to emissions regulation. The UK leads the group on emissions-reduction targets (together with Germany) and on emissions regulations, while scoring as number two in the other areas. Somewhat surprisingly, the UK ranks as the leading country with respect to technology development – a few years ago, its climate policy was more dominated by market thinking. Germany and the UK are closely followed by Denmark, which ranks as number two in most issue-areas, but is number one, together with Germany, on renewable energy. France has a significantly lower position: in all issue-areas it emerges as the least ambitious country when assessed in relation to technology development criteria.

Since the UK used to be the main European promoter of market measures it is particularly interesting to note that now it ranks so high on the technology dimension. The past five years have seen a radical shift in British climate policy, away from market measure dominance and towards technology development. True, the UK has developed some measures that fit with the two other dimensions, but these are not dominant in any of the four sub-categories assessed here. Hence, the UK is ranked consistently in accordance to the technology development dimension, where it comes out first in two out of four categories. Note, however, that Germany and Denmark rank above the UK as regards renewable energy –a particularly important sub-issue within the technology development view on climate policy.

In both Denmark and Germany, climate policies are essentially *energy system transformation* projects, and also the UK has taken substantial steps in this direction. For Denmark and Germany, GHG emission reductions are important, but that is not the primary guiding principle: their long-term commitments to renewable energy are climate policy objectives in their own right. The UK pays more attention to GHG emissions than Denmark and Germany, with national carbon budgets as the main steering mechanism. Still, the UK's climate policy strategy is just as nationally focused as the Danish and German strategies, and the UK is more engaged in costly energy-efficiency measures than the other leading technology development countries. The technology development approach to climate change has received increasing criticism lately, especially in Germany but also in the UK. However, this has not led to any significant recent shifts in policy.

Second, Norway emerges as a clear climate-policy winner as regards the Minimizing Societal Costs dimension. With the exception of Sweden, it is also the only country that is ranked in accordance with this view on climate policy ambitiousness. There are elements of this thinking in Denmark as well, but neither Denmark nor Sweden is close to Norway when it comes to the dominance of this approach to climate policy development. Interestingly, during the last decade, Norway has introduced various measures that clash with 'minimizing societal cost' thinking – such as a green certificate scheme for renewable energy, energy certification of buildings, aid measures for energy efficiency administered by the State Housing Bank, and the ban on gas power without CCS. Many of these measures have been influenced by EU climate policy – but, since Norway is the only country in this 'class of competitors', it emerges as the winner.

It may be argued that it is 'natural' for the UK, Germany and Denmark to pay more attention to transforming their national energy systems than Norway, as they need to move away from fossil fuels (and nuclear power in Germany) while Norway already has almost 100% renewable electricity production. However, it is striking that Germany, whose economy is based on industries that rely on fossil fuel and nuclear power, is actively seeking to change its industrial structure, while Norway, whose economy is based on petroleum production, has no aims in that direction. Germany wants to transform its industry and energy production through technology development, whereas Norway has focused on using economic instruments that reduce emissions but have little impact on the structure of its industry. Norway aims to apply its financial resources in a way that can maximize emission reductions, and pays less attention to long-term transformation of its national industry-energy system.

Third, Sweden emerges as a clear leader along the market dimension: it ranks as number one in this dimension in all sub-areas, although sharing this position with Norway in one instance. Moreover, Sweden also has elements of the two other dimensions in its climate policy strategy. Swedish climate policy was initially more aligned to the technology development approach, but the market approach has been in focus lately. The market dimension and the 'minimizing societal cost' dimension have a range of commonalities, so Sweden and Norway have more in common with each other than with the other four countries studied here. Interestingly, Sweden has moved in a market direction under a Conservative government, while the reverse has been the case in the UK.

Fourth, this assessment shows that ambitiousness in climate policy can be defined in many different ways. How countries are ranked will depend largely on which criteria are used. The countries assessed in this report do not develop their climate polices independently of each other: they are all covered by EU climate policy and may be influenced by each other. This report has shown that that even though the 'cornerstone' in EU climate policy, the ETS, is a market measure, many other measures are in keeping with the technology development approach. If the EU fails to change the ETS rules in a way that can lead to higher carbon prices, feed-in schemes may become the motor in the European climate transformation project. Hence, there is reason to expect an increasing level of conflict between Norwegian and EU climate policies.

References

Aldy, J.E. and R.N. Stavins (2009) Post-Kyoto International Climate Policy: Summary for Policymakers. Cambridge University Press

AERES (2007) Association des Entreprises pour la Reduction de l'Effect de Serre. Presentation 23 February 2007. http://www.epe-asso.org/aeres/doc/06-051-EM-Presentation%20AERES-ANGLAIS-23.02.07.pdf [Accessed 26 April 2013]

Aggerholm, S., K. E. Thomesen and K.B. Wittchen (2010) Implementation of the EPBD in Denmark. Status in November 2010. http://www.epbd-ca.org/Medias/Pdf/country_reports_14-04-2011/Denmark.pdf [Accessed 15 January 2013]

Andresen, S., E.L. Boasson and G. Hønneland, G. (eds) (2012) *International Environmental Agreements – An Introduction.* London: Routledge.

Boasson, E.L. (2011) *Multi-sphere Climate Policy: Conceptualizing National Policy-making in Europe*. PhD thesis. Oslo: Department of Political Science, University of Oslo.

Boasson, E.L. and J. Wettestad (2013) *EU Climate Policy: Industry, Policy Interaction and External Environment.* Aldershot: Ashgate.

Bertoldi, P. and S. Rezessy (2009) *Energy Saving Obligations and Tradable White Certificates*. Report prepared by the Joint Research Centre of the European Commission. Brussels: European Commission.

Bertoldi, P. and S. Rezessy (2010) *Voluntary Agreements in the Field of Energy Efficiency and Emission Reduction: Review and Analysis of the Experience in Member States of the European Union*. Report prepared by the Joint Research Centre of the European Commission. Brussels: European Commission

BMU (2010) 5th National Communication. Report under the Kyoto Protocol to the United Nations. Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety) http://unfccc.int/resource/docs/natc/deu_nc5_resubmit.pdf [Accessed 15 January 2013]

BMU (2012) Renewable Energies. Driving Germany's Energiewende. Berlin: Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)

Business Green (2013) France backs plan for EU 2030 renewables targets. Article published 24 April 2013 http://www.businessgreen.com/bg/news/2263541/france-backs-plan-for-eu-2030-renewables-targets [Accessed 24 April 2013]

Carter, N. (2008) 'Combating climate change in the UK: Challenges and obstacles'. *The Political Quarterly* 79 (2): 194–205.

Carter, N. (2009) 'Vote blue, go green? Cameron's conservatives and the environment'. *The Political Quarterly*, 80 (2): 233–242.

CCC (2011) *The Fourth Carbon Budget*. London: The Climate Change Committee.

CCC (2012) *Meeting Carbon Budgets – 2012 Progress Report to Parliament.* London: Committee on Climate Change.

CCS Association (2013). Frequently asked questions. http://www.ccsassociation.org/faqs/uk-policy/ [Accessed 13 March 2013].

Christoff, P. and R. Eckersley (2011) ‘Comparing state responses’, pp. 432–48 in J.S. Dryzek, R.B Norgaard and D. Schlosberg (eds) *Oxford Handbook of Climate Change and Society*. Oxford:Oxford University Press.

Climate Change Act (UK) (2008) http://www.legislation.gov.uk/ukpga/2008/27. [Accessed 13 March 2013].

Commission (2005). *The Support of Electricity from Renewable Energy Sources*. Communication from the Commission COM 627. Brussels: European Commission.

Commission (2008) *The Support of Electricity from Renewable Energy Sources.* Commission staff working document, SEC 57. Brussels: European Commission.

Dansk Energi (2013) Energiselskaber skaber nye vækstmuligheder med spareaftale. Article by Eva Tingkjær. http://www.danskenergi.dk/Aktuelt/Arkiv/2012/November/12_11_13C.aspx [Accessed 19 April 2013]

DECC (2009) *The UK’s Fifth National Communication under the United Nations Framework Convention on Climate Change.* London: Department of Energy and Climate Change.

DECC (2012a) CCS Roadmap. Supporting deployment of Carbon Capture and Storage in the UK. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48317/4899-the-ccs-roadmap.pdf London: Department of Energy and Climate Change.

DECC (2012b) Annual Energy Statement 2012. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65633/7086-annual-energy-statement-2012.pdf. London: Department of Energy and Climate Change.

DECC (2012c) Electricity Market Reform: policy overview. London: Department of Energy and Climate Change.

DECC (2012c) Renewables Obligation Banding Review for the period 1 April 2013 to 31 March 2017: Government response to further consultations on solar PV support, biomass affordability and retaining the minimum calorific value requirement in the Renewables Obligation. London: Department of Energy and Climate Change.

DECC (2013) Green Deal http://www.decc.gov.uk/en/content/cms/tackling/green_deal/green_deal.aspx [Accessed 15 January 2013] London: Department of Energy and Climate Change.

DECC (2013) Energy Bill: Feed-in Tariffs with Contracts for Difference (CfD) Department of Energy and Climate Change.

DG Climate Action (2013). NER 300. http://ec.europa.eu/clima/policies/lowcarbon/ner300/index_en.htm [Accessed 11 March 2013]

Economist (2012) Germany’s energy transformation: Energiewende. 28 July 2012. http://www.economist.com/node/21559667 [Accessed 18 March 2013]

Economist (2013). Troubled turn: Germany’s national energy project is becoming a cause for disunion. 9 February 2013. http://www.economist.com/news/europe/21571440-germanys-national-energy-project-becoming-cause-disunion-troubled-turn [Accessed 18 March 2013]

EdieEnergy (2013) Green Deal cashback cap abolished 14 January 2013. http://www.edie.net/news/6/Green-Deal-cashback-cap-abolished/23835/ [Accessed 15 January 2013]

EEA (2013) Greenhouse gas emissions per capita and per unit of GDP in purchasing power standards in 2008. http://www.eea.europa.eu/data-and-maps/figures/greenhouse-gas-emissions-per-capita-1/ [Accessed 13 March 2013]

EEA (2012) Greenhouse gas emission trends and projections in Europe 2012: Tracking progress towards Kyoto and 2020 targets. Presentation of EEA Report No 6/2012. Copenhagen: European Environment Agency.

EEW (2013) Energy efficiency in Europe. Assessment of energy efficiency action plans and policies in EU member states 2013. Energy Efficiency Watch. Country Report Germany. http://www.energy-efficiency-watch.org/fileadmin/eew_documents/Documents/EEW2/Germany.pdf [Accessed 15 April 2013]

ENDS (2001) Germany to boost housing energy efficiency, 7 March.

ENDS (2002) German buildings energy law enters into force, 1 February.

Energimyndigheten (2005) *Konsekvenserna av en utvigad elcertifikatmarknad*. Eskilstuna, Sweden: Energimyndigheten.

Energistyrelsen (2010) Ny fremskrivning af udviklingen i energiforbrug og drivhusgasser. 15 April 2010. http://www.ens.dk/da-dk/info/nyheder/nyhedsarkiv/2010/sider/20100415nyfremskrivningafudviklingenienergiforbrugogdrivhusgasser.aspx [Accessed 25 April 2013]

Energistyrelsen (2011) Danmarks anden nationale handlingplan for energieffektivitet under Directiv 2006/32/EF. Copenhagen: Energistyrelsen.

Energistyrelsen (2012) Go' Energi bliver nedlagt. Press statement 22 March 2012. http://www.ens.dk/arkiv/pressearkiv/pressemeddelelser_archive/go-energi-bliver-nedlagt [Accessed 30 April 2013].

Energistyrelsen (2009) ‘Det danske eksempel’ – vejen til en energieffektiv og klimavenlig økonomi. Note, February 2009. http://www.kemin.dk/daDK/videnom/Documents/Det%20danske%20eksempel%20FINAL%20200209.pdf Accessed 28 February 2013].

Energy Saving Trust (2013) Green Deal and Energy Company Obligation (ECO) http://www.energysavingtrust.org.uk/Take-action/Find-a-grant/Green-Deal-and-Energy-Company-Obligation-ECO#eco [Accessed 15 January 2013]

Enova (2013a) Industry. http://www.enova.no/finansiering/naring/industri/industri/70/85/ [Accessed 30 April 2013].

Enova (2013b) Ordforklaringer. http://www.enova.no/innsikt/rapporter/resultatrapport-2012/verktoy/ordforklaring/ordforklaring/627/1417/ [Accessed 30 April 2013]

Environment Agency (2013). Climate Change Agreement Scheme. http://www.environment-agency.gov.uk/business/topics/pollution/136236.aspx. [Accessed 28 February 2013].

EuroACE 2010. *Making Money Work for Buildings. Financial and Fiscal Instruments for Energy Efficiency in Buildings*. A report by Klinckenberg Consultants for EuroACE. Brussels: EuroACE.

Euroactive (2010) France plans transitional CO2 tax for big emitters. Published 22 January 2010, updated 05 February 2010. http://www.euractiv.com/climate-environment/france-plans-transitional-co2-tax-big-emitters/article-189173 [Accessed 15 March 2013]

EURELECTRIC 2011. *National Renewable Energy Action Plans: An Industry Analysis*. A EURELECTRIC Renewables Action Plan (RESAP) Report. Brussels: EURELECTRIC.

European Commission 1998a. *Energy Efficiency in the European Community – Towards a Strategy for the Rational Use of Energy*. Communication from the Commission. COM (1998) 246 final.

European Commission 2008. *Questions and Answers on the Revised EU Emissions Trading System*. Memo/08/796, 17 December.

European Commission 2009. *Commission Decision of 30 June 2009 Establishing a Template for National Renewable Energy Action Plans under Directive 2009/28/EC of the European Parliament and of the Council* (notified under document number C(2009) 5174). (2009/548/EC).

European Commission 2011b. Meeting document for the Expert Workshop on the comparative framework methodology for cost optimal minimum energy performance requirements. In preparation of a delegated act in accordance with Art 290 TF EU 6 May 2011 in Brussels, presented by the Directorate General for Energy.
European Commission (2012) Report from the Commission to the European Parliament and the Council. Progress towards achieving the Kyoto objectives. COM 626 final.
European Energy Review (2012) The end of the honeymoon period for renewables. Article, 24 September 2012. http://www.europeanenergyreview.eu/site/pagina.php?id=3865 [Accessed 26 September 2012]
European Parliament and Council (2009) Decision No 406/2009/EC of the European Parliament and of the Council of April 2009 and the effort of Member States to reduce their greenhouse gas emission to meet the Community's greenhouse gas emission reduction commitments up to 2020.
European Parliament and Council 2009a. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009, on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. *Official Journal of the European Union*, L 140/16, 5 June.
European Parliament and Council 2009b. Directive 2009/29/EC of the European Parliament and the Council of 23April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community. *Official Journal of the European Union*, L140/63, 5 June.
European Parliament and Council 2010. Directive 2010/317/EU of the European Parliament and of the Council of May 2010 on the energy performance of buildings (recast). *Official Journal of the European Union*, L153/13, 18 June.
European Parliament and Council 2012. Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC. Official Journal of the European Union, L 315/1, 14 November.
Eurostat (2012) Energy, transport and environment indicators. Eurostat Pocketbooks. Brussels: Eurostat, European Commission. http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-DK-12-001/EN/KS-DK-12-001-EN.PDF
Eurostat (2013a) Total Greenhouse Gas Emissions (source: EEA) http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=ten00072&plugin=0 [Accessed 13 March 2013]
Eurostat (2013b) Greenhouse gas emissions *Total Greenhouse Gas Emissions (in CO2 equivalent) indexed to 1990.* http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tsdcc100&plugin=0 (source: EEA) [Accessed 13 March 2013]
Eurostat (2013c) Implicit tax rate on energy http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tsdcc360&plugin=1 [Accessed 28 April 2013]
Fligstein, N. (2001) *The Architecture of Markets.* Princeton, NJ: Princeton University Press.
FMENCNS (2011) The Federal Government's energy concept of 2010 and the transformation of the energy system of 2011. Berlin: Federal Ministry for Environment, Nature Conservation and Nuclear Safety. Revised version of: Energy Concept for an Environmentally Sound, Reliable and Affordable Energy Supply 28. September 2010 http://www.bmu.de/fileadmin/bmu-

import/files/english/pdf/application/pdf/energiekonzept_bundesregierung_en.pdf [Accessed 18 March 2013].

Fuglseth, B.B. (2009) *Regulative Change Targeting Energy Performance of Buildings in Sweden: Key Drivers and Main Implications*. FNI Report 2/2009. Lysaker: Fridtjof Nansen Institute.

Gawel, E., S. Strunz and P. Lehmann (2012) *The German Energiewende under attack: Is there an irrational Sonderweg?* UFZ-Diskussionspapiere No. 15/2012, http://hdl.handle.net/10419/64555

GLOBE International (2013) *Climate Legislation Study: A Review of Climate Change Legislation in 33 Countries.* 3rd edn. Edited by T. Townshend, S. Fankhauser, R. Aybar, M. Collins, T. Landesman, M. Nachmany and C. Pavese. London.

Gupta, S., D.A. Tirpak, N. Burger, J. Gupta, N. Höhne, A.I. Boncheva, G.M. Kanoan, C. Kolstad, J.A. Kruger, A. Michaelowa, S. Murase, J. Pershing, T. Saijo, and A. Sari (2007) Policies, Instruments and Co-operative Arrangements, in B. Metz, O.R. Davidson, P.R. Bosch, R. Dave and L.A. Meyer (eds) *Climate Change 2007: Mitigation.* Cambridge: Cambridge University Press.

Harris, P.G. (ed.) (2007a) *Europe and Global Climate Change: Politics, Foreign Policy and Regional Development*. Cheltenham: Edward Elgar.

Hasselmeier, G. and J. Wettestad (2000) *German Climate Policy Ambitiousness: Just a Side Effect of Reunification?* FNI Report 2/2000. Lysaker: Fridtjof Nansen Institute.

Hjort, H.O., T. Johansson and O. Svenssion (2010) Implementation of EPBD in Sweden. Status in November 2010. Concerted Action, Energy Performance of Buildings.

HM Revenue & Customs (2013). Climate Change Levy Rates from April 2012. http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageExcise_InfoGuides&propertyType=document&id=HMCE_CL_001174 [Accessed 26 February 2013]

HM Government (2010) The Coalition: Our programme for Government. London: HM Government.

HM Government (2011) The Carbon Plan: Delivering our low carbon future. London: HM Government.

HM Treasury (2011) Carbon price floor consultation: the Government response. London: HM Treasury.

Hoffmann, M. (2011) *Climate Governance at the Crossroads.* Oxford University Press

Hovi, J., D. F. Sprinz and A. Underdal (2003) The Oslo-Potsdam solution to measuring regime effectiveness: critique, response, and the road ahead. *Global Environmental Politics*, 3(3): 74 – 96

Husbanken (2003) *Husbankhus halverer energibehovet*. Oslo: Husbanken.

IEA (2012) CO_2 emissions from fuel combustion. IEA Statistics. Highlights. IEA:Paris

Information (2012). Danmark vil skærpe EU's klimamål. Article published 2 February 2012.

http://www.information.dk/292329

Innovasjon Norge (2013) France and Italy. http://www.gassnova.no/frontend/files/CONTENT/CCSWorld/Europa/france_italy_ex.summary.pdf. [Accessed 11 March 2013].

Innst. S. nr. 145 (2007–2008) *Innstilling fra energi- og miljøkomiteen om norsk klimapolitikk.* Oslo: Stortinget.

Innst. 390 S – 2011–2012) *Innstilling fra energi- og miljøkomiteen om norsk klimapolitikk.* Oslo: Stortinget.

Jacobs, D. (2012) *Renewable Energy Policy Convergence in the EU. The Evolution of Feed-in Tariffs in Germany, Spain and France.* Aldershot: Ashgate.

Jordan, A., D. Huitema, H. van Asselt, T. Rayner and F. Berkhout (eds) (2010), *Climate Change Policy in the European Union: Confronting the Dilemmas of Mitigation and Adaptation.* Cambridge: Cambridge University Press.

KEB (2011) *Vores Energi.* Copenhagen: Klima-, Energi- og Bygningsministeriet.

KEB (2012) Aftale mellem regeringen (Socialdemokraterne, Det Radikale Venstre, Socialistisk Folkeparti) og Venstre, Dansk Folkeparti, Enhedslisten og Det Konservative Folkeparti om den danske energipolitik 2012-2020. http://www.kemin.dk/Documents/Presse/2012/Energiaftale/Aftale%2022-03-2012%20FINAL.doc.pdf [Accessed 19 April 2013]

Klok, J., A. Larsen, A. Dahl and K. Jansen (2006) Ecological tax reform in Denmark: history and social acceptability, *Energy Policy* 34: 906–916.

KRD (Ministry of Local Government and Regional Development) (2007) *Forskrift om endringer i forskrift 22 January 1997. Nr. 33 til Plan og Bygningsloven om krav til byggverk og produkter til byggverk (TEK). Fastsatt av Kommunal- og regional-departementet den 26. januar 2007, med hjemmel i plan- og bygningsloven av 14. juni 1985 nr. 77 §§ 6, 77, 81, 82, 84*. Oslo: Ministry of Local Government and Regional Development.

Lavenergiboliger (2009) Den mest miljøvennlige energien er den som ikke blir brukt. Available at: www.lavenergiboliger.no (Accessed 4 April 2009].

Locasta, N., S. Oberthür, E. Santos and P. Borata (2010) 'From sharing the burden to sharing the effort: Decision 406/2009/EC on member state emission targets for non-ETS sectors, pp. 93 – 116 in S. Oberthür and M. Pallemaerts, M. (eds) *The New Climate Policies of the European Union*, edited by S. Oberthur and M. Pallemaerts. Brussels: VUB Press, 27–65.

Lockwood, M. (2013) *The Political Sustainability of the 2008 Climate Change Act.* EPG Working Paper. Exeter: University of Exeter.

Loi Grenelle (2009**)** LOI n° 2009-967 du 3 août 2009 de programmation relative à la mise en œuvre du Grenelle de l'environnement (1). http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000020949548 [Accessed 11 March 2013].

Meckling, J. (2010) *Carbon Coalitions: Business, Climate Politics and the Rise of Emissions Trading.* Cambridge, MA: MIT Press

MEDDE (2009) The Fifth National Communication of France to the United Nations Framework Convention on Climate Change. November 2009, English abstract. Paris : Ministère de l'Écologie, du Développement durable et de l'Énergie

Metz, B. O.R. Davidson, P.R. Bosch, R. Dave and L.A. Meyer (eds) (2007) *Climate Change 2007: Mitigation.* Cambridge: Cambridge University Press.

Miljödepartementet (2009) *Eco-effektiv framtid.* Stockholm: Miljödepartementet.

Miljøverndepartementet (Norway) (2013) *Klima.* http://www.regjeringen.no/nb/dep/md/tema/klima.html?id=1307 [Accessed 15 August2013]

Mitchell, R. (2008) 'Evaluating the performance of environmental institutions: what to evaluate and how to evaluate it?' page 79 – 114 in O. R. Young, L. A. King, and H. Schroeder (eds) *Institutions and Environmental Change: Principal Findings, Applications, and Research Frontiers.* Cambridge, MA MIT Press, 2008.

Naturvårdsverket (2012) *Underlad till en färdplan för ett Sverige utan klimagassutslipp 2050.* Stockholm: Naturvårdsverket.

Newell. P. and M. Paterson (2011) *Climate Capitalism. Global Warming and Transformation of the Global Economy*. Cambridge: Cambridge University Press.

Nilssen, M. (2005a) 'Learning, frames, and environmental policy integration: the case of Swedish energy policy'. *Environment and Planning C: Government and Policy*. 23 (207–226).

Nilssen, M. (2005b) The role of assessments and institutions for policy learning: a study in Swedish climate and nuclear policy formation. *Policy Sciences*, 38 (4):225–249

NVE (2010) *Forskrift om energimerking av bygninger og energivurdering av tekniske anlegg. Forslag til endringer i forskrift av 18.12.2009 nr. 1665*. Oslo: Norwegian Water Resources and Energy Directorate (NVE).

NVE (2012) Vindkraftproduksjon 2012 http://www.nve.no/no/Energi1/Fornybar-energi/Vindkraft/Vindkraftproduksjon-2011/ [Accessed 30 April 2013].

Næringsutskottets betenkande (Sweden) (2012/13:NU4) Program för energieffektivisering och vissa andra frågor http://www.riksdagen.se/sv/Dokument-Lagar/Utskottens-dokument/Betankanden/201213Program-for-energieffek_H001NU4/[Accessed 30 April 2013]

OECD 2006. *Linking GHG Emission Trading Schemes and Markets*. Paris:OECD. [Online]. Available at: www.oecd.org/dataoecd/45/35/37672298.pdf [Accessed 13 February 2012].

OECD (2013) *Taxing Energy Use: A Graphical Analysis*. Paris: OECD

OED (2012a) *Nasjonal handlingsplan for fornybar energi i henhold til Direktiv 2009/28/EC.* Norge. Oslo: Ministry of Petroleum and Energy (OED)

OED (2012b) Regjeringens mål for energieffektivisering i bygg. Press release, 23.11.2012. Oslo: Ministry of Petroleum and Energy (OED)

Ot. prp. nr. 24 (2008-2009) *Om lov om endringar i lov 29. Juni 1990 nr. 50 om produksjon, omforming, overføring, omsetning, fordeling og bruk av energi m.m. (energiloven).* Oslo: Ministry of Petroleum and Energy.

Pearce, D. (2005). *The United Kingdom Climate Change Levy: A study in political economy*. Paris: OECD Environment Directorate, Centre for Tax Policy and Administration.

Point Carbon (2013) Live exchange prices. [Accessed 08 May 2013] http://www.pointcarbon.com/news/marketdata/euets/forward/eua/

Ragwitz, M. ,J.Winkler, C. Klessmann, M. Gephart, G. Resch (2012) *Recent Developments of Feed-in Systems in the EU.* A research paper for the International Feed-In Cooperation. Karlsruhe: Fraunhofer ISI, Energy Economics Group, ECOFYS.

Rayner, T. and A. Jordan (2011) The United Kingdom: a paradoxical leader?, pp. 95–111 in *The European Union as a Leader in International Climate Change Politics*, edited by R.K.W. Wurzel and J. Connelly. Oxford: Routledge.

Regjeringskansliet (2011:11) Sveriges andra nationella handlingsplan för energieffektivisering. Beslutad vid sammenträde den 30 juni 2011. Stockholm: Regjeringskansliet.

Regjeringskansliet (2012) Sveriges Nationella Handlingsplan för främjande av förnybar energy enligt Direktiv 2009/28/EG och Kommissionens beslut av den 30.06.2009. Stockholm: Regjeringskansliet.

Renewable Energy World (2013) Germany moves to tackle rising renewables costs http://www.renewableenergyworld.com/rea/news/article/2013/03/germany-moves-to-tackle-rising-renewables-costs [Accessed 30 April 2013]

Riksrevisjonen (2010) *Riksrevisjonens undersøkelse av Enova SFs drift og forvaltning*. Dokument 3:6. Oslo: Office of the Auditor General of Norway (Riksrevisjonen).

Schettler-Köhler, H.P and S. Kunkel (2010) Implementation of the EPBD in Germany. Concerted Action, Energy Performance of Buildings. http://www.buildup.eu/sites/default/files/Germany.pdf [Accessed 11 April 2013]

Schreurs, M. A. (2012) The politics of phase-out. *Bulletin of the Atomic Scientists*, 68: 30 – 41.

Sims, R.E.H, R.N. Schock, A. Adegbululgbe, J. Fenhann, I. Konstantinaviciute, W. Moomaw, H.B. Nimir, B. Schlamadinger, J. Torres-Martínez, C. Turner, Y. Uchiyama, S.J.V. Vuori, N. Wamukonya and X. Zhang (2007) Energy

supply,Chapter 4 in B. Metz, O.R. Davidson, P.R. Bosch, R. Dave and L.A. Meyer (eds) *Climate Change 2007: Mitigation.* Cambridge: Cambridge University Press
Skjærseth, J.B. and J. Wettestad (2008) *EU Emissions Trading: Initiation, Decision-making and Implementation*. Aldershot: Ashgate.
Skrivarhaug (2013) 'Erfaringsmøte for elsertifikater 18.april 2013'. Presentation at 'Erfaringsmøte for Elsertifikater, 18 April 2013. http://www.nve.no/Global/Elsertifikater/130418%20-%20Erfaringsseminar_NVE_velkommen.pdf [Accessed 30 April 2013]
Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, M. and H.L.Miller (eds) (2007) *Climate Change 2007 – The Physical Science Basis.* Working Group I contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. New York: Cambridge University Press.
Stiglitz, J.E and C.E. Walsh (2006) *Economics.* 4th edn. New York: W.W. Norton
St. meld. 21 (2011 – 2012) *Norsk klimapolitikk.* Oslo: Ministry of the Environment (Miljøverndepartementet)
Szarka, J. (2008) France: Towards an alternative climate policy template?, pp. 125–143 in Compston, H. and I. Bailey (eds). *Turning Down the Heat:The Politics of Climate Policy in Affluent Democracies.* Chippenham: Palgrave Macmillan
Szarka, J. (2011) France's troubled bids to climate leadership, pp. 112–128 in *The European Union as a Leader in International Climate Change Politics*, edited by R.K.W. Wurzel and J. Connelly. Oxford: Routledge.
UK Government (2013) Guide Green Deal: energy saving for your home or business. London.
Underdal, A. (2002) 'One Question, Two Answers', pp. 3–45 in E.L. Miles, A. Underdal, S. Andresen, J. Wettestad, J.B. Skjærseth and E.M. Carlin (eds) *Environmental Regime Effectiveness*. Cambridge, MA: MIT Press.
UNFCCC (2011a) Report of the in-depth review of the fifth national communication of France. Bonn: United Nations Framework Convention on Climate Change.
VG (2012) Solhjell varsler norske miljø-kutt. http://www.vg.no/nyheter/innenriks/artikkel.php?artid=10063043. Published 14 November 2012. [Accessed 15 August2013].
Watanabe, R. (2011) *Climate Policy Changes in Germany and Japan: A Path to Paradigmatic Policy Change.* London: Routledge
Woods, P. (2010) Implementation of the EPBD in England and Wales, Scotland and Northern Ireland. Published November 2010.
http://www.buildup.eu/sites/default/files/England_and_Wales_Scotland_and_Northern_Ireland.pdf [Accessed 15 January 2013]
Wurzel, R. and J. Connelly (eds) (2011) *The European Union as a Leader in International Climate Change Politics.* London: Routledge
Yin, R.K. (1994) Case Study Research: Design and Methods. 2nd edn. London: Sage
Yong, O. (2001) Inferences and Indices: Evaluating the Effectiveness of International Environmental Regimes. *Global Environmental Politics*. (1): 99–121.

CICERO (Center for International Climate and Environmental Research - Oslo)
CICERO (Center for International Climate and Environmental Research - Oslo) was established by the Norwegian government in 1990 as a policy research foundation associated with the University of Oslo. CICERO's research and information helps to keep the Norwegian public informed about developments in climate change and climate policy.

The complexity of climate and environment problems requires global solutions and international cooperation. CICERO's multi-disciplinary research in the areas of the natural sciences, economics and politics is needed to give policy-makers the best possible information on which to base decisions affecting the Earth's climate.

The research at CICERO concentrates on:

- Chemical processes in the atmosphere
- Impacts of climate change on human society and the natural environment caused by emissions of greenhouse gases
- Domestic and international climate policy instruments
- International negotiations on environmental agreements

CICERO (Center for International Climate and Environmental Research - Oslo)
P.O.Box 1129 Blindern, N-0318 Oslo, Norway
Visiting address: CIENS, Gaustadalléen 21, 0349 Oslo
Telephone: +47 22 85 87 50 Fax: +47 22 85 87 51
E-mail: admin@cicero.uio.no www.cicero.uio.no