



The European Union: the polycentric climate policy leader?

Tim Rayner* and Andrew Jordan

The European Union's (EU) claims to be a leader in international climate policy are well known. Since the early 1990s, a rich and vibrant academic literature has analyzed the internal sources and international consequences of its leadership aspirations, especially in relation to the challenges of mitigation. More recently, attention has turned to adaptation policy. The literature highlights how policy actors have successfully exploited many of the opportunities afforded by the EU's 'polycentric' form, while minimizing its downsides, but that acute challenges lie ahead, particularly if a strong global-level framework remains elusive. It has continually underlined the fact that the EU's climate policy activities have enormous relevance well beyond European borders. Both in terms of its role as a driver of international policy and a source of transferable policy lessons on how to govern in 'polycentric' settings, appreciating the EU's experience is vital for those seeking to understand the governance of climate change, both within and between states. © 2013 John Wiley & Sons, Ltd.

How to cite this article:

WIREs Clim Change 2013. doi: 10.1002/wcc.205

INTRODUCTION

The European Union (EU) claims, with some justification, to be a global leader in climate policy. Since the early 1990s, a growing literature has explored many different facets of its governing activities. Although in many ways a *sui generis* system of polycentric or, in EU parlance, multilevel governance, the EU's experience in handling a range of climate governance dilemmas arguably has a much wider relevance, especially to broadly similar governance systems—including other regional groupings of states, as well as federal and/or quasi-federal states—with which it is often compared.^{1–6} As the long-standing commentator on EU climate policy Jørgen Wettestad (p. 26) has put it, 'both its relative diversity and institutional strength indicate that the EU can be looked upon as a rather benign "critical case": if [it] cannot develop effective climate policies, then the implications for the globe are grim.'⁷ The *realpolitik* of international climate policy, in which the EU is seeking to build alliances with other major

emitters that currently lie outside the Kyoto Protocol, also highlights the need to understand the sources and effects of climate governance in Europe.⁸ So whether in terms of its global implications or the academic response it has provoked, the EU's experience in governing climate policy is hugely important.

In her editorial essay on the *WIREs* climate policy and governance theme, Harriet Bulkeley highlighted a number of important subthemes.⁹ Among these are the diverse levels and spaces in which climate governance takes place and policy is enacted, the interaction between policy-making venues at different scales, issues of where power and authority lie, and how these might be researched and understood (p. 312). Another subtheme has to do with sectors, including how responsibilities (and associated costs) are allocated for the twin imperatives of mitigation and adaptation. All of these have been brought vividly to life in the academic literature on EU climate policy, which has grown significantly since the early 1990s. In a world struggling to arrive at binding, multilateral agreements to tackle climate change, the EU's inherent polycentricity—i.e., its active encouragement of experimental efforts at multiple levels, with active steering of actors at local, regional, and national levels—has become steadily

*Correspondence to: tim.rayner@uea.ac.uk

School of Environmental Sciences, Tyndall Centre for Climate Change Research, University of East Anglia, Norwich Research Park, Norwich, UK

more relevant and fascinating to scholars.¹⁰ On the face of it, the EU has managed to deliver a great deal. It has handled burden sharing between industry and other sectors in novel ways, pioneered the use of emissions trading across borders,^{11,12} and it is beginning to consider how responsibilities for reducing the EU's vulnerability to future climate impacts might be implemented.^{13,14}

This article reviews the debates that have arisen around the governance of climate change since the EU first began to address the issue in the late 1970s, and how they have been reflected in the academic literature. It reflects on the current political context, and where both policy and academic research is heading in the future. While acknowledging the EU's significance as an international actor (especially after what looked like a revival in its ability to steer the international regime at the 2011 Durban UN climate conference), because of space constraints we mostly concentrate on its inner workings. We refer the reader to other summaries of its 'external' role in the international climate regime.^{15–22} Although we have minimized references to theoretical debates over the dynamics of European integration that characterize much of the literature, we do assume a basic understanding of the main policy-making institutions and procedures of the EU; readers who lack this may want to consult one of the many relevant textbooks on the EU²³ or its broader environmental policies.²⁴

The main theme running through this article is the complex relationship between policy leadership and polycentricity. Generally speaking, the more levels of governance in a system, the more the opportunities for policy innovation. The possible drawback is that if each level opts for policies that conflict with one another, the policy system as a whole risks policy incoherence and/or complete gridlock. This article asks how successfully policy makers in the EU have been able to exploit the opportunities for policy leadership afforded by its polycentric form, while reducing the potential downsides, often characterized as 'decision traps'.²⁵ It shows that the EU's ambitious (or 'leading') climate policies are both a product of its internal polycentric form and a potential source of lessons for similar governance systems seeking to govern climate change. But it also cautions against seeing polycentricity as an inherently 'good' thing or assuming that the more levels there are the better; indeed, it highlights how the continuing lack of a predictable framework at the higher (i.e., global) level may negatively affect the EU's future capacity to lead.

After a brief elaboration of the concept of polycentricity and its relevance to climate policy, this

article offers a short chronological overview of the key landmarks in the development of EU policy over the last three decades. Successive sections then explore how scholars have analyzed the constituent processes and outputs associated with these landmarks, and take stock of the emerging challenges currently facing both EU climate policy makers and scholars, highlighting potential future research opportunities. To some extent, the themes in the literature mirror the well-known 'stages' of the policy process, moving from agenda setting to policy adoption, implementation, and evaluation. A concluding section offers further reflection on the relevance of the concept of polycentricity in EU climate policy as well as future research needs in this rich and highly dynamic area of scholarship.

CLIMATE POLICY LEADERSHIP IN POLYCENTRIC SYSTEMS

Conventional collective-action theory predicts that in situations where actors are reluctant to undertake expensive measures because the benefits from doing so will be diffuse, an external authority is needed to determine appropriate actions to be taken, monitor behavior, and if necessary impose sanctions. In climate policy, this tends to equate to advocacy of a top-down, multilateral system in which states are assigned emission reduction targets and a timetable to achieve them, a position recently reiterated by Hare et al.²⁶ The concept of polycentricity essentially refers to circumstances where, rather than a single monocentric unit attempting to govern, multiple governing authorities are active at many different scales. According to Ostrom (Ref 10), the fact that multiple benefits (including, for example, increased energy security and employment opportunities) are generated at diverse scales from mitigation efforts, even in the absence of central direction, makes polycentricity a useful analytical approach for understanding climate change governance, and indeed informing the design of policies. She argues that although by no means perfect, polycentricity has considerable advantages in offering greater scope for experimentation by multiple actors, leading to mutual monitoring and learning. She further asserts that it leads to more equitable, effective, and sustainable outcomes. Whether these things actually appear in practice is, of course, an important empirical question.

Among the disadvantages of polycentricity that Ostrom recognizes are the possibilities that efforts by multiple governments and other organizations involved in reducing emissions may give rise to 'major leakages, inconsistent policies, inadequate

certification, gaming the system, and free riding' (Ref 10, p. 551). The need for a degree of oversight from high-level actors is therefore clearly recognized: '[a]s larger units get involved, problems associated with non-contributors, local tyrants, and inappropriate discrimination can be addressed and major investments made in new scientific information and innovations'. At what point increased involvement from larger units would shift a polycentric system into a monocentric one is, however, debatable.

Monocentricity and polycentricity are best seen as points on a continuum. As in many other aspects of governance, a key issue is how best to combine the preferred features of both (in practice, the mix really does matter). In the EU, a polycentric system of governance has developed which mixes different elements in highly complex and unique ways (Ref 23). Thus, the Member States allow the European Commission the power to act as guardian of what are perceived to be Europe-wide interests by proposing legislation that, if adopted, is binding across all 27 countries. By doing so, situations in which conflicting national approaches threaten the free movement of goods across borders—the facilitation of which may be regarded as the EU's core mission—can be avoided. Once legislation is adopted, forms of free-riding, non-implementation, or discrimination by Member States can be sanctioned by the European Court of Justice, and potentially enforced through fines. However, it is only if such proposals are jointly adopted by national governments (acting through a joint body known as the Council) and the European Parliament that EU-wide legislation can come into effect. In some areas, such as energy and land-use planning, Member States have insisted on preserving a high degree of autonomy, or in the language of the EU, 'subsidiarity', and the Commission's competence to propose common policies is relatively limited.

THE EMERGENCE OF EU CLIMATE POLICY

Despite its current reputation for leadership, it is important to note that the EU's policies on climate change have been over 30 years in the making. The situation has evolved from the late 1970s when climate science began to feature as a small aspect of research programs, to a position in 2013 when a wide range of economic and social activities in Member States are influenced, to varying degrees, by policy initiatives originating at EU level.²⁷

Relevant policies and measures began to be put in place from the late 1980s, albeit that their

primary motivations were often to do with securing environmental and energy policy objectives, rather than climate change mitigation benefits *per se*. While at this time most policies were developed and adopted at Member State level, in preparation for the 1992 Rio 'Earth Summit', the Commission launched what it called an integrated package of legislative proposals for the EU as a whole, covering energy efficiency, renewable energies, a monitoring mechanism for CO₂ emissions and a combined tax on the carbon/energy content of fuels. Through the new monitoring mechanism (Decision 93/389/EEC), all Member States were required to 'devise, publish, and implement national programmes' to manage their emissions. The renewable energy proposal (Decision 93/500/EEC) was adopted in 1993, but included more modest targets and more limited funding than had been hoped. The proposed carbon/energy tax—even in diluted form—proved far too radical for the majority of Member States,²⁸ especially as the European economy slipped further into recession, and was eventually withdrawn in 2002.²⁹

Following the publication (in 1995) of the Intergovernmental Panel on Climate Change's Second Assessment Report, EU environment ministers resolved that global average temperatures 'should not exceed 2 degrees above pre-industrial levels' and that this target 'should guide global limitation and reduction efforts' (paras. 3 and 6).³⁰ While the origins of, and scientific rationale for this aim have been much debated,³¹ the 2 degree target has proven to be enduringly important for the EU, as both a long-term policy guiding goal and a visible expression of its commitment to international leadership.

With the Kyoto Conference of the Parties to the UN Framework Convention on Climate Change looming, in 1997 the EU agreed a significant internal 'burden sharing' arrangement among its then 15 members, on the basis of which the Union as a whole advocated a 15% reduction by industrialized countries.³² This agreement allowed less developed Member States 'headroom' to grow and increase their emissions, while quite substantial reductions were made by the richer, more environmentally progressive member states. This development marked another significant landmark in the evolution of EU climate policy—even if subsequently the Kyoto Protocol required a lesser, 8% reduction on 1990 levels by 2012. The Kyoto Protocol's targets and timetables approach very much reflected the EU's traditional, regulatory approach to governing. The mid-1990s also saw discussions on how to tackle steadily rising emissions from road transport culminate in an EU strategy to reduce CO₂ from cars (COM (95) 689)

and improve vehicle efficiency by 25% in 10 years. The centerpiece was a voluntary agreement between the Commission and vehicle manufacturers, signed in 1998 (Ref 29).

In order to ensure delivery of its Kyoto target, in March 2000 the Commission began to develop ‘common and coordinated policies and measures’, using a multistakeholder process known as the European Climate Change Programme. Member States acknowledged that without common policy measures, their own national efforts combined would not be sufficient. The major policy to emerge at this time was the EU emissions trading scheme (ETS), a system in which allowances to emit would be allocated and made tradable in a carbon market, in order to incentivise the most cost-effective forms of abatement (Refs 11 and 12). About 40% of the EU’s total greenhouse gas emissions were covered by the system. Member States were given responsibility to produce national allocation plans, which set out the total cap for their domestic emissions and the more specific distribution among relevant installations. The Commission could reject plans deemed insufficiently ambitious in view of the EU’s Kyoto commitment. The associated Directive was adopted in 2003; its first (pilot) phase commenced in 2005. Compared to the ill-fated carbon/energy tax proposal (see above), this constituted rapid progress.³³ This, and a series of other directives that followed, apparently signaled a trend toward deeper, faster, and smoother harmonization in the area of climate policy than had been possible in the 1990s.^{34,35}

Looking to the situation after 2012, the Commission called for a range of new policies to support a 20% reduction in emissions by 2020 ‘to demonstrate international leadership’, rising to 30% if other states agreed to make comparable effort.³⁶ Throughout 2008, a package of proposals of unprecedented scale and complexity was negotiated. Labeled *20, 20 by 2020—Europe’s Climate Change Opportunity* (COM (2008) 30), it encompassed new legislation on emissions trading, renewable energy, vehicle emissions, and carbon capture and storage.³⁷ Most of the reduction effort (21% by 2020 from a 2005 baseline) was to be delivered by a new phase of emissions trading, from 2013 to 2020, in a system where total emissions would be capped, and allowances allocated, centrally. This replacement of nationally-based allocation of allowances represented a major increase in the powers of the Commission, and promised a major boost to the instrument’s effectiveness.³⁸ For the ‘non-trading’ sectors outside the ETS (e.g. transport, agriculture, and waste), together accounting for 60% of total EU greenhouse

gas emissions, reductions of 10% were to be achieved, with varying national targets set out in a new ‘effort sharing’ Decision (406/2009/EC)—the word ‘burden’ having been replaced by a more palatable term. A revised directive set a separate target and burden sharing arrangements for renewable energy, with failure to reach mandatory national targets incurring financial penalties. A new regulation on passenger car emissions replaced the poorly implemented voluntary agreement with manufacturers, suggesting a shift away from softer modes of governance toward the kind of hierarchical regulation that in the 1990s would have been deemed far too heavy-handed.

Around this time, however, the European economy was hit by an unexpected financial crisis, slipping into a recession that was deeply challenging for those advocating stronger climate policies. With governments prioritizing reductions of public sector debt burdens and the protection of jobs, ‘ecologically modern’ arguments that unilaterally adopting a 30% reduction target would ultimately improve the EU’s global competitiveness gained little traction, even though the 20% reduction target will almost certainly be achieved comfortably. Even so, a target of 30% by 2020 falls well short of what many scientists suggest is required to give any realistic chance of holding mean global temperature increase below 2°C.³⁹ In recognition that even achieving this target would leave a range of climate impacts requiring some kind of response, a White Paper in 2009 marked the first formal involvement of the EU in adaptation policy, until then the preserve of national, regional, and local actors. The Commission undertook to integrate or ‘mainstream’ adaptation concerns in fields where it had policy competence and to facilitate increased national-level actions through funding research and knowledge exchange with a view to formulating a more comprehensive strategy (Ref 13) after 2013.^{40,41}

EU CLIMATE POLICY: THE EVOLUTION OF A LITERATURE

Policy Emergence: Opportunities and Constraints

As noted above, this short overview highlights how a single point of steering in a polycentric system such as the EU can potentially deliver many opportunities to develop ambitious policies—but in certain conditions also throw up constraints. The early 1990s saw a number of attempts to account for the emergence of a common climate policy in such a setting. These were notable for the way in which they downplayed rational-choice, interest-oriented

explanations, highlighting instead the importance of learning and the social construction of problems and identities. Jachtenfuchs, for example, highlighted how ‘frames’ structured problem definitions and thus opened up or prevented new possibilities for action.^{42,43} Jachtenfuchs also emphasized that what the EU learned, in terms of its response to the climate challenge, was conditioned by how the issue was perceived in relation to the long-standing meta objective of closer European economic integration. Between 1988 and 1991, a major ‘frame shift’ occurred in the EU’s environmental policy, away from seeing the economy and the environment as separate, toward a new ‘sustainability frame’ which integrated the two domains, and saw strong environmental regulation as potentially economically beneficial. For policy makers in the Commission, putting this ‘sustainability frame’ into practice by means of an EU-wide carbon tax would promote the goal of European integration *and* give the Union a stronger global diplomatic identity. Fortunately, the rise of interest in climate change coincided with a peaking in public concern and with a high degree of optimism regarding the wider integration project. As noted above, in practice things did not turn out this way.

While not denying them, these early interpretations tended to underplay the importance of a range of barriers and constraints on the ambition of EU climate action. But as it became clear that early enthusiasm for these new policy frames might not be enough to adopt ambitious legislation, that the issue might, in the words of one early analyst, be ‘too hot to handle’,⁴⁴ a number of explanatory factors were sought. These have recurred in later literature. Some commentators drew from traditional, political economy conceptions of the power of actors with vested interests in the continuation of carbon-intensive industries and ways of life.⁴⁵ Industrial lobbyists were seen to be far better financed than environmental groups, a situation which appears relatively unchanged.⁴⁶ New literatures also highlighted relative lobbying skill of different sections of industry as a significant factor explaining the form taken by particular policy instruments, but especially emissions trading.⁴⁷

Others highlighted the EU’s lack of legal competence to act in key areas, namely energy and fiscal policy, where Member States insisted on high levels of subsidiarity.⁴⁸ This would remain the case for as long as Member States controlled the pace and extent of European integration, always putting their interests first, as liberal-intergovernmental theory suggested they would.⁴⁹ As a system of polycentric governance, the EU lacked a central core executive, able to impose agreement and drive climate policy

forward. Instead, actors at a number of ‘veto points’ could either block adoption of a new proposal or, if it was passed, obstruct its full implementation.^{50,51} To this list, Dahl added the relative lack of financial resources available to EU-level climate policy makers, compared to agriculture or regional policy domains.⁵² A further subtheme in the literature highlighted how ideologically, the EU has tended to prioritize competitiveness, the completion of the single market and economic liberalization, and that the pursuit of these policy objectives is not always conducive to climate policy goals.^{53,54} Finally, more recent contributions have reflected on how far the expansion of the EU to incorporate newer and relatively poor Member States from Central and Eastern Europe has constrained the EU’s ambitions, at least in some respects, after 2004.^{55–58}

Policy Leaders and Distributed Leadership

The question of who provides leadership in polycentric governance systems is a highly salient one. The EU’s apparent ability to overcome various constraints and adopt such significant policy innovations as the burden/effort sharing agreements and the ETS rightly constitutes a significant theme in the literature. In light of these policy innovations, several authors have explored the concept of leadership, expressed both in terms of developments within the Union, and the EU’s ability to influence negotiations over the global climate regime.^{59–61} These aspects were acknowledged to be closely related, with some suggesting that the ‘compliance pull’ and incentives associated with the Kyoto Protocol increased the willingness of EU governments to implement innovative policy instruments of a kind that would not have diffused horizontally between states as easily as diffusion theory would lead us to expect.^{62,63} It was important, therefore, always to view the 27 Member States as existing under the framework of EU policy making, which in turn is ‘nested’ in a much wider global regime.⁶⁴

For Gupta and Grubb,⁵⁹ the concept of the EU’s leadership can be divided into three types: ‘directional’, ‘structural’, and ‘instrumental’. These could describe the actions of the EU as a bloc globally, or of those offering leadership within it. Directional leadership rests on unilateral action and the demonstration effect associated with it.⁶⁵ Structural leadership could be exercised by an actor able to take actions or deploy power resources that create incentives for others. Some have credited Germany in particular with structural leadership *within* the EU.⁶⁶ As a powerful economy, Germany is more able to ‘upload’ its regulatory preferences to

the institutions of the EU, to ensure that its (in many cases) ambitious standards do not place its industry at a competitive disadvantage. Finally, instrumental leadership involves the linkage of issues and coalition building to arrive at agreements. This literature has a strongly normative flavor, offering recommendations as to how EU leadership can be enhanced. Later contributors added a further type, described variously as cognitive or ideas-based (Ref 60), more akin to the concept of policy entrepreneurship.

In terms of internal leadership, analysts used the concept of policy entrepreneurship to explain how the Commission in particular, but also certain Member States periodically taking their turn as Presidencies of the European Council, have overcome the institutional and interest-based barriers noted above, to reach agreement on policy innovations such as the ETS (Ref 33) and the burden sharing agreements (more on which below; Ref 32). As advocates of polycentricity would suggest, multiple benefits, in addition to emission reductions, were indeed emphasized to build a coalition in favor of such innovations. For example, improved energy security and employment prospects have been used effectively to promote the merits of renewable energy.^{67,68} For Skjaereth and Wettstad, the concept of ‘epistemic leadership’ constitutes a subcategory within the broad category of entrepreneurial leadership. It captures how a small group of dedicated individuals working within the European Commission and sharing the same belief in emissions trading, built up independent expertise on how the instrument could be designed and mobilized support from state and non-state actors at various levels of decision making.⁶⁹ Skjaereth and Wettstad draw the lesson that this type of leadership may be needed more generally to deal with a variety of other challenges characterized by high scientific uncertainty and social complexity in which learning is pertinent: ‘[s]earching, learning and innovation are emerging as standard features of negotiations rather than exceptions’ (p. 312).

While some Member States were portrayed as ‘pushers’ or forerunners, and efforts made to outline and explain the strategies adopted by them,⁷⁰ none was seen to ‘push’ consistently across all policy issues. Arguably, in climate policy no one EU institution has offered a consistent lead either (although the European Parliament is routinely acknowledged to be the ‘greenest’).⁷¹ This finding presented analysts with something of a paradox. In one particularly significant contribution to the literature, Schreurs and Tiberghien suggested that the EU’s capacity to innovate (in effect to offer directional leadership) derived from a phenomenon they dubbed ‘competitive

multi-level reinforcement’.⁷² Since the mid-1990s, actors operating at different levels of governance have become adept at ‘passing the baton’ (p.25) of leadership from one to another, in such a way that veto-points have not been as significant as might have been imagined. In this way, the EU’s polycentricity—principally its open and pluralistic governance structure—was seen to be beneficial. Policy makers were, they argued, less troubled than they would be in a single national government by electoral concerns and the profile of climate change concerns in the issue attention cycle. A more nuanced and empirically complete picture was offered by Jordan et al.³⁵ who highlighted that policy development has not been nearly as linear and consistent as Schreurs and Tiberghien’s account suggested, and how it has relied on a relatively small set of policy instrument types. Jordan et al. also question the longer term sustainability of the EU’s endeavor to exert global leadership, a theme to which we return below.

Equity and Political Solidarity

As we have noted, the more polycentric a governance system, the greater the likelihood that its component parts pursue different and possibly incoherent approaches. While these differences can in principle be a source of policy innovation (with leaders learning from laggards), it can also generate inequitable relationships, which over time may undermine political solidarity among the various component parts, and other policy incompatibilities which together undermine problem solving capacity (Ref 25). A number of scholars have highlighted the importance of the EU’s concern for solidarity among its members, and with solutions perceived as broadly equitable, as one key aspect of its capacity to show leadership. From the earliest days of EU climate change policy, the ‘asymmetrical interests’ that the issue generates among Member States have been regularly identified as key obstacles to agreement on common policies (Ref 44). These include differences in: the likely impacts of climate change; economic development; predicted energy demand; capacity for fuel switching and energy saving potentials.⁷³ At the same time, it has also been observed that regardless of these asymmetries, when compared to most international regimes, the EU is well-equipped with governing capacities and trust among parties to develop common policy, for example, through regional infrastructure (in EU parlance ‘cohesion’) spending (Ref 44).

The 1997 burden sharing agreement allocated the EU’s Kyoto target between Member States

on the basis of a so-called triptych approach.^{74,75} Emissions were treated as arising from three sectors: power generation, energy-intensive industry, and a third sector covering all other activities including domestic, commercial, transport, and agriculture. A methodology was used to determine emissions allowances for the three sectors, which, when added together, gave the Member States' targets. Contrary to expectations that such differentiated agreements are highly unlikely in international treaty making among industrialized countries (Ref 32) and in EU climate policy making in particular,⁷⁶ an agreement was struck. Moreover, it appears to have been negotiated without recourse to Community financial instruments, whereby direct side-payments are made to poorer Member States. A number of analyses have attempted to establish how equity issues were addressed, and showed that, on average, less wealthy countries were assigned lower targets than the more wealthy.^{77,78}

As part of its post-2012 drive, the EU has adopted a two-part 'effort sharing' strategy, using a formulaic approach mainly based on the principles of solidarity and capability. Boston and Stephenson² suggest that the simplicity, flexibility, and relatively equitable nature of the framework for determining effort sharing on emissions reductions and renewable energy growth are characteristics that have ensured broad political acceptance across the relatively diverse range of EU countries.

Policy Instruments: Different Mixes and Packages

Once policy goals have been agreed, attention soon turns to the choice among the various instruments to achieve them, be they traditional, hierarchical direct regulation, market-based mechanisms, or more network-based approaches based on trust between actors.^{79,80} In polycentric governance systems, this choice can be especially productive of political conflict. Not surprisingly, how the range of instruments deployed to deliver climate policy goals has evolved, both at EU and national levels, has been a particularly dynamic area of scholarship. Some have sought to identify whether, given that national climate policies are discussed in and promoted by international institutions, convergence is evident in the instruments adopted. Analysis by Albrecht and Arts suggested that in most European countries, the explorative phase of climate policy evolved into the selection and further elaboration of a set of core measures (especially in the energy and transport sectors), implying a degree of convergence of policy outputs.⁸¹

However, patterns of instrument use have been shown to remain messy and in flux, presenting

analytical challenges to which scholars have yet to adequately rise (Ref 79). Consequently, it is unclear whether or not polycentricity makes it relatively easier or harder to create effective policy instrument packages. Investigations of the extent to which 'new' environmental policy instruments are being deployed in general have begun to reach into the climate policy domain, as it is widely seen to be one of the more dynamic areas of EU environmental policy. A combination of actor preferences and institutional factors has been seen to underlie the limited use of voluntary agreements, struggles to use labeling schemes, and the continuing failure to agree ambitious eco-taxes (Ref 28). Innovation, in the sense defined by Benson and Jordan,^{82,83} has only really been detected with respect to emissions trading, but even here, the EU ETS exhibits a curious hybrid form, encompassing a strong element of regulation.⁸⁴ Otherwise, instruments tend to be layered on top of one another.

Ultimately, it is fair to say that the EU remains deeply wedded to fairly traditional forms of regulation. For sure, it has successfully 'imported' instruments first used outside Europe (emission trading was originally pioneered in the USA) and built on pre-existing instrument choices made at the Member State level (witness, for example, the various attempts to use voluntary agreements and informational devices), but *au fond* it remains a *regulatory state*—reminding us of well-known limitations on its ability creatively to select and deploy different combinations of policy instruments (Ref 80). So whereas the responsibility for governing climate policy targets, goals, and timetables does seem to be steadily accumulating at EU level, the power to choose and fine-tune policy instruments is not. For scholars of polycentric governance, this is a puzzling pattern.

Adapting to Climate Change

Since around 2005, the perceived need to prepare for, and respond to, the impacts of climatic change has widened the scope of EU climate policy and opened up new avenues for research. It is now widely accepted that key sectors, including agriculture, forestry, water, coastal zone management, biodiversity, and health, will experience effects to which actors will have to adapt.⁸⁵ One question to attract scholarly attention has been why the EU has been so slow to develop common policy in the area—only producing a White Paper on adaptation in 2009—in comparison with its efforts on mitigation, and to pioneering action by a number of Member States. One obvious answer was that policy makers feared that taking adaptation

more seriously could undermine the EU's leadership position on mitigation (Ref 13). Another was that the EU lacked sufficient competence to act in the critical area of land-use planning, where Member States guard their sovereignty particularly closely.⁸⁶ In the EU, the question of legal competence is, as we have noted, hugely important in terms of defining what is or is not possible. In this sense, the degree of polycentricity can be seen as somewhat greater in the adaptation domain, although whether or not greater harmonization is warranted remains unclear.

But other factors have also been seen to be at play. Emphasizing how problems are framed in relation to the institutional context in which solutions can be developed, Rayner and Jordan¹³ suggest that in part the EU has acted more slowly because the whole issue of adaptation does not (at least for now) connect so clearly and directly to the standard rationales for EU action noted above, namely the development of an internal market in products and services. Moreover, when compared to mitigation, states are less reliant on one another to achieve policy results, and no global, hierarchical set of policy targets and timetables exerts a 'compliance pull' to galvanize a collective response.

With the national level being the most active site of policy innovation, comparative analyses of the content of national adaptation strategies have appeared which reveal who is doing what.⁸⁷⁻⁸⁹ Strategies have been shown to resemble one another quite closely in terms of topics, methods, and approaches, and to face similar institutional and implementational challenges, including multilevel governance and sectorized policy making. Such studies are in danger of being overtaken quite quickly by events, however, in such a rapidly evolving policy field. An emerging interest in the role of solidarity in adapting to climate impacts, and how far existing instruments provide for it, is also evident.⁹⁰

EMERGING THEMES AND DEBATES

The Effectiveness of EU Policy

According to Ostrom,¹³ mutual monitoring, learning, and adjustment of policy as a result, are advantages normally associated with polycentric systems. The EU, however, is well known for its 'implementation gaps'—in terms of both the transposition and enforcement of legislation by national authorities, and whether the targets enshrined in policies are ultimately reached. These gaps of course are not unique to climate policy; they affect most other EU policy areas including the environment.⁹¹ Nonetheless, with EU climate policies having been in place for a significant length

of time, the scale of implementation gaps is emerging as a potentially very interesting area for research.

Some, such as contributors to the volume edited by Peeters and Deketelaere⁹² frame implementation in strictly legal terms, and are thus interested less in the ultimate effectiveness of policy interventions. Others are now becoming more interested in the ultimate effectiveness of the EU's climate policies, i.e., what they deliver in terms of greater mitigation and adaptation. One criticism leveled at the literature on leadership has been that it neglected the question of how far the EU's efforts to lead by example were matched by policy-induced emission reductions obtained—or even undermined by their absence (Ref 59). Surprisingly, it was not until an analysis by Kerr, criticizing claims by politicians from developed countries that their policies were causing emissions reduction as largely unsubstantiated, that the issue of effectiveness really began to receive more focused attention.⁹³ European policy makers, Kerr suggested, could present themselves as leaders, safe in the knowledge that their emission reductions targets would be met largely as the fortuitous by-product of 'non-climate' policy developments and economic restructuring, most notably the UK's 'dash for gas' in the energy sector and the collapse of many heavy industries in the former East Germany. In this sense, the EU could be regarded as succumbing to one of the dangers of polycentrism identified by Ostrom, that of free-riding by some actors on the efforts of others.

More recently, researchers have developed this insight by examining the nature and extent of policy evaluation practices, finding a highly variable picture.^{94,95} Lack of monitoring and evaluation has proven to be far less of an issue in the ETS; the significance of this instrument to the EU's ability to deliver its Kyoto commitment has meant that it is more closely monitored by policy makers and also evaluated for its mitigation performance by pressure groups and academic researchers.^{96,97}

It is also important to recognize how the outcomes of EU environmental governance generally are significantly affected by policy interactions which render any assessment of the effectiveness of individual instruments deeply problematic.⁹⁸ Glachant et al.'s study of the implementation of EU environmental directives found the impact of policy interactions on outcomes to be pervasive.⁹⁹ Interactions occurred with pre-existing but more ambitious domestic policies covering the same environmental problem, other environmental policies emerging at the national, EU or international level, as well as non-environmental policies such as energy market liberalization. This being the case, the implementation of an EU Directive must

be seen as part of a ‘complex patchwork of dynamic interactions across a multi-level and multi-centred policy system’ (pp. 243–244). An interesting coalescing of research on policy instruments and effectiveness is thus apparent.

As the EU comes under increased pressure to demonstrate the effectiveness of its mitigation efforts, more interest is likely to be paid to the practices of policy evaluation. The revision of the monitoring mechanism that was first introduced in 1993 provides researchers with new opportunities to focus on this under-researched area. Ostrom’s suggestion that polycentricity leads to mutual monitoring and learning (in this case about the most effective means of reducing emissions) presupposes the existence of broadly consistent ways of measuring effectiveness, and of evaluating costs and benefits of policies and measures. Arguably, although the EU’s ‘monitoring mechanism’ requires a minimum level of information to be collected and shared, a lack of prioritization and investment in relevant infrastructure, and lack of consistency in monitoring and evaluation practices,¹⁰⁰ has meant that the potential benefits of polycentricity have not yet been fully realized. This is an area that merits much greater research, given that innovative policies may not necessarily be ‘better’ policies.

Mitigating and Adapting: A Meta-coordination Challenge?

In the post-Kyoto era, the EU faces critical decisions regarding both mitigation and adaptation. Regarding mitigation, it must decide whether and how far to increase its level of ambition, given the potential for emissions to ‘leak’ due to the relocation of industry to less strictly regulated jurisdictions. But even a 30% target falls short of what many scientists suggest is required to give any realistic chance of holding mean global temperature increase below 2°C. This means that consciously or not, the EU’s political leaders are accepting a future in which the world has to adapt to increases significantly in excess of 2°C, the target to which the Union is, at least officially, still committed. In addition to its mitigation efforts, the EU must therefore also confront more explicitly the issue of how to ensure effective adaptive action in preparation for climate impacts on European territory, and elsewhere, potentially at the more severe end of projections.¹⁰¹

Globally, the challenges are considerable. With the failure to advance international climate targets at Copenhagen in late 2009, the prospect of up to 4°C mean warming by 2100 (and potentially rather sooner) arguably means that it may not be enough simply to ‘climate-proof’ business as usual; instead, a

more ‘transformative’ adaptation, engendering a more fundamental questioning of existing development models and how they may work to exacerbate vulnerabilities, may be required.¹⁰² At EU level, how far decision makers in the most powerful sectors will be willing to see a correspondingly radical overhaul of policy, particularly in relation to spending (where the ‘mainstreaming’ agenda requires less support for ‘maladaptive’ or carbon-intensive investments and more for mitigation and adaptation actions) remains a moot point at the time of writing, and thus another potentially highly fruitful area for future research.¹⁰³

The imperative of responding to climate change requires efforts across a range of policy sectors whose core objectives are not necessarily related. The literature on the challenges of climate policy integration in the EU remains relatively small.¹⁰⁴ However, the EU’s past experience of how challenging it can be to shift well-established sectoral objectives and practices in the interests of environmental policy integration has already been subject to a great deal of academic scrutiny, with salutary findings.¹⁰⁵ Begun optimistically in 1998, by late 2002, the production of new sectoral strategies and/or the updation of existing ones under something known as the ‘Cardiff Process’, had effectively ceased, overshadowed by a new focus on social and economic reform. The EU’s drive for environmental policy integration was handicapped by a lack of high-level political leadership, and by its reliance on a relatively small number of fairly weak coordination instruments. Sectoral strategies tended to accumulate in a rather incremental manner, not well harmonized with one another, a problem exacerbated by the deeply sectorized nature of EU policy making. Advocates of climate policy mainstreaming would do well to draw hard lessons from this experience.

Thus, at the time of writing, policy makers are becoming more and more preoccupied by the overall coherence of policy portfolios and instrument mixes in what has become a steadily more cluttered area of policy development. Within the mitigation domain, as Ostrom has noted, one of the disadvantages of polycentricity is the potential inconsistency between policies. At the time of writing, the perceived need to complement the ETS with flanking policies that can boost—rather than undermine—its effectiveness is high on the political agenda.¹⁰⁶ Somewhat surprisingly, issues such as these have not attracted much academic attention, other than from economists with an interest in policy interactions.^{107–110} As one of these has pointed out, the introduction of the ETS in the first place implied the need for quite fundamental reviews of Member State climate programs, only a short period after their introduction

and regardless of whether existing policies were working.¹¹¹ Continuation of existing instruments, or the introduction of new ones, becomes problematic because a cap and trade system such as ETS guarantees the attainment of a particular emission target. Hence, any instruments which directly or indirectly interact with the ETS will contribute nothing further to overall emission reductions as they will simply 'free-up' allowances for purchase and use.

The underlying concern for greater coherence is increasingly one that is common to the mitigation and adaptation domains. As the perceived need to address both becomes more pressing, sectors are becoming less distinct in terms of which are expected to contribute to mitigation goals (and to what extent) and which to adaptation. Whether current institutional arrangements within the Commission and Member States are able to respond adequately to this complexity is again a moot point—and thus an area where academic research could find challenging new questions, and answers of potentially great policy relevance. Apart from sectoral, or horizontal issues of coherence and policy integration to consider, there are also vertical considerations, across governance scales, as originally pointed out by Urwin and Jordan,¹¹² and later by Biesbroek et al.¹¹³ Mitigation policies set at higher scales could exacerbate vulnerabilities or impede adaptation at local level. One such danger arises from the requirement on Member States to meet targets for biofuels, if water-intensive biocrop production takes place in water-scarce or biodiversity-rich areas. These challenges imply a change in the focus of scholarship toward greater attention to how the EU operates not only *within* the mitigation domain but also *across* the adaptation and mitigation domains.

The Political Legitimacy of Policy

Amid all the discussion of targets and instruments, it is vital to remember that no system of governance—let alone a relatively young, polycentric one with inchoate democratic foundations—can possibly hope to endure unless it is seen to be legitimate by its citizens. The EU began life as 'an elitist project', supported by an implicit and often quite passive acceptance among national publics that deeper European integration was an inherently 'good thing' (Ref 24). In recent years, the EU's mitigation policies have benefitted as much as other policy areas from the permissive consensus in favor of deeper and deeper European integration. Indeed, the relationship has been two way: in a political world short of 'Europe-wide policy discourses',¹¹⁴ climate change presented the EU with a golden opportunity to demonstrate its political

relevance by generating more and more policy outputs. In the case of very salient issues such as climate change, for example, 'better opportunities for output legitimacy are hard to imagine'.¹¹⁵

As has so often been the case in the EU, politicians have relied strongly on generating policy *outputs* to secure the EU's legitimacy, and rather neglected the *input* side of politics: public participation, deliberation, and open contestation. It is striking that many of the key decisions on issues such as burden sharing and standards for traded products were made in highly technocratic fora such as the EU's labyrinthine 'comitology' committees. However, the permissive consensus has been badly dented in recent years by a series of referendum defeats, declining turnouts in European elections, the crisis in the Euro-zone and rise of anti-EU parties in several Member States. This trend risks producing something altogether different: a 'constraining dissensus' in relation to all new EU-wide initiatives.¹¹⁶ In a polycentric setting, the EU institutions are by definition relatively isolated from everyday political discourse at the national level; much of their time is devoted to dealing with special interest groups that mobilize at EU level to secure selective benefits. It is they that shape and dominate political agendas, not citizens, national parliaments or, for that matter, national political leaders.

More and more, scholars are starting to ask where this leaves not just climate policy but all policies after the EU's 'near death' experiences in the early 2010s. As the impacts of climate change become more pronounced and the financial cost of mitigation and adaptation stack up, the politics of governing show every sign of becoming *more*, not less difficult. If, for example, the EU moves from 20% to a 30% target and then, as envisaged, onto something like an 80% reduction by 2050, will European citizens be as ready to accept 'Brussels' intruding into their everyday choices? Will national politicians be as willing to pool parliamentary sovereignty on such strategically important issues as energy supply in the EU? These are likely to emerge as important questions for future research. Either way, Member State governments may find that they have to work a lot harder to carry their citizens with them. How well they do so could have important implications not only for the EU's climate policies but also, given the EU's leading position, long-term global action.

CONCLUSION

To return to the central theme of this article, climate policy actors in Europe appear on the whole to have successfully exploited many of the

opportunities afforded by the EU's polycentric form, while minimizing many of its downsides. Lessons may be drawn from this for policy making in similar contexts (Refs 82 and 83). The way in which policy makers have identified the negative aspects and taken effective steps to deal with them (and in doing so been regarded as an important example to follow) is most evident in the history of the ETS, an instrument which embodied a conscious element of 'learning by doing'. Here, in order to minimize the problems of gaming and free-riding identified by Ostrom (Ref 10), Member State participants proved willing to countenance a greater degree of central control. Member States have also (more or less!) willingly agreed to differentiated burden (or effort) sharing targets that, while undoubtedly sources of tension, are regarded as broadly simple, fair, and transparent (Ref 2). That Member States were willing to accept these developments was arguably related to the prevailing global context, in which the Kyoto targets provided a strong disciplinary effect, or compliance pull (Ref 62), although Wettstedt (Ref 38) suggests that there were other drivers too.

To the extent that the EU's ability to make progress on emission reduction was due to the pressure deriving from international, treaty-based commitments, the emergence of a more bottom up, 'pledge and review' type of global regime may be a cause for concern. Thus, while a broadly polycentric system without strong central leadership has served the EU well *internally*, at a global level an analogous system may not provide a strong and predictable enough framework to spur radical emission reductions in Europe.

Moreover, while Ostrom was right to note how the multiple benefits to be gained from climate policy at different levels can be exploited in more polycentric settings, in order to reach the levels of emission reduction that many scientists suggests is necessary to stand even a 50% chance of limiting warming to 2°C, a far more aggressive set of policies appears necessary. To date, there has been an undeniable element of 'free-riding' on gratis emission reductions accumulated in the 1990s, unrelated to climate policy (Refs 93 and 108). To achieve greater reductions, the EU cannot continue to rely on a mixture of serendipity and policies which display obvious co-benefits. How well its polycentricity will serve the EU in this era is an open question. Some, such as Skjaereth and Wettstedt, suggest that the entrepreneurial leadership role played by the European Commission in the ETS process is increasingly needed for further development of EU climate (and environmental) policy. They also suggest that this type of leadership can be best

exercised by international secretariats more generally who, owing to their perceived independence, may help creatively to facilitate common solutions when parties are locked into intense negotiation battles (Ref 68). As we have noted, however, much will depend on whether governments and their publics regard such a role as legitimate. Meanwhile, adaptation policy has been characterized by markedly different dynamics, in which the highlighting of co-benefits may well be an appropriate strategy to encourage future action. Here the EU is moving gradually toward a system in which local, regional, and national efforts are monitored and reported in a way that allows lessons to be drawn, and where funding allocated from the centre is assessed to some degree in terms of its contribution to the EU's resilience against climate impacts.

In future, the literature suggests that greater attention will be directed to how the EU seeks to manage governance challenges both *within* and *across* the adaptation and mitigation 'domains'. One of the most vibrant areas of new research concerns the underlying explanation for the uneven pattern of instrument use (noted above), leading to curious and sometimes rather perverse interactions between instruments. Unfortunately, there is no comprehensive 'theory of EU policy' instruments (or even of policy instruments more generally) that academics and policy makers can turn to. Indeed, there is not even a unanimously accepted typology of the main instruments. Instead of seeking to develop and test a specific theory of instrument choices in the EU or engaging in yet more debate about definitions, some scholars have turned to more general theories of the policy process. Jordan et al.²⁸ use several of these and find that none is sufficient but all have something to offer. Hence, the EU's ongoing struggle to govern by multiple instruments would seem to be an ideal context in which scholars of policy instruments *and* the EU can engage in mutually beneficial theory development and testing activities.

To conclude, this article has shown that the evolution of climate policy in the EU has attracted a huge amount of comment from academics working both in and well outside Europe. Arguably, the literature has evolved since the 1980s from a position where analysts attempted wide-ranging investigations across the broad sweep of EU climate policy, through a period when, as policy became more common and more differentiated, research became more specialized, concentrating on particular instruments (such as the ETS) or particular governance challenges (such as how allocate to allocate regulatory costs between different sectors and regions). We are now back in a period when scholarship is undergoing a degree of

consolidation and synthesis, and broad overviews are again being attempted (Refs 34, 35, 37, 61)—arguably reflecting the increasing maturity of the EU's climate policy portfolio. Old debates about who or what is steering EU action—is it the Member States or the EU institutions?—have been reinvigorated, but clear-cut answers remain elusive (Ref 38).

Some things are clear, however. First of all, EU climate policy has definitely *not* evolved in the same functionally driven manner as environmental policy; states have been far too unwilling to cede control over their tax, energy, and foreign policy powers to EU institutions. Nevertheless, EU climate

policy has developed well beyond the lowest common denominator of state preferences. But states remain an enduringly important focus of research; even in a young and relatively open system of polycentric governance, evidently some actors and levels remain more important than others. Second, EU climate policy is here to stay, supported as it is by a whole host of 'policy takers' with an active stake in its continuation,^{117,118} including clean energy companies and environmentalists. This outcome, while seemingly self-evident today, was certainly not preordained, and indicates just how far EU climate policy has evolved in the last 40 years.

ACKNOWLEDGMENTS

The authors kindly acknowledge the financial support of the European Commission through the ADAM (contract GOCE-018476) and RESPONSES (grant agreement 2440982) projects, and the Leverhulme Trust (FOO 204 AR). We are also grateful to two anonymous referees for their suggestions.

REFERENCES

- Krämer L. The EU—a regional model? In: Winter G, ed. *Multilevel Governance of Global Environmental Change: Perspectives from Science, Sociology and the Law*. Universität Bremen; 2006, 333–357.
- Stephenson P, Boston J. Climate change, equity and the relevance of European 'effort-sharing' for global mitigation efforts. *Clim Policy* 2011, 10:3–16.
- Wagner J. The climate change policy of the European Union. In: Fermann G, ed. *International Politics of Climate Change*. Oslo: Scandinavian University Press; 1997, 297–340.
- Wynne B. Implementation of greenhouse gas emissions reduction in the EC. *Glob Environ Change* 1993, 3:101–128.
- Schreurs M, Selin H, VanDeveer S. Conflict and cooperation in transatlantic climate policies: Different stories at different levels. In: Schreurs M, Selin H, VanDeveer S, eds. *Transatlantic Environment and Energy Policies*. Farnham: Ashgate; 2009, 165–185.
- Kelemen RD. Regulatory federalism: EU environmental regulation in comparative perspective. *J Public Policy* 2000, 20:133–167.
- Wettestad J. The complicated development of EU climate policy. In: Grubb M, Gupta J, eds. *Climate Change and European Leadership*. Dordrecht: Kluwer Academic Publishers; 2000, 25–45.
- Harris PG, ed. *Europe and Global Climate Change*. Cheltenham: Edward Elgar; 2007.
- Bulkeley H. Climate policy and governance: an editorial essay. *Wiley Interdiscip Rev Clim Change* 2010, 1:311–313.
- Ostrom E. Polycentric systems for coping with collective action and global environmental change. *Glob Environ Change* 2010, 20:550–557.
- Bailey I. The European Union emissions trading scheme. *Wiley Interdiscip Rev: Clim Change* 2010, 1:144–153.
- Skjærseth JB, Wettestad J. *EU Emissions Trading: Initiation, Decision-making and Implementation*. Aldershot: Ashgate; 2010.
- Rayner T, Jordan A. Adapting to a changing climate: an emerging European Union policy? In: Jordan AJ, Huitema D, van Asselt H, Rayner T, Berkhout F, eds. *Climate Change Policy in the European Union: Confronting the Dilemmas of Mitigation and Adaptation?* Cambridge: Cambridge University Press; 2010, 145–166.
- Aakre S, Rübhelke D. Adaptation to climate change in the European Union: efficiency versus equity considerations. *Environ Policy Govern* 2010, 20:159–179.
- Van Schaik L, Schunz S. Explaining EU activism and impact in global climate politics: is the union a norm- or interest-driven actor? *J Common Market Stud* 2012, 50:169–186.
- Van Schaik L. The sustainability of the EU's model for climate diplomacy. In: Oberthür S, Pallemmaerts M, eds. *The New Climate Policies of the European Union*. Brussels: VUB Press; 2010, 251–280.
- Afonis S. The European Union as a negotiator in the international climate change regime. *Int Environ Agree* 2011, 11:341–360.

18. Vogler J. The European Union as a global environmental policy actor: climate change. In: Wurzel RKW, Connelly J, eds. *The European Union as a Leader in International Climate Change Politics*. London: Routledge; 2010.
19. Oberthür S, Kelly CR. EU Leadership in international climate policy: achievements and challenges. *Int Spect* 2008, 43:35–50.
20. Lacasta NS, Dessai S, Powroslo E. Consensus among many voices: articulating the European Union position on climate change. *Golden Gate Univ Law Rev* 2002, 32:351–414.
21. Bretherton C, Vogler J. *The European Union as a Global Actor*. London: Routledge; 2006.
22. Sbragia A, Damro C. The changing role of the European Union in international environmental politics: Institution building and the politics of climate change. *Environ Plan C* 1999, 17:53–68.
23. Wallace H, Pollack M, Young A, eds. *Policy-Making in the European Union*. 6th ed. Oxford: Oxford University Press; 2010.
24. Jordan A, Adelle C, eds. *Environmental Policy in the European Union: Contexts, Actors and Policy Dynamics*. 3rd ed. London: Earthscan; 2012.
25. Falkner G, ed. *The EU's Decision Traps: Comparing Policies*. Oxford: Oxford University Press; 2011.
26. Hare W, Stockwell C, Flachsland C, Oberthür S. The architecture of the global climate regime: a top-down perspective. *Climate Policy* 2010, 10:600–614.
27. Jordan A., Rayner T. The evolution of climate policy in the European Union: an historical overview. In: Jordan AJ, Huitema D, van Asselt H, Rayner T, Berkhout F, eds. *Climate Change Policy in the European Union: Confronting the Dilemmas of Mitigation and Adaptation?* Cambridge: Cambridge University Press; 2010, 52–80.
28. Zito A. Integrating the environment into the EU: the history of the controversial carbon tax. In: Jordan A, ed. *Environmental Policy in the European Union*. London: Earthscan; 2002, 241–255.
29. Jordan AJ, Benson D, Wurzel R, Zito AR. Environmental policy: governing by multiple policy instruments? In: Richardson JJ, ed. *Constructing a Policy State? Policy Dynamics in the EU*. Oxford: Oxford University Press; 2012, 104–124.
30. Environment Council. *Conclusions of the 1939th Environment Council Meeting, 25–26 June*. Brussels: Council of Ministers; 1996,
31. Tol R. Europe's long-term policy goal: a critical evaluation. *Energy Policy* 2007, 35:424–423.
32. Ringius L. Differentiation, leaders, and fairness: negotiating climate commitments in the European Community. *Int Negot* 1999, 4:133–166.
33. Wettstad J. The making of the 2003 EU emissions trading directive: an ultra quick process due to entrepreneurial proficiency? *Global Environ Polit* 2005, 5:1–23.
34. Jordan AJ, Huitema D, van Asselt H, Rayner T, Berkhout F, eds. *Climate Change Policy in the European Union: Confronting the Dilemmas of Mitigation and Adaptation?* Cambridge: Cambridge University Press; 2010.
35. Jordan AJ, van Asselt H, Berkhout F, Huitema D, Rayner T. Understanding the paradoxes of multi-level governing. Climate change policy in the European Union. *Global Environ Politics* 2012, 12:41–64.
36. European Commission. *Limiting Global Climate Change to 2 Degrees Celsius—The Way Ahead for 2020 and Beyond*. Brussels: European Commission; 2007,
37. Oberthür S, Pallemarts M, eds. *The New Climate Policies of the European Union*. Brussels: VUB Press; 2010.
38. Wettstad J. European climate policy: toward centralized governance? *Rev Policy Res* 2009, 26:311–328.
39. IPCC (Intergovernmental Panel on Climate Change). *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Cambridge: Cambridge University Press; 2007
40. Ellison D. Addressing adaptation in the EU policy framework. In: Keskitalo ECH, ed. *Developing Adaptation Policy and Practice in Europe: Multi-level Governance of Climate Change*. Dordrecht: Springer Science+Business Media B.V.; 2010, 39–96.
41. Isoard S. Perspectives on adaptation to climate change in Europe. In: Ford JD, Berrang Ford L, eds. *Climate Change Adaptation in Developed Nations*. Dordrecht: Springer; 2010, 51–68.
42. Jachtenfuchs M, Huber M. Institutional learning in the European Community: the response to the greenhouse effect. In: Liefferink D, Lowe PD, Mol APJ, eds. *European Integration and Environmental Policy*. Chichester: John Wiley and Sons; 1993, 36–58.
43. Jachtenfuchs M. *International Policy Making as Learning Process? The European Union and the Greenhouse Effect*. Aldershot: Avebury; 1996.
44. Skjærseth JB. The climate policy of the EC: too hot to handle? *J Common Market Stud* 1994, 32:25–45.
45. Grant W. Business: the elephant in the room? In: Wurzel RKW, Connelly J, eds. *The European Union as a Leader in International Climate Change Politics*. London: Routledge; 2010, 197–213.
46. Gullberg AT. Rational lobbying and EU climate policy. *Int Environ Agree* 2008, 8:161–178.
47. Wettstad J. EU energy-intensive industries and emission trading: losers becoming winners? *Environ Policy Govern* 2009, 19:309–320.
48. Collier U. The European Union's climate change policy: limiting emissions or limiting powers? *J Eur Public Policy* 1996, 3:122–38.

49. Moravcsik A. Preferences and power in the European community: a liberal intergovernmentalist approach. *J Common Market Stud* 1993, 31:473–524.
50. Weale A. Environmental rules and rule-making in the European Union. *J Eur Public Policy* 1996, 3:594–611.
51. Zito A. *Creating Environmental Policy in the European Union*. Basingstoke: Macmillan; 2000.
52. Dahl A. Competence and subsidiarity: legal basis and political realities. In: Gupta J, Grubb M, eds. *Climate Change and European Leadership: A Sustainable Role for Europe?* Dordrecht: Kluwer Academic Press; 2000, 203–220.
53. Collier U. *Deregulation in the European Union: Environmental Perspectives*. London: Routledge; 1998.
54. Collier U. *Energy and Environment in the European Union: The Challenge of Integration*. Aldershot: Avebury; 1994.
55. Damro C, McKenzie D. The European Union and the politics of multi-level climate governance. In: Compston H, Bailey I, eds. *Turning Down the Heat: The Politics of Climate Policy in Affluent Democracies*. Basingstoke: Palgrave Macmillan; 2008, 65–84.
56. Wurzel RKW. Environmental policy: EU actors, leader and laggard states. In: Hayward J., ed. *Leaderless in Europe*. Oxford: Oxford University Press; 2008, 66–88.
57. Skjærseth JB, Wettestad J. Is EU enlargement bad for environmental policy? Confronting gloomy expectations with evidence. *Int Environ Agree* 2007, 7:263–280.
58. Jankowska K. Poland's climate change policy struggle. In: Wurzel RKW, Connelly J, eds. *The European Union as a Leader in International Climate Change Politics*. London: Routledge; 2010, 163–178.
59. Gupta J, Grubb M, eds. *Climate Change and European Leadership: A Sustainable Role for Europe?* Amsterdam: Elsevier; 2000.
60. Parker C, Karlsson C. Climate change and the European Union's leadership moment: an inconvenient truth? *J Common Market Stud* 2010, 48:923–943.
61. Wurzel RKW, Connelly J, eds. *The European Union as a Leader in International Climate Change Politics*. London: Routledge; 2010.
62. Oberthür S, Tanzler D. Climate policy in the EU. In: Harris PG, ed. *Europe and Global Climate Change*. Cheltenham: Edward Elgar; 2007, 255–278.
63. Tews K, Busch PO, Jörgens H. The diffusion of new environmental policy instruments. *Eur J Polit Res* 2003, 42:569–600.
64. Skjærseth JB, Wettestad J. Understanding the effectiveness of EU environmental policy: how can regime analysis contribute? *Environ Politics* 2002, 11:99–120.
65. Gupta J, Ringius L. The EU's climate leadership: reconciling ambition and reality. *Int Environ Agree Politics Law Econ* 2001, 1:281–299.
66. Jänicke M. German climate change policy: political and economic leadership. In: Wurzel RKW, Connelly J, eds. *The European Union as a Leader in International Climate Change Politics*. London: Routledge; 2010, 129–146.
67. Buchan D. *Energy and Climate Change: Europe at the Crossroads*. Oxford: Oxford University Press for the Oxford Institute for Energy Studies; 2010.
68. Hildingsson R, Strippel J, Jordan A. Governing renewable energy in the EU: confronting a governance dilemma. *Eur Polit Sci* 2012, 11:18–30.
69. Skjærseth JB, Wettestad J. Making the EU emissions trading system: the European commission as an entrepreneurial epistemic leader. *Glob Environ Change* 2010, 20:314–321.
70. Veenman S, Leifferink D. Different countries, different strategies: 'Green' Member States influencing EU climate policy. In: Wijen F, Zoetman K, Peeters J, eds. *A Handbook of Globalisation and Environmental Policy*. Cheltenham: Edward Elgar; 2005, 519–544.
71. Burns C, Carter N. The European Parliament and climate change: from symbolism to heroism and back again. In: Connelly J, Wurzel R, eds. *The European Union as a Leader in International Climate Change Politics*. London: Routledge; 2010, 58–73.
72. Schreurs MA, Tiberghien Y. Multi-level reinforcement: explaining European Union leadership in climate change mitigation. *Global Environ Polit* 2007, 7:19–46.
73. Collier U., Lofstedt RE. *Cases in Climate Change Policy. Political Reality in the European Union*. London: Earthscan; 1997.
74. Blok K, Phylipsen GJM, Bode JW. *The Triptique Approach: Burden Differentiation of CO₂ Emission Reduction Among European Community Member States*. Department of Science, Technology and Society: Utrecht University; 1997.
75. Phylipsen GJM, Bode JW, Blok K, Merkus H, Metz B. Triptych sectoral approach to burden differentiation: GHG emissions in the European bubble. *Energy Policy* 1998, 26:929–943.
76. Grubb M. The greenhouse effect: negotiating targets. *Int Aff* 1990, 66:67–89.
77. Eyckmans J, Cornillie J, van Regemorter D. *Efficiency and Equity in the EU Burden Sharing Agreement*. Working Paper Series no. 2000-02. Leuven: Katholieke Universiteit Leuven, Centrum voor Economische Studien; 2002.
78. Marklund P-O, Samakovlis E. What is driving the EU burden-sharing agreement: efficiency or equity? *J Environ Manage* 2007, 85:317–329.

79. Jordan A, Benson D, Wurzel R, Zito A. Policy instruments in practice. In: Dryzek JS, Norgaard RB, Schlosberg D, eds. *The Oxford Handbook of Climate Change and Society*. Oxford: OUP; 2011, 536–549.
80. Jordan A, Wurzel R., Zito A. Still the era of ‘new’ environmental policy instruments? Exploring patterns of innovation and continuity. *Environ Polit* 2013, 22.
81. Albrecht J, Arts B. Climate policy convergence in Europe: an assessment based on National Communications to the UNFCCC. *J Eur Public Policy* 2005, 12:885–902.
82. Benson D, Jordan A. What have we learned from policy transfer research? Dolowitz and Marsh revisited. *Polit Sci Rev* 2011, 9:366–378.
83. Benson D, Jordan AJ. Policy transfer research: still evolving, not yet through? *Political Stud Rev* 2012, 10:333–338.
84. van Asselt H. Emissions trading: the enthusiastic adoption of an alien instrument?. In: Jordan AJ, Huitema D, van Asselt H, Rayner T, Berkhout F, eds. *Climate Change Policy in the European Union*. Cambridge: Cambridge University Press; 2010, 125–144.
85. European Commission. *Adapting to Climate Change: Towards a European Framework for Action*. COM (2009) 147. Brussels: European Commission; 2009.
86. Faludi A, Waterhout B. *The Making of the European Spatial Development Perspective: No Masterplan (The RTPI Library Series)*. London: Routledge; 2002.
87. Biesbroek GR, Swart RJ, Carter TR, Cowan C, Heinrichs T, Mela H, Morecroft MD, Rey D. Europe adapts to climate change: comparing national adaptation strategies. *Glob Environ Change* 2010, 20:440–450.
88. Bauer A, Feichtinger J, Steurer R. *The Governance of Climate Change Adaptation in Ten OECD Countries: Challenges and Approaches*. Discussion Paper 1-2011. Vienna: (BOKU); Institute of Forest, Environmental, and Natural Resource Policy, University of Natural Resources and Applied Life Sciences; 2011.
89. Termeer C, Biesbroek R, van den Brink M. Institutions for adaptation to climate change: comparing national adaptation strategies in Europe. *Eur Polit Sci* 2012, 11:41–53.
90. Hochrainer S, Linnerooth-Bayer J, Mechler R. The European Union Solidarity Fund: its legitimacy, viability and efficiency. *Mitig Adapt Strat Global Chan* 2010, 15:797–810.
91. Tosun J, Jordan A. Policy implementation. In: Jordan A, Adelle C, eds. *Environmental Policy in the European Union: Contexts, Actors and Policy Dynamics*. 3 ed. London: Earthscan; 2012, 247–266.
92. Peeters M, Deketelaere K. *EU Climate Change Policy*. Cheltenham: Edward Elgar; 2006.
93. Kerr A. Serendipity is not a strategy: the impact of national climate programmes on greenhouse-gas emissions. *Area* 2007, 39:418–430.
94. Huitema D, Jordan A, Massey E, Rayner T, van Asselt H, Haug C, Hildingsson R, Monni S, Stripple J. The evaluation of climate policy: theory and emerging practice in Europe. *Policy Sci* 2011, 44:179–198.
95. Hilden M. The evolution of climate policies—the role of learning and evaluations. *J Clean Prod* 2011, 19:1798–1811.
96. Denny Ellerman A, Buchner BK. Over-allocation or abatement? A preliminary analysis of the EU ETS based on the 2005–06 emissions data. *Environ Resour Econ* 2008, 41:267–287.
97. Freedman M, Freedman O, Stagliano AJ. Greenhouse gas disclosures: evidence from the EU response to Kyoto. *Int J Crit Account* 2012, 4:237–264.
98. Glachant M. The need for adaptability in EU environmental policy design and implementation. *Eur Environ* 2001, 11:239–249.
99. Glachant M, ed. *Implementing European Environmental Policy: The Impacts of Directives in Member States*. Cheltenham: Edward Elgar; 2001.
100. Haug C, Rayner T, Huitema D, Hildingsson R, Jordan A, Massey E, Monni S, Stripple J, van Asselt H. Navigating the dilemmas of European climate policy. Evidence from policy evaluation studies. *Clim Change* 2010, 101:427–445.
101. Rayner T, Jordan A. Governing climate change: the challenge of mitigating and adapting in a warming world. In: Dauvergne P, ed. *Handbook of Global Environmental Politics*. Cheltenham: Edward Elgar; 2012, 222–234.
102. Stafford Smith M, Horrocks L, Harvey A, Hamilton C. Rethinking adaptation for a 4°C world. *Phil Trans R Soc A* 2011, 369:196–216.
103. Medarova-Bergstrom K, Volkery A, Schiellerup P, Withana S, Baldock D. *Strategies and Instruments for Climate Proofing the EU Budget*. London: Institute for European Environmental Policy; 2011.
104. Nilsson M, Nilsson LJ. Towards climate policy integration in the EU: evolving dilemmas and opportunities. *Clim Policy* 2005, 363–376.
105. Jordan A, Schout A, Unfried M. The European Union. In: Jordan A, Lenschow A, eds. *Innovation in Environmental Policy? Integrating Environment for Sustainability*. Edward Elgar; 2009, 159–179.
106. Van Renssen S. EU seeks perfect policy mix. *Nature Clim Change* 2011, 1:89–90.
107. Sijm J. The interaction between the EU emissions trading scheme and national energy policies. *Clim Policy* 2005, 5:79–96.
108. Helm D. EU climate-change policy—a critique. In: Helm D, Hepburn C, eds. *The Economics and Politics of Climate Change*. Oxford: Oxford University Press; 2009, 222–246.
109. Kautto N, Arasto A, Sijm J, Peck P. Interaction of the EU ETS and national climate policy Instruments.

- Impact on biomass use. *Biomass Bioenergy* 2012, 38:117–127.
110. Hood C. *Summing up the Parts. Combining Policy Instruments for Least-Cost Climate Mitigation Strategies*. Paris: International Energy Agency; 2011.
111. Sorrell S, Smith A, Betz R, Walz R, Boemare C, Quirion P, Sijm J, Mavrakis D, Konidari P, Vassos S, et al. *Interaction in EU Climate Policy*. Final Report, Project No. EVK2-CT-2000-0067, Science Policy Research Unit, Brighton; 2003.
112. Urwin K, Jordan A. Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance. *Glob Environ Change* 2008, 18:180–191.
113. Biesbroek GR, Swart RJ, van der Knaap WGM. The mitigation–adaptation dichotomy and the role of spatial planning. *Habit Int* 2009, 33:230–237.
114. Scharpf F. *Governing in Europe: Effective and Democratic?* Oxford: Oxford University Press; 1999.
115. Warleigh-Lack A. Greening the European Union for legitimacy? A cautionary reading of Europe 2020. *Innov Eur J Social Sci Res* 2010, 23:297–311.
116. Hooghe L, Marks G. A postfunctionalist theory of European integration: From permissive consensus to constraining dissensus. *Brit J Polit Sci* 2009, 39: 1–23.
117. Bauer M, Jordan A, Green-Pedersen C, Héritier A, eds. *Dismantling Public Policy: Preferences, Strategies and Effects*. Oxford: Oxford University Press; 2012.
118. Jordan A, Bauer M, Green-Pedersen C. Policy dismantling. *J Eur Public Policy* 2013, 20.