Explaining Success and Failure in Climate Policies

Developing Theory through German Case Studies

Roger Karapin

While many scholars have described and explained climate policies in rich industrialized countries,[1] few have explored the policy outcomes, that is, the changes in greenhouse gas emissions.[2] This is surprising since presumably environmental outcomes are one of the main ultimate concerns of those interested in environmental policy, and fairly reliable greenhouse gas emissions data are readily available. Explanations of changes in emissions will probably be different from explanations of climate policies since not all climate policies contribute equally to improvements, some improvements are not due to climate policies, and other factors may counteract the effects of even the most successful policies.[3]

Hence, this article focuses initially on environmental outcomes (changes in greenhouse gas emissions) and then on their causes, including climate policies, other government interventions, the factors that shape policymaking and policy implementation, and other dynamics that affect emissions, such as socioeconomic trends. It contributes to theorizing about environmental outcomes in areas of persistent environmental problems through a comparative analysis of nine cases within one country, defined mainly in policy and sectoral terms. This approach complements and helps to overcome the limitations of cross-national, large-N studies.[4]

As the world's sixth largest greenhouse gas emitter and a leader in reductions, Germany is a good country to study in order to develop and test theories of these phenomena. It reduced its emissions by 26 percent from 1990 to 2009 and is on track to surpass its ambitious Kyoto commitment of a 21 percent reduction by the 2008–2012 period.[5] Because its emissions reductions exceed those of all other Western countries except Britain, Germany is usually seen as a climate policy success, but closer examination shows a mixture of partial successes and failures.[6] Both are grist for the theoretical mill.

Theories of Environmental Outcomes

It is not clear why political scientists have paid less attention to the outcomes of environmental policies than to the policies themselves.[7] Obtaining comparable, valid measures of environmental outcomes for many countries is often challenging, but this problem is much smaller in studies of one or a few countries. Also, fairly reliable and consistent data on greenhouse gas emissions in industrialized countries are available.[8] Another argument

against focusing on outcomes is that they are often influenced by factors out of the control of policy makers, such as new technologies, industrial restructuring, or economic recessions.[9] While this is true to an extent, it is often possible to separate the effects of policies designed to achieve environmental goals from the effects of other factors, and to understand better how politics and policymaking are involved in what appear to be extraneous factors. Examining all the causes of environmental outcomes may point to levers for achieving better outcomes and to limits on explicitly designed government policies, which are also important to understand.

Although they make valuable contributions, large-N studies of environmental outcomes have several limitations.[10] First, the studies are biased toward structural explanations based on geographic and socioeconomic structures or political institutions. Taken together, they find that the factors which most consistently correlate with national environmental outcomes are population density, income per capita, institutions that either concentrate political power or require consensus (there is disagreement here), perhaps corporatist interest group systems (again, there is disagreement), and strong green or left-libertarian parties. Large-N studies have focused on structural factors partly because those are easier to investigate with comparable and reliable cross-national data than are political processes. Another reason is that these studies typically rely on cross-sectional data, which have difficulty capturing change, rather than on longitudinal data.[11] As a result, even factors such as income and green-party strength, which can be interpreted as dynamic variables, themselves strongly influenced by other political and economic processes, tend to be treated and presented as structural factors that vary between countries but are otherwise relatively fixed.

Second, the large-N studies rely on correlations between causal factors and environmental outcomes in order to infer causation, an approach that has several important limitations. Available data may be poor proxies for what is meant to be measured, and statistically significant correlations do not always indicate causation. In any case, correlations do not by themselves provide an account of the mechanisms through which the factors operate.[12] A more complete theory requires specifying mechanisms that can be empirically tested. Another problem is that countries are treated in a highly aggregated way, as data points that indicate success, failure, or some point in between. This obscures the complexities of environmental performance over time and across economic sectors, policy areas, and regions.

Structured, focused comparisons of cases within one country, or of a few countries, can help to overcome those limitations and contribute to theory building in several ways. First, political and socioeconomic processes can be more fully included in the qualitative analysis of a small number of cases, even though there is no comparable information presently available for a large number of countries.[13] Second, the mechanisms or processes that could link putative causes to the environmental outcomes can be investigated through process tracing within each case. If the mechanisms are not present or are different from those expected by the theory, or if the theory does not specify any mechanisms, the case study suggests modification to the theory.[14] Third, where scholars disagree about how factors such as affluence, governmental institutions,

or neocorporatism affect environmental outcomes, case studies can provide good reasons for preferring one hypothesis over another on the basis of observed mechanisms. Fourth, case studies can generate new hypotheses about the effects of combinations of variables by examining how they interact to generate particular outcomes.

Furthermore, although comparative analysis is often conflated with cross-national comparisons, of course comparison is possible within a single country case. In this article, sectoral, policy, and east-west regional distinctions are used to identify nine cases within Germany. When German climate policy is seen not as a monolithic success to be explained, but rather as a patchwork of partial successes and failures, new variance can be identified and used to test and develop causal theories. Somewhat paradoxically, a detailed, differentiated analysis of a country case can expand the number of units available for study, rather than shrink the number of cases to one.

While Andreas Duit notes that the literature on environmental outcomes has not been strongly guided by a theoretical framework, this may be because no single framework is broad enough to encompass all the causes that operate.[15] Analysts have applied a wide range of theoretical approaches, which consider numerous causal factors, including geographic and economic structures, political and economic institutions, and political mobilization.[16] This articles focuses on four theoretical areas where the present case studies can help to specify mechanisms and adjudicate between contradictory findings.

Neocorporatist and Pluralist Interest Group Systems Neocorporatist systems are characterized by a small number of economic interest organizations that represent a large share of the population, are organized in peak associations, are consulted by government, and have cooperative and consensual relations with each other and with government. The literature reaches conflicting conclusions about the effects of neocorporatism on environmental outcomes. In one view, neocorporatism helps produce more effective environmental policies by helping to overcome potential resistance from associations of businesses, farmers, and unions in highly polluting sectors. These stand to lose from national environmental policies that increase their costs, especially in the presence of international competition. However, proponents of neocorporatism argue that it can help overcome this opposition by compensating losers, communicating the benefits of environmental policies to members, creating consensus, and hence reducing free riding and promoting the internalization of externalities. By contrast, in a pluralist system, the economic actors that would be harmed by environmental policies tend to lobby successfully for preferential treatment, allowing them to impose external costs on others.[17]

But others argue that neocorporatist institutions harm environmental quality, because they institutionalize the power of producer groups and keep environmental issues off the agenda in favor of a consensus on economic growth. Hence, pluralist interest group systems may offer better chances for new environmental issues and groups.[18] These effects may be especially strong for climate policies, which target the consumption of energy from fossil fuel sources and thus provoke broad opposition from economic interest groups, most of which are involved in the supply or consumption of fossil fuel-based energy, including the manufacturing industry. The sectors that would benefit from stronger climate policy

(renewable energy, nuclear energy, and insurance) are comparatively weak.[19] Hence, institutions that empower producer groups will tend to brake climate policies.

The empirical findings of the large-N studies have been mixed on this issue. While most show a correlation between neocorporatism and environmental outcomes,[20] others find no significant relationship,[21] or even a negative, though not robust, correlation.[22]

Given the conflicting results, case studies of policy areas where neocorporatist institutions have been active may shed some light. Germany has a moderately strong corporatist pattern of interest intermediation and a relatively consensual policy style, which extends to environmental policy.[23] Business is strongly organized in peak associations, including the Federation of German Industry (BDI) and the German Chambers of Industry and Commerce (DIHK), and the federal economics ministry is very responsive to them.[24] While rankings of neocorporatism tend to show Germany around the middle of the pack compared with other Western democracies, this is somewhat misleading. When researchers assign numeric scores, Germany places much closer to the most strongly neocorporatist countries such as Austria than to pluralist nations such as the U.K., at about 80 or 85 on a 0–100 scale.[25] Whether neocorporatism helps or hinders environmental performance, or both, should be visible in cases where German peak associations have been active in environmental policies.

Green Parties Green parties include explicitly ecological parties and left-socialist parties that have adopted strong environmental programs. Several large-N studies find that green-party strength is correlated with stronger environmental performance,[26] although other studies find only statistically insignificant effects.[27] The Greens have been relatively strong in Germany, gaining more than 5 percent and an average of 7.6 percent of the vote in Bundestag elections from 1983 to 2009. In the case studies, I examine whether this party's actions are linked to emissions reductions and, if so, investigate the likely mechanisms. If a correlation exists between environmental outcomes and the vote shares or parliamentary seat shares of green parties, one likely mode of influence is by triggering innovation by larger parties. Another possibility, which can be examined in the German cases, is that their participation in government improves environmental performance.

Income and Economic Development There has been considerable debate about whether high incomes and other features of economic development improve or worsen environmental quality.[28] The "environmental Kuznets curve" view is that rising levels of economic development and prosperity produce major changes that promote better environmental outcomes: a shift away from industrial production; increased perceptions of environmental problems and demands for addressing them; and the financial resources, institutions, and technological capacities for solving them. By contrast, in the "prosperity pollution" view, economic activity in industrial societies degrades the environment because higher incomes result in increased production and consumption in absolute terms, even if the proportion of industrial activity declines.

There is much evidence that the relationship between income and environmental conditions depends on the nature of the environmental problem. Martin Jänicke and

colleagues argue that improvements occur with rising incomes only if a relatively inexpensive technical solution is available, for example, for reducing SO_x and particulate pollution or increasing sewage treatment.[29] If such a solution is not available and effective policies would harm the interests of powerful polluters, rising incomes lead to more pollution, such as in volatile organic chemical pollution, municipal waste, or deforestation.

Greenhouse gas emissions usually have been seen as a prosperity-pollution case rather than as one subject to an environmental Kuznets curve.[30] However, at first glance, the German case seems to support the Kuznets thesis for greenhouse gas emissions since emissions have peaked and begun to decline there. The analysis of sectoral cases in Germany will make it possible to explore whether and how rising income affect climate-policy outcomes.

Advocacy Coalition Formation Political processes have been largely neglected by large-N studies of environmental outcomes. Although some of them include variables related to political processes, they do so in a static way rather than by examining change over time.[31] For example, Lyle Scruggs found that a mobilization index made up of environmental group membership, votes for green parties, and public opinion measures did not correlate significantly with environmental outcomes.[32] By contrast, Detlef Jahn found that a new politics index based on a history of a strong nuclear energy conflict, environmental movement strength, and votes for green parties did correlate with improvements.[33] In both studies, the political processes were measured at only one point in time and the mechanisms through which these variables might operate were not examined.

Although it is not captured in those studies, the formation and development of advocacy coalitions are political processes that may play a role in climate policy outcomes. A large body of work has identified the formation of advocacy coalitions as important in environmental policy areas, including energy and climate protection.[34] In part, this theory states that policy change by authoritative decision makers is a result of the relative strength of the coalitions comprising advocates and opponents of a policy direction.[35] Both kinds of coalitions draw on specialists in a variety of governmental and private organizations, including government agencies, parties, parliaments, interest groups, nonprofit organizations, movement organizations, research institutions, and media outlets. Events external to the particular policy system, such as socioeconomic developments or changes in the composition of government, can affect the composition of advocacy coalitions as well as their resources and constraints.[36] The coalitions' beliefs and strategies are not fixed and can be affected by the outcomes of policies.[37] In the case studies, I consider whether advocacy coalitions help explain policy changes that led to major changes in Germany's emissions.

Defining Cases within Germany

Germany's leading role in international greenhouse gas negotiations has gone hand in hand with relatively strong domestic climate policies,[38] which have enjoyed the support of a broad range of governing parties. These policies helped Germany achieve

significant reductions in greenhouse gas emissions, greater than those in any other Western country. Compared with the 1990 baseline, Germany had reduced its emissions by 26 percent in 2009, the last year for which cross-nationally comparable data are available. Among Western countries, only Britain's decrease of 27 percent came close to Germany's, and the performances of the rest of the EU-27 (−15 percent) and the U.S. (+7 percent) over this period were considerably worse than Germany's.[39] However, even Germany's performance is far from adequate to prevent major climate change, since it is still emitting 11.4 tons of CO_2-equivalent per capita, much higher than the 3.0 tons per capita maximum worldwide emissions that are estimated to be consistent with limiting global warming to two degrees Celsius by 2050.[40]

Moreover, Germany's large aggregate reduction conceals a number of more specific areas of success and failure, which become visible when its performance is analyzed into cases defined by policy areas and sectors. Table 1 shows estimates of how the most important interventions by the German government affected emissions relative to business-as-usual scenarios, that is, continued economic growth in the absence of the interventions. These estimates are based largely on studies of a wide range of policy measures by a consortium of research institutes under contract to the German environment ministry, reported in the Fourth and Fifth National Communications to the UNFCCC,[41] as well as other available studies that I have used to improve the estimates.[42] The table includes the most important policies that were designed to reduce emissions as well as other interventions that had significant effects. Although they are affected by the assumptions made about business-as-usual scenarios, the estimates are the best available, have been used by other scholars,[43] have not been critiqued in academic publications, and are plausible given the magnitudes claimed in relation to the absolute changes in emissions. Hence, they are likely to be accurate enough for the purpose here, which is simply to identify successes and failures rather than to make precise estimates.

In the first place, Table 1 shows that Germany had two major successful government interventions: the economic transformation of eastern Germany following unification in 1990; and the promotion of renewable energy. These two account for an estimated 113 and 95 megatons per year (Mt/year) of reductions,[44] respectively, and together represent 53 percent of the emissions reductions attributable to government interventions. In addition, there is a third successful policy to be explained: the setting in 1990 of an ambitious reduction target of 25 percent of CO_2 emissions (later modified to 21 percent of greenhouse gas emissions), which underlay all the climate policies. Second, the table shows that three of Germany's most highly touted policies seem to have been largely ineffective: the ecotax, voluntary agreements with industry regarding CO_2 emissions, and emissions trading, which produced only modest estimated reductions in emissions (totaling only 27 Mt/year, 7 percent of the policy-induced reductions). In fact, those policies achieved much less than did three unsung successes: recycling/waste laws and regulations (58 Mt/year), the reduction of nitrous oxide emissions in the adipic acid industry (26 Mt/year), and ordinances for residential building efficiency (26 Mt/year). Although these policies deserve further research, the present lack of underlying studies places them beyond the scope of this article.

Table 1 Estimated Relative Contributions of Major Government Interventions to Germany's Reductions in Kyoto Greenhouse Gas Emissions, 1990–2010

Source of reduction or increase in emissions	Emissions reduced (−) or added (+) in megatons CO_2-equivalent/year	% of total emissions reductions attributable to government action
Eastern German economic transformation policies*	−112.9	29%
Renewable energy policies	−95.3	24%
Waste regulations and biomass ordinance regarding methane; recycling laws and regulations	−58.4	15%
Voluntary agreement between government and adipic acid producers regarding N_2O	−26.0	7%
Residential building ordinances	−25.8	7%
Ecological tax reform	−18.2	5%
Voluntary agreements between government and industry regarding CO_2 and other greenhouse gases	−8.2	2%
Emissions trading system	−0.4	0%
Industrial and commercial ordinances on heating and energy saving	−11.0	3%
Combined heat and power (cogeneration) policies, including industrial cogeneration	−5.5	1%
Transportation policies (fuel tax, rail regionalization, emissions-based road tax, high-sulphur fuel tax, cycling promotion, climate protection campaign, 130g CO_2 standard for cars)	−16.0	4%
Agricultural policies on biogas, biomass, and organic farming (mainly regarding methane and N_2O)	−5.8	1%
Coal mining: policy-induced production decline and methane regulations (regarding methane)	−8.8	2%
Subtotal: all reductions attributed to government actions	**−392.3**	100%
Reductions not driven by policies, including CO_2 reductions due to increased energy efficiency and reduced carbon content of fuel mix	−189.1	
Subtotal: all reductions (gross)	**−581.4**	
Increases due to growth in income per capita**	+214.6	
Increases due to growth in population**	+25.7	
Total net reductions 1990–2010	**−341.1**	

* through 2000; ** energy-related CO_2 emissions; all other items are for the Kyoto gases estimated through 2010.
Sources: See the text and the accompanying notes.

Third, as indicated in the last few lines of the table, increased income and consumption canceled out many of the emissions reductions from efficiency improvements. Per-capita income grew by 27 percent from 1990 to 2010, which increased annual CO_2 emissions by an estimated 215 megatons,[45] more than counterbalancing an estimated 189 megatons in reductions due to increased energy efficiency and fuel switching. As a

result, emissions reductions in household heating, transportation, and electricity were much smaller than they otherwise would have been.

These nine cases of success and failure are discussed below in ways that illuminate issues in theories of environmental outcomes. The three main success cases described above (target setting, eastern German transformation, and renewable energy) indicate the crucial roles of external events and advocacy coalitions, and are used to specify the paths through which green parties matter. The three cases of flawed policymaking (the ecotax, voluntary agreements, and emissions trading) show the ways that neo-corporatism can undermine environmental outcomes. Finally, the effects of socio-economic trends on emissions in three sectors (household heating, transportation, and electricity) show how increased incomes in the absence of government policies that regulate technological change and consumption can undermine climate policy outcomes.

Explanation of Successes and Failures

Emissions Target Setting Beginning in 1990, German officials set a series of ambitious targets for reducing carbon dioxide and other greenhouse gas emissions. Although weakened somewhat in the late 1990s, these goals were often proclaimed in high-profile statements concerning domestic policies and maintained during negotiations within the EU and the UNFCCC process.[46] The goal of a 21 percent reduction in emissions over the 1990–2010 period was a cornerstone in Germany's broad climate policy programs announced in 2000, 2005, and 2009; beginning in 2002, it was supplemented with a target of a 40 percent reduction from 1990 to 2020, conditional on an EU commitment to a 30 percent reduction in the same time frame.[47] Since the 1990s, the ambitious reduction targets have represented a consensus among Germany's governing parties and have been supported by a wide range of governing coalitions: conservative-liberal (until 1998 and again from 2009), social democratic-green (1998–2005), and conservative-social democratic (2005–2009).

A very broad, cross-party advocacy coalition for climate policy developed in response to several unusual, external-focusing events concerning the environment and environmental protection that coincided in 1985–1986. In March 1985 the Vienna Convention on ozone-depleting substances was adopted, and two months later British scientists announced the discovery of an ozone hole over Antarctica.[48] Next, a January 1986 report by the respected German Physical Society warned of climate change and rising sea levels. These events triggered media coverage that generated public attention and raised fears.[49] Then, in April 1986, the disastrous Chernobyl nuclear accident occurred, focusing public and elite attention on environmental problems in West Germany, which was one of the Western European countries receiving the greatest amount of radioactive fallout, along with Austria, Greece, and the Scandinavian countries.[50] Finally, in December 1986, international negotiations on targets for ozone-depleting gases began, raising the political salience of both ozone and climate protection, issues that were often linked in public discourse at this time.[51]

Driven by these events, public support for environmental protection reached a peak in the late 1980s.[52]

In response to these events, a broad advocacy coalition for climate policy formed and achieved the adoption of ambitious emissions targets.[53] Two months after the Chernobyl accident, the conservative-liberal government led by Chancellor Helmut Kohl created the Federal Environment Ministry, which strengthened those in the administration who favored ozone regulation and other global environmental policies.[54] In October the next year, the Bundestag created a parliamentary inquiry commission to examine ozone and climate change, headed by another Christian Democrat, Bernd Schmidbauer.[55] As is typical, the commission consisted of experts and politicians from all parliamentary parties and operated mainly by consensus.[56] In the area of climate protection, the commission integrated the results of 150 studies involving over fifty research institutes. Its final report called for Germany to reduce CO_2 and methane emissions by 30 percent compared with 1987 rates, comprehensively reform its energy policy, adopt an electricity feed-in law to assist renewable energy, and establish an interministerial working group on CO_2 reduction.[57]

The consensus that developed within the commission on those targets and measures stretched from the Greens on the left to the conservative Christian Democrats. These odd political bedfellows had a common interest in strict emissions goals, the Greens in order to promote environmental protection and the Christian Democrats in order to promote nuclear power, an energy source classified as not emitting greenhouse gases.[58] All parliamentary parties joined to endorse the commission's main recommendations, except on using nuclear energy as a solution to global warming, which the Christian Democratic and Liberal members endorsed but the Social Democrats and Greens opposed.[59]

The commission's report and the cross-party consensus that it embodied set in motion a major commitment to climate policy. In 1990, the federal cabinet and the Bundestag adopted a target of reducing energy-related carbon-dioxide emissions by 25 percent from 1987 to 2005, a goal reiterated in a unanimous Bundestag vote in November 1991.[60] Later, as part of the EU's burden sharing agreement, this goal was weakened somewhat, to a 21 percent reduction in the emissions of the six Kyoto-regulated greenhouse gases over the 1990–2010 period. Nonetheless, Germany's targets became the basis of climate-protection policies adopted beginning in 1991, and the targets remained ambitious throughout this period.[61]

Economic Transformation of Eastern Germany The single largest contribution to greenhouse gas reductions came not from climate policy, but from the economic transformation of the former East Germany. Like emissions target setting, this was triggered by dramatic external events that were not predicted and cannot be directly explained by structural factors. The fall of the Berlin Wall in November 1989 and multiparty elections in East Germany in March 1990 led to the economic unification of East and West Germany, via currency reform in July and a political unification treaty in October. East German industry collapsed beginning in Spring 1990, and an agency of the federal government, the *Treuhandanstalt*, transferred most East

German enterprises from state ownership under central planning to private ownership operating in a market economy.[62]

These events and the policy responses to them sharply reduced greenhouse gas emissions in the former East Germany. Emissions fell due to a combination of industrial collapse, the ending of energy subsidies, privatization, and the subsidized restructuring of the energy sector. The extension of preexisting policies to the new eastern states, such as the 1983 Ordinance on Large Combustion Plants (amended in 1990), also spurred the shutdown of lignite (brown coal) power plants. In addition, key actors in the economics and interior ministries helped shape the energy policy aspects of unification.[63] The government made massive investments in the energy sector, which reduced emissions but would have been difficult to justify in terms of climate protection alone: renovation of old buildings, replacing lignite with natural gas in household heating, replacing almost all central power plants, and investments in cogeneration facilities.[64] As a result, energy-related CO_2 emissions fell 41 percent in the eastern states from 1990 to 2004, with the entire decline occurring by 1996.[65]

Renewable Energy Of all the policies that were intended to reduce emissions, those promoting renewable energy were by far the most successful. Early policies included government funding for research and development in the 1980s and investment subsidies for a 100-megawatt wind program and a 1,000-roof solar photovoltaic program in 1989. A crucial advance was the 1990 Electricity Feed-In Law, which required utilities to purchase electricity from renewable sources at prices equaling 90 percent of consumer retail prices, effective 1991. This law was comprehensively overhauled and strengthened by the social democratic-green government in the 2000 Renewable Energy Sources Act, which guaranteed feed-in prices for twenty years and distributed the costs of wind power subsidies among consumers served by all energy companies rather than those closest to the turbines.[66] The act and later amendments also provided a tax exemption for biofuels beginning in 2002 and increased subsidies for biomass beginning in 2004.[67]

These policies were very effective. Renewable energy production more than quintupled from 1990 to 2010, rising to 17 percent of Germany's electricity consumption and 11 percent of its final energy consumption.[68] Wind and biomass were responsible for almost all the increase; hydroelectric power was largely stable in this period, as was nuclear power. Germany has been a leading country in renewable energy for the last two decades, ranking third in the world in total installed wind capacity and first in solar photovoltaic capacity in 2010.[69] The increase in renewable energy production due to government policies was avoiding an estimated 95 Mt/year of greenhouse gas emissions by 2010.[70]

Strong renewable energy policies were adopted and effectively implemented because a strong advocacy coalition developed, partly in unpredictable ways, and the policies that it won further strengthened the coalition. The 1990 Feed-In Law was the result of an initiative by an unusually broad coalition, which included the federal Green and Christian Democratic parties and the trade association of hydroelectric producers.

The latter, who also received guaranteed feed-in tariffs under the law, were spurred into action by a 1987 announcement by the electric utilities that they would no longer increase their payments for hydroelectric power, which put constraints on small hydro plants.[71] Advocates secured support for the legislation from deputies in all Bundestag parties and gained grudging acceptance from Christian Democratic leaders in parliament and the economics ministry.[72]

The advocacy coalition also benefited from the surprising inactivity of the large utilities on the 1990 Feed-In Law. The large utilities generally opposed policies promoting renewable energy because of their own large investments in coal and nuclear power plants. The Feed-In Law increased the utilities' costs and opened opportunities for new electricity producers, and hence most large utilities vigorously tried to roll back the law in the late 1990s and to prevent its expansion in 2000. However, the large utilities did not mobilize against the Feed-In Law in 1990, when they might have nipped it in the bud, because they underestimated the effect of the law on wind power development and were preoccupied with taking over the eastern German electricity producers.[73]

Moreover, the 1990 law strengthened the advocacy coalition for renewable energy by creating a market for wind turbines and solar photovoltaic cells and hence reducing their costs, and by spurring interest group formation and mobilization. Hence, when large utilities and the federal government tried to reduce the feed-in subsidies in 1997, they were met by a coalition of wind turbine suppliers and operators, solar energy producers, metalworkers, farmers, environmental and religious organizations, and the large Equipment and Machinery Producers Association (VDMA). The coalition drew 4,000 people to a demonstration in Bonn and narrowly defeated the proposed cuts in a Bundestag committee.[74]

The advocacy coalition for renewable energy reached a new level of influence after the 1998 parliamentary elections, in which the Greens received 6.7 percent of the vote and joined in a national coalition government with the Social Democrats, led by Chancellor Gerhard Schroeder.[75] Under that government, a series of major climate policies were enacted, including a 100,000 roofs program for solar photovoltaics and the 2000 Renewable Energy Sources Act.[76] The coalition supporting the 2000 act included the metalworkers union, the Equipment and Machinery Producers Association, *Land* politicians, environmental organizations, and even one utility company (Preussen Elektra); it overcame strong opposition from the BDI and most large utilities.[77]

Voluntary Agreements, Emissions Trading, and Ecological Tax Reform By contrast, three major and widely cited policies yielded disappointing results in terms of emissions reductions. The voluntary agreements with the industrial associations to reduce CO_2 emissions, participation in the European emissions trading system, and the ecological tax reform together produced only an estimated 27 Mt/year of reductions by 2010. This was only about 2.2 percent of the 1990 baseline and about 7 percent of all reductions due to government interventions (see Table 1). The relative ineffectiveness of these policies was due largely to resistance by organized business interests, which gained major concessions in the policymaking phase and sometimes failed to comply

in the implementation phase. This casts doubt on the argument that neocorporatism benefits environmental performance.

Although German industry was broadly supportive of the government's emissions reduction targets beginning in the early 1990s, it sought to avoid any measures that would increase production costs and put it at a competitive disadvantage against manufacturers in other industrialized economies. Hence, the BDI preferred voluntary agreements rather than mandatory policies, and worked consistently against fiscal and regulatory measures to achieve major reductions. It argued that domestic measures should be voluntary and that any binding measures should be adopted at the international level rather than in Germany first.[78] Indeed, industry was able to extract four major concessions from the Kohl and Schroeder governments in return for making the voluntary agreements: no energy taxes and no heat utilization ordinance for industry in return for the 1995–1996 agreements, and no mandatory energy audit ordinance and no lifting of the ecotax's exemptions for industry in return for the 2000 agreements.[79]

Moreover, the voluntary agreements were based on unambitious targets for emissions reductions. Industry resisted targets for absolute reductions in emissions, and most associations accepted only targets for reductions in specific emissions, such as emissions per value added.[80] Indeed, the reductions promised in 1995–1996 were smaller than those projected by the trend in increasing industrial energy efficiency since 1970. The promised reductions had been largely achieved already by 1995, through the economic transformation of eastern Germany and compliance with regulations, rather than due to any additional voluntary measures.[81] Furthermore,, the agreements were not legally binding, and monitoring and compliance were sometimes weak. Although the German power industry agreed to reduce CO_2 emissions by 20 Mt/year through increases in cogeneration by 2005, instead, its emissions increased by 30 Mt/year.[82]

The voluntary agreements are a good example of how neocorporatism can affect environmental performance, since they were negotiated and implemented through well-developed corporatist procedures. Initial negotiations in 1995 involved fifteen trade associations, including the powerful association of electricity producers VDEW, and by 1996 the agreements covered associations responsible for 80 percent of industrial production.[83] The peak association BDI negotiated and signed the agreements, acting as intermediary between the government and individual trade associations.[84]

For similar reasons, the outcomes of the first round of emissions trading (2005–2007), in which the German government moved to implement the European Emissions Trading System, were also meager. Opposition from German industry and the coal miners' union, along with business arguments about the need for international competitiveness, led the government to press for extremely generous allocations of emissions permits.[85] Hence, industry and the energy sector got overall reduction targets that were even smaller than those in the voluntary agreements, only about 1.5 Mt/year.[86] The second round of emissions trading (2008–2012) provided for more significant cuts of 21 Mt/year, because the EU overruled German domestic interests. However, this round actually produced only an estimated 0.4 Mt/year in emissions reductions in Germany, since the economic recession of 2009 reduced industrial emissions below the mandated cap.

A similar influence for industry and the power sector is visible in the ecological tax reform adopted in 1998. This revenue-neutral measure raised energy taxes, lowered social security taxes, and channeled about 10 percent of the tax revenue to renewable energy projects. In the first place, the BDI and DIHT strongly opposed any kind of energy or CO_2 tax unless it were done at the OECD level, in order to protect the competitiveness of German industry.[87] Even though such a tax had been included in the conservative-liberal government's coalition agreement in January 1991, industrial opposition successfully prevented the tax throughout the 1990s. After Kohl left office, the BDI and VDEW campaigned strongly against the tax when it was introduced in 1999 by the social democratic-green government.[88]

Influence by economic interest groups is also evident in the weak form that the ecological tax reform took, which protected those sectors most exposed to international competition. As adopted in 1999, it exempted coal completely and required manufacturing industry to pay only 20 percent of the full rate, which was increased to 60 percent in 2003. As a result, the tax was not related to the carbon content of fuels or assessed equally across different kinds of emitters; it fell mostly on gasoline and diesel fuel.[89] Moreover, the size of the tax is modest. It raised Germany's total environmental taxes only from 5.8 percent of tax revenue in 1998 to 7.3 percent in 2004, which placed the country only twelfth out of thirty OECD countries.[90]

Socioeconomic Trends in Transportation, Housing, and Electricity Finally, many of the reductions achieved through government interventions were canceled out by increases in emissions due to socioeconomic trends. Several major trends unfolded independently of climate policy in the two decades after 1990: a rise in income and household consumption, and unregulated technological change producing new, energy-intensive products.[91] Together, these led to an estimated 240 Mt/year increase in emissions, which offset emissions reductions due to increased energy efficiency.[92]

Probably the most powerful socioeconomic process that tended to increase emissions was the rise in income. Real GDP per capita rose by 27 percent through 2010, and its effects, coupled with those of consumer culture, can be seen in many areas. Private car ownership increased by 21 percent and passenger kilometers driven rose 24 percent.[93] Moreover, due partly to trends in technology and marketing, new passenger cars became 41 percent more powerful and the share of four-wheel drive vehicles among them rose from 3 percent to 11 percent over the 1990–2010 period.[94] Despite a comprehensive and relatively attractive public transportation system, the share of passenger travel by car and airplane actually rose slightly in this period, from 84.2 percent to 85.4 percent.[95]

Growth in freight transportation was even larger, with a 67 percent increase in freight volume (ton-kilometers). Road freight grew much faster (by 79 percent) than train or barge freight (which rose 16 and 30 percent, respectively). Hence, the share of freight hauled by trucks, which is associated with the highest emissions per ton-kilometer, rose from 62 percent to 70 percent.[96] About half of the increase in road freight transportation was due to increased trade with Eastern Europe and with EU-15 countries and to the liberalization of freight transportation.[97] As a result of the

various trends toward physical growth in transportation, emissions in the road transportation sector declined by only 6 Mt/year (4 percent of the baseline) from 1990 to 2010, in spite of large efficiency improvements, including a 20 percent decline in CO_2 emissions per kilometer in passenger cars.[98]

Rising incomes also tended to increase household energy consumption. Households became smaller (fewer persons per household) and housing units larger as people moved from rented apartments to houses. This trend was especially strong in eastern Germany, where many fled urban high-rise apartment buildings for new suburbs, a pattern that also increased the demand for transportation.[99] Hence, living space per person rose by 20 percent, which contributed to a 3 percent rise in residential fuel use.[100] These sources of increase offset some of the reductions in emissions due to energy-efficiency improvements and fuel switching away from lignite.[101]

In addition, technological change and income growth drove a 13 percent increase in total electricity consumption from 1990 to 2010 in Germany, which lacks a comprehensive electricity conservation policy. Consumption rose across all sectors due to the development and dissemination of new electrical products, both producer and consumer goods. Households increased their use of electricity by 20 percent as they increased their use of electrical appliances, including air conditioning, cell phones, and other devices that are rechargeable or use energy in standby mode. Similarly, the rise of information technology in offices, commerce, and industry produced a 20 percent increase in electricity consumption in the service sector and a 5 percent increase in manufacturing and mining.[102] These sources of increase offset the emissions reductions due to the energy sector's fuel switching away from lignite to natural gas; therefore, emissions from power generation declined by only 4 percent from 1995 to 2010.[103]

Theoretical Implications

External Focusing Events, Advocacy Coalitions, and Structural Change These case studies have four main implications for theories of environmental outcomes, especially in areas with potentially high economic costs and conflict potential, such as climate policy.

First, external focusing events and advocacy coalitions should have a central role in theories of strong environmental performance; indeed, they may be necessary for major improvements. Ambitious target setting and the promotion of renewable energy, which comprise two of the three most successful cases in Germany, resulted from combinations of extraordinary external events and the formation and development of advocacy coalitions, which were strengthened by policy feedback. The Chernobyl accident, the start of Montreal Protocol negotiations, and the political success of the Green parties were all crucial. In these cases, climate protection advocates turned consensual institutions to their advantage by forming very broad coalitions. The relative strength of advocacy and opposing coalitions depends in part on their economic bases, with advocacy coalitions potentially gaining political strength as the renewable energy and energy-efficient economic sectors grow. Hence, differentiated analyses of those economic bases

are needed, as is more theoretical attention to the ways that policy feedback affects economic sectors and their political organizations.

The economic transformation of eastern Germany, which yielded major "wall-fall benefits" for climate policy, shows the importance of external events in a different way. Rather than sparking the formation and growth of an advocacy coalition, the events that led to unification triggered rapid structural change, which in turn produced massive emissions reductions. This was possible because of major, preexisting structural differences between East and West Germany in democracy, affluence, and environmental laws, as well as the availability of technical solutions to the problem of high emissions (more energy-efficient manufacturing and electricity-generation processes, less carbon-intensive fuels). However, those structural conditions were irrelevant for emissions in eastern Germany until the external events that led to unification suddenly and unexpectedly unfolded in the late 1980s.

That is, while structures matter for environmental outcomes, those structures sometimes change through rapid processes triggered by events external to environmental policy. Another example comes from the U.K., where the privatization of the coal, gas, and electricity industries and the liberalization of energy markets in the 1990s led to a massive switch from coal to natural gas, most of it from the North Sea, which produced about half of Britain's 13 percent reduction in greenhouse gas emissions over the 1990–2000 period.[104]

Green Parties The German case supports the conclusion that green or left-libertarian parties help produce stronger environmental performance. In addition, the cases help develop theory by showing that these parties do so through at least four different mechanisms. First, the Greens spurred electoral competition on environmental issues. Their entry into the party system in the early 1980s, on the heels of intense and sometimes violent conflicts over nuclear energy, led the established Christian Democrats and Social Democrats to quickly adopt environmental positions in an effort to contain or undermine the Greens. During the 1980s, the Christian Democrats moved strongly to regulate SO_x emissions in an effort to limit forest dieback, while the Social Democrats backed away from their earlier support for nuclear energy.[105] Therefore, although the major parties were key actors on climate protection from the late 1980s onward, this reflects the Greens' prior influence on those parties rather than the unimportance of the new party.

Second, in Germany the Greens were a crucial actor within the environmental and climate protection advocacy coalitions, using their institutional position in parliament and later in the federal government to provide key political resources. Third, when the Greens participated in a national coalition government from 1998 to 2005, they had a large hand in the burst of innovations in climate policy that resulted.[106] Some of these proved more effective (renewable energy subsidies, measures to improve building efficiency) than others (the ecotax, emissions trading), mostly because the latter were undermined by business opposition. Fourth, green party strength is a variable that depends on election results, not merely a structural factor. The Greens' strong election result in 2002, in which the party increased its vote share from 6.7 percent to 8.6 percent,

strengthened its position within the coalition government with the Social Democrats. After the election, the Greens successfully pressed for a further expansion of renewable energy, the adoption of a 40 percent emissions reduction goal, emissions trading, and a halving of the ecotax exemptions for industry, agriculture, and forestry.[107]

Neocorporatism and Advocacy Coalitions The third main theoretical conclusion concerns neocorporatist institutions. While large-N studies are divided about their effects, the cases analyzed here show that such institutions can retard climate policy performance by limiting both effective policies and their implementation. Industry opposition prevented, delayed, or weakened many climate policy measures in Germany, including an industrial heat ordinance, the ecotax, mandatory energy audits, emissions trading, and quotas for cogeneration. Associations representing traditional sectors such as coal, electricity generators, and heavy industry, acting through the BDI and their trade associations, used their organizational strength and entrenched positions to resist change. While business has enjoyed corporatist-style access, environmental organizations have been largely relegated to pluralist-style pressure from the outside, assisted by the Greens and other members of the advocacy coalition.[108]

The German cases suggest that if neocorporatism does not improve environmental performance on the whole, this may be because its benefits in creating stable, consensual environmental policies are at least counterbalanced by major disadvantages. Business and labor often oppose environmental policies due to their perceived costs,[109] are more strongly organized than environmental organizations, and have better access to government decision makers. Hence, neocorporatism may operate differently on environmental than on economic issues.[110] Consensual institutions such as neocorporatism aid environmental policy only if and when environmental issues become part of the consensus. This points back to the importance of the processes by which advocacy coalitions are formed, gain strength, and may come to dominate certain policy areas.

Indeed, on the whole, the roles of business and labor in German climate policies give more support to the advocacy coalition framework than to the neocorporatist theory. The mobilization of business opposition and of climate policy proponents were key factors, and they varied across the cases for reasons that are contingent rather than due to structural causes such as the fixed interests of particular economic sectors. In the two areas where government interventions were highly successful in reducing emissions, the mobilization of business was extraordinarily weak. In the economic transformation of eastern Germany, business was marginalized by the massive role of government investment in pursuit of the deeply held national goal of political and economic unification, which was made possible by the unexpected collapse of the East German system. In the case of renewable energy policy, the utilities were caught napping concerning the 1990 Feed-In Law, and later, their vigorous opposition in the late 1990s was narrowly overcome by the growth of a remarkably broad advocacy coalition that engaged in an effective combination of protest tactics and routine politics.

To the extent that the neocorporatist-pluralist dimension is relevant to environmental outcomes, it should be studied as a process related to advocacy coalition formation,

and not only as a structural feature. In Germany, the rise of the Greens and the development of the climate policy advocacy coalition created changes in interest intermediation. During the social democratic-green government (1998–2005), environmental organizations in Germany gained more access to officials than before and gained influence on some aspects of climate policy.[111] This shift in the interest group system has continued beyond the tenure of that government, as the electricity utilities and their associations went into political decline after 2005, renewable energy interests created more centralized organizations, and increased transparency in environmental decision making benefited the environmental organizations.[112]

Finally, strategic choices and political conflict are also important in these changes, as shown by the changing position of business on climate policies. For the first fifteen years, German industry publicly endorsed the government's climate policy while more quietly resisting it, then shifted to a radical rejection of it during a burst of vigorous, high-profile opposition in 2005, and more recently moved toward a deeper acceptance of the government's policies. The political processes surrounding the 2005 election campaign can explain these rapid shifts. According to news reports and industry documents, two weeks before the Bundestag elections in September 2005, the DIHK and BDI hoped for a conservative-liberal majority to replace the social democratic-green government and went on the offensive against the government's climate and other environmental policies. They called on the federal government to give the "economic basis of sustainability" priority over Germany's international role as an environmental pioneer, to reduce the ecological tax, and to drop its target of a 40 percent reduction in greenhouse gas emissions by 2020.[113]

However, the business campaign was met with resistance from leaders in all the political parties, and the Bundestag election resulted in a grand coalition of Christian Democrats and Social Democrats.[114] Hence, industry abandoned its anti-climate policy offensive after the elections and moved toward greater acceptance of environmental policy. In 2007 the BDI created a climate policy initiative and commissioned a study by the consulting firm McKinsey, which argued that the wider adoption of available technologies would make it possible to reduce greenhouse gas emissions by 26 percent in 2020 (compared with 1990) at minimal cost.[115]

Rising Incomes and Consumption The final theoretical conclusion is that rising incomes and technological change, and the lack of government policies addressing them, deserve more attention in theories of environmental performance. Income and consumption should be treated as dynamic variables that are linked to political processes, rather than as structural features, as they have been in most large-N studies.

Increasing incomes and consumption and unregulated technological change tend to increase greenhouse gas emissions by increasing passenger car travel, road freight transportation, household heating and cooling, and electricity consumption. These trends, which were demonstrated in the German case, are quite general in rich, industrialized countries. For example, almost all of the twenty-two high-income OECD countries had substantial increases in passenger car travel and in road freight transportation

over the 1990–2004 period.[116] Electricity consumption also increased in all these countries, with a total rise of about 30 percent in the OECD European countries over the 1990–2008 period.[117] These increases in consumption tend to counteract any reductions in greenhouse gas emissions due to efficiency improvements. Governments in industrialized democracies generally have not undertaken strong policies to limit road transportation, electricity consumption, or the size of dwellings; and both the causes of their inaction and any exceptions deserve more study.

These findings also show that the effects of national income on environmental performance in the area of climate protection are deeply ambivalent. In the 1990s Jänicke and colleagues viewed climate change as a prosperity-pollution problem, which worsens as incomes rise because there is no available technical solution that does not adversely affect core economic interests. However, by the late 2000s, greenhouse gas emissions appeared to comprise a mixed case in the richest countries, fitting neither the prosperity-pollution nor the environmental Kuznets theories. By 2008 six high-income countries apparently had passed their peaks in greenhouse gas emissions (Germany, Britain, Sweden, Belgium, Denmark, and France), with declines of over 5 percent, yet eleven others remained on trajectories of increasing emissions, with increases of over 5 percent.[118] Moreover, climate protection is a mixed case within countries, too. This is shown by the German cases and by Jahn's recent study of twenty-one highly industrialized OECD countries, demonstrating that industrial CO_2 emissions follow an inverted U-shaped curve as incomes rise, while CO_2 emissions from transportation rise continuously.[119] Perhaps governments and industry in many countries follow an environmental Kuznets curve, while individual households collectively still follow a prosperity-pollution curve.

On the whole, high incomes have contradictory effects on climate policy outcomes. Affluence facilitates environmental performance by increasing post-material values, government capacity, and research and development capacity, but also leads to increased consumption in areas that are still closely coupled to emissions. This is supported by Klaus Armingeon's finding that the level of economic development is correlated with falling CO_2 emissions, while economic growth rates are correlated with rising emissions.[120]

Conclusion

This article has attempted to enhance the dialogue between large-N studies and case studies of environmental outcomes, seen as complementary approaches to developing theories. Case studies can help to show that processes such as dramatic external events, political interactions, and socioeconomic change are important, and hence that structural explanations are inadequate by themselves. Case studies also help delineate the multiple mechanisms and paths through which causal factors operate, and highlight the interactions between different factors, such as the ways that political processes modulate the effects of dramatic external events. Climate policy is a complex area, about which few scholarly studies of outcomes have been conducted so far. Hence, at this point we can benefit from country-specific studies that compare the effects of different

government interventions in reducing greenhouse gas emissions. With those in hand, we could carry out productive cross-national comparisons of successes and failures that draw on and improve existing theories of environmental outcomes.

Finally, the case study analyses carried out here suggest that present theories should be modified in several ways. External events and advocacy coalition formation should be included as key processes, and at least four specific causal paths through which green parties improve environmental quality should be investigated. Scholars must also examine the ways that neocorporatism can hinder environmental performance and that advocacy coalition formation can change patterns of interest intermediation. Finally, more attention should be paid to rising incomes and the lack of policies concerning household consumption as factors producing environmental deterioration.

NOTES

I thank Martin Jänicke, Rüdiger Wurzel, Helmut Weidner, Lutz Mez, Avi Gottlieb, Miranda Schreurs, Johannes Urpelainen, and the anonymous reviewers for *Comparative Politics* for their comments, suggestions, and help with sources. Thanks also to Miranda Schreurs for arranging for me to be a visiting researcher at the Environmental Policy Research Centre, Free University of Berlin, and to Hunter College, for providing funding through the Presidential Travel Award Program. Earlier versions of this article were presented at the Free University of Berlin in September 2009 and the APSA Annual Meeting in Washington, D.C. in September 2010.

1. For example, Miranda Schreurs, *Environmental Politics in Japan, Germany, and the United States* (New York: Cambridge University Press, 2002); Shizuka Oshitani, *Global Warming Policy in Japan and Britain* (Manchester, UK: Manchester University Press, 2006); Paul Harris, *Europe and Global Climate Change* (Northampton, MA: Edward Elgar, 2007); Hugh Compston and Ian Bailey, eds., *Turning Down the Heat* (New York: Palgrave Macmillan, 2008).

2. Those that do include Markus Crepaz, "Explaining National Variations of Air Pollution Levels," *Environmental Politics*, 4 (1995): 391–414; and Eric Neumayer, "Are Left-Wing Party Strength and Corporatism Good for the Environment?" *Ecological Economics*, 45 (June 2003): 203–20. These use CO_2 emissions per capita in 1990 or 2000 as dependent variables; however, these cannot capture the effects of recent policies. Two unpublished papers using measures of changes in emissions are Klaus Armingeon, "Encompassing Institutions and CO_2 Emissions"; and Detlef Jahn, "The Politics of Climate Change"; both were prepared for the ECPR Joint Sessions of Workshops, April 11–16, 2008, Rennes, France.

3. Cf. Michele Bättig and Thomas Bernauer, "National Institutions and Global Public Goods," *International Organization*, 63 (December 2008): 281–308.

4. Alexander George and Andrew Bennett, *Case Studies and Theory Development in the Social Sciences* (Cambridge, MA: MIT Press, 2005).

5. UNFCCC [United Nations Framework Convention on Climate Change], "National Greenhouse Gas Inventory Data for the Period 1990–2009," Submitted to the Subsidiary Body for Implementation, November 16, 2011, p. 15.

6. Joachim Schleich, et al., "Greenhouse Gas Reductions in Germany," *Climate Policy*, 1 (September 2001): 363–80; Axel Michaelowa, "Germany," *Climate Policy*, 3 (January 2003): 31–43; "German Climate Policy between Global Leadership and Muddling Through," in Hugh Compston and Ian Bailey, eds., *Turning Down the Heat* (New York: Palgrave Macmillan, 2008), pp. 144–63; Roger Karapin, "Environmental Performance and Ecological Damage," *German Politics and Society* (Autumn 2012), forthcoming.

7. A number of major studies of environmental outcomes were done in the mid- and late 1990s: Crepaz; Martin Jänicke and Helmut Weidner, *Successful Environmental Policy* (Berlin: Sigma, 1995); *National Environmental Policies* (Berlin: Springer Verlag, 1997); Jänicke, *Umweltpolitik der Industrieländer* (Berlin: Edition Sigma, 1996); Christian Ricken, *Determinanten der Effektivität der Umweltpolitik* (New York: Peter Lang, 1997); Detlef Jahn, "Environmental Performance and Policy Regimes," *Policy Sciences*, 31 (June 1998): 107–31; Lyle Scruggs, "Political and Economic Inequality and the Environment," *Ecological Economics*, 26 (September 1998): 259–75; Scruggs, "Institutions and Environmental Performance in Seventeen Western Democracies," *British Journal of Political Science*, 29 (January 1999): 1–31. However, less has been published since then, e.g., Neumayer; Scruggs,

Sustaining Abundance (New York: Cambridge University Press, 2003); Andreas Duit, et al., "Saving the Woodpeckers," *Journal of Environment and Development*, 18 (March 2009): 42–61.

8. For example, UNFCCC and the National Communications and National Inventory Reports, available at unfccc.int.

9. Ricken, pp. 40–41; Per-Olof Busch, Klaus Jacob, and Nana Künkel, "Modeling Environmental Capacities of Nation States," Paper presented at the Amsterdam Conference on the Human Dimensions of Global Environmental Change, May 24–26, 2007; Andreas Duit, "Understanding Environmental Performance of States," Quality of Government Working Paper 7, Göteborg University, 2005, p. 14.

10. The most important include Jänicke and Weidner, *Successful Environmental Policy*; *National Environmental Policies*; Crepaz; Jänicke, *Umweltpolitik der Industrieländer*; Jahn, "Environmental Performance," Scruggs, "Institutions"; *Sustaining Abundance*; Neumayer.

11. Exceptions include Neumayer; Jahn, "Politics of Climate Change."

12. George and Bennett, pp. 19–21.

13. Evan Lieberman, "Nested Analysis as a Mixed-Method Strategy for Comparative Research," *American Political Science Review*, 99 (August 2005): 435–52, at p. 440.

14. George and Bennett, pp. 20–21.

15. Duit, "Understanding Environmental Performance," p. 6.

16. For example, Scruggs, *Sustaining Abundance*; Jahn, "Environmental Performance."

17. Scruggs, *Sustaining Abundance*, pp. 13–14; Crepaz, pp. 391–92, 395–400; Neumayer, p. 205.

18. Crepaz, pp. 394–95; Scruggs, "Institutions," pp. 3–4; Oshitani, pp. 44–45; Jahn, "Environmental Performance," p. 119; Neumayer, p. 206.

19. Robert Falkner, *Business Power and Conflict in International Environmental Politics* (New York: Palgrave Macmillan, 2008), pp. 97–99.

20. Scruggs, *Sustaining Abundance*, ch. 5; "Institutions," pp. 30–31; Jahn, "Environmental Performance," p. 125; Crepaz; Ricken, pp. 205–10, p. 238.

21. Armingeon.

22. Neumayer, p. 219.

23. Michael Hatch, "Voluntary Agreements" in Hatch, ed., *Environmental Policymaking* (Albany, NY: SUNY Press, 2005), pp. 97–124, at 104; Hatch, "The Europeanization of German Climate Change Policy," Paper prepared for the EUSA Tenth Biennial International Conference, Montreal, Canada, May 17–19, 2007, pp. 8–9; Scruggs, *Sustaining Abundance*, pp. 222–23.

24. Christiane Beuermann and Jill Jäger, "Climate Change Politics in Germany," in Tim O'Riordan and Jäger, *The Politics of Climate Change* (London: Routledge, 1996), pp. 186–227, at p. 189.

25. Siaroff gives Germany a score of 4.125 for the 1990s, with other countries ranging from 1.875 to 4.625; cf. Alan Siaroff, "Corporatism in 24 Industrial Democracies," *European Journal of Political Research*, 36 (October 1999): 175–205. Scruggs ranks Western Germany as "strong/very strong," effectively at 3.5 on a scale of 1–4 (from very weak to very strong); cf. Scruggs, *Sustaining Abundance*, pp. 219–28. Thus, the Federal Republic of Germany would score 82 or 83 if either of these indices were placed on a 0–100 scale.

26. Jahn, "Environmental Performance," p. 124; Neumayer, p. 218.

27. Scruggs, "Institutions," pp. 27–28; Armingeon, p. 10.

28. Scruggs reviews the debate in *Sustaining Abundance*, pp. 56–62; see also Martin Jänicke, Harald Mönch, and Manfred Binder, "Umweltindikatorenprofile im Industrieländervergleich," in Jänicke, ed., *Umweltpolitik der Industrieländer* (Berlin: Edition Sigma, 1996), pp. 113–31.

29. Jänicke, Mönch, and Binder, pp. 129–30; Jänicke, *Megatrend Umweltinnovation* (Munich: Oekom Verlag, 2008), pp. 172–75.

30. Nemat Shafik and Sushenjit Bandyopadyhay, "Economic Growth and Environmental Quality," Background Paper for the World Development Report (Washington, DC: World Bank, 1992), p. 10; Jahn, "Politics of Climate Change."

31. However, Neumayer uses panel data to investigate the relationship between traditional left and green party strength and environmental outcomes.

32. Scruggs, *Sustaining Abundance*, pp. 111, 120.

33. Jahn, "Environmental Performance," pp. 123–25.

34. For example, Paul Sabatier, "An Advocacy Coalition Framework of Policy Change and the Role of Policy-Oriented Learning Therein," *Policy Sciences*, 21 (June 1988): 129–68; Sabatier and Christopher Weible, "The Advocacy Coalition Framework," in Sabatier, ed., *Theories of the Policy Process*, 2nd ed. (Boulder, CO: Westview Press, 2007), pp. 189–220; Martin Jänicke, "Trend Setters in Environmental Policy," *European Environment*, 15 (March 2005): 129–42, at p. 138; Gesine Jost and Klaus Jacob, "The Climate Change Policy Network in Germany," *European Environment*, 14 (February 2004): 1–15; Rie Watanabe, *A Comparative Analysis on Climate Policy Change Processes Between Germany and Japan*, Ph.D. Dissertation, Free University of Berlin, 2009.

35. Another main dimension of the theory, involving policy learning by coalition members, will not be treated here.

36. Sabatier and Weible, p. 202.

37. Sabatier, pp. 131–34.

38. Helmut Weidner and Burkard Eberlein, "Still Walking the Talk?" in Eberlein and Bruce Doern, eds., *Governing the Energy Challenge* (Toronto: University of Toronto Press, 2009), pp. 314–43, at pp. 319–21.

39. UNFCCC, pp. 9, 15; these data include the six Kyoto greenhouse gases while excluding contributions from land use, land use changes, and forestry.

40. This assumes a global budget of 1500 gigatons over the 2000–2049 period, a residual 25 percent risk of exceeding two degrees of warming, and an average world population of eight billion; the first two assumptions are from Malte Meinshausen, et al., "Greenhouse Gas Emission Targets for Limiting Global Warming to 2 Degrees C," *Nature*, 458 (April 30, 2009), pp. 1158–63. There is, of course, substantial uncertainty about such estimates.

41. Federal Republic of Germany, *Fourth National Report by the Government of the Federal Republic of Germany (4th National Communication)*, Report under the Kyoto Protocol to the United Nations Framework Convention on Climate Change, July 2006; *Fifth National Report by the Government of the Federal Republic of Germany (5th National Communication)*, Report under the Kyoto Protocol to the United Nations Framework Convention on Climate Change, n.d. [November 2010].

42. Schleich, et al.; BMU [Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit], *Erneuerbare Energien in Zahlen* (Berlin: *idem.*, 2011); Institut für Energie- und Umweltforschung and Öko-Institut, *Klimaschutzpotenziale der Abfallwirtschaft* (Berlin: *idem.*, January 2010); Stefan Bach, Michael Kohlhaas, and Barbara Praetorius, "The Effects of the Ecological Tax Reform in Germany," *Economic Bulletin*, 38 (May 2001): 165–70; Michael Kohlhaas, "Gesamtwirtschaftliche Effekte der ökologischen Steuerreform," Deutsches Institut für Wirtschaftsforschung, Berlin, August 2005; Hans–Joachim Ziesing, "*Milde Witterung lässt CO_2-Emissionen in Deutschland 2011 sinken*," *Energiewirtschaftliche Tagesfragen*, 62 (2012): 30–37.

43. Schleich, et al.; Geoffrey Kelly, *National Policy Choices for an International Problem*, Ph.D. Dissertation, Faculty of Commerce, University of Wollongong, Australia, 2008.

44. Unless otherwise specified, numbers are for the Kyoto greenhouse gases in megatons of CO_2-equivalent.

45. Hans-Joachim Ziesing, "Kräftiger Anstieg der CO_2-Emissionen in Deutschland," *Energiewirtschaftliche Tagesfragen* 61 (2011): 61–68, at Table 3.

46. Schreurs, *Environmental Politics*.

47. Michaelowa, "Germany," pp. 32–33; Umweltbundesamt, *Data on the Environment,* 2005 ed. (Dessau, Germany: *idem.*, 2005), pp. 27–28.

48. Jeannine Cavender and Jill Jäger, "The History of Germany's Response to Climate Change," *International Environmental Affairs*, 5 (1993): 3–18, at p. 11.

49. Christiane Beuermann, "Germany," in William Lafferty and James Meadowcroft, *Implementing Sustainable Development* (New York: Oxford University Press, 2000), pp. 85–111, at p. 100; Udo Kords, "Tätigkeit und Handlungsempfehlungen der beiden Klima-Enquete-Kommissionen des Deutschen Bundestages (1987–1994)," in Hans Günther Brauch, ed., *Klimapolitik* (Berlin: Springer, 1996), pp. 203–14, at p. 204; "Die Klima-Katastrophe – Ozon-Loch, Pol-Schmelze, Treibhaus-Effekt," *Der Spiegel* 1986/33 (August 11, 1986).

50. Mark Peplow, "Counting the Dead," *Nature*, 440 (April 20, 2006): 982–83, at p. 983.

51. Watanabe, Rie and Lutz Mez, "The Development of Climate Change Policy in Germany," *International Review for Environmental Strategies*, 5 (2004): 109–26, at p. 111.

52. Guri Bang, *Sources of Influence in Climate Change Policymaking*, Dr. Polit. thesis submitted to the Department of Political Science, University of Oslo, June 2003, p. 217.

53. These responses were also made possible by earlier political and policy developments, including the adoption of strong air pollution policies in the 1970s, the environmental movement and the rise of the Green party, and the rise of environmental issues such as nuclear power and "forest death" due to acid deposition in the 1970s and 1980s; cf. Weidner and Eberlein, pp. 318, 333.

54. Watanabe and Mez, p. 111.

55. Watanabe and Mez, p. 112; Jänicke, *Megatrend*, p. 92; Beuermann, pp. 100–01.

56. Bang, p. 107.

57. Volkmar Lauber and Lutz Mez, "Renewable Electricity Policy in Germany, 1974 to 2005," *Bulletin of Science, Technology and Society*, 26 (2006): 105–20, at pp. 105–06; Enquete Commission, "Dritter Bericht der Enquete Kommission Vorsorge zum Schutz der Erdatmosphäre, zum Thema Schutz der Erde," *Bundestag Drucksache*, 11/8030 (May 24, 1990), pp. 60, 392–439, 464–516, 854–55; Kords, pp. 205, 207.

58. Gerd Rosenkranz, "Alle reden vom Treibhaus – und bauen dran," *die tageszeitung*, March 3, 1990.

59. Enquete Commission, pp. 464–568; Bang, p. 103; "Klimagau auf 2000 Seiten," *die tageszeitung*, October 6, 1990; Watanabe, p. 146.

60. Beuermann, p. 101; Monika Ganseforth, "Politische Umsetzung der Empfehlungen der beiden Klima-Enquete-Kommissionen des Deutschen Bundestages (1987–1994)," in Hans Günther Brauch, ed., *Klimapolitik* (Berlin: Springer, 1996), pp. 215–24, at p. 219.

61. Bang, pp. 106–10.

62. Thomas Baylis, "Transforming the East German Economy," in Michael Huelshoff, Andrei Markovits, and Simon Reich, eds., *From Bundesrepublik to Deutschland* (Ann Arbor: University of Michigan Press, 1993), pp. 77–92, at pp. 83–89; Eric Owen Smith, *The German Economy* (New York: Routledge and Kegan Paul, 1994), pp. 478–99.

63. Watanabe and Mez, p. 115 and n. 11.

64. Edda Müller, "Differences in Climate Change Policies in Germany and the United States from a Political Science Perspective," *Energy and Environment*, 9 (1998): 463–77, at pp. 464–65.

65. Data from Statistische Ämter der Länder, *Umweltökonomische Gesamtrechnungen der Länder* (Düsseldorf: Landesamt für Datenverarbeitung und Statistik Nordrhein-Westfalen), October 2008, Table 8.4.

66. Michaelowa, "Germany," p. 38.

67. Umweltbundesamt, *Data on the Environment*, 38; Mischa Bechberger and Danyel Reiche, "Renewable Energy Policy in Germany," *Energy for Sustainable Development*, 8 (March 2004): 47–57, at p. 52.

68. BMU, pp. 12–13.

69. REN21, *Renewables 2011 Global Status Report* (Paris: REN21 Secretariat), 2011, p. 15.

70. Calculated from data in BMU, pp. 12, 16, 20, 22.

71. Bechberger, pp. 4–5.

72. Lauber and Mez, p. 106.

73. Ibid.

74. Staffan Jacobsson and Volkmar Lauber, "The Politics and Policy of Energy System Transformation," *Energy Policy*, 34 (February 2006): 256–76, at p. 265; Michaelowa, "German Climate Policy," p. 195; Watanabe, pp. 151–52, 160, 166, 179, 184.

75. Jänicke, "Trend Setters," p. 138; Helmut Weidner, "Environmental Policy and Politics in Germany," in Uday Desai, ed., *Environmental Politics and Policy in Industrialized Countries* (Cambridge, MA: MIT Press, 2002), pp. 149–202, at p. 182.

76. Bechberger and Reiche, p. 50.

77. Jacobsson and Lauber, p. 267.

78. Müller, pp. 472–73; Watanabe, pp. 157–58, 161.

79. Bailey, Ian, "'Voluntary' Environmental Agreements and Climate Policy," Paper presented at the Corporate Responsibility Research Conference, Dublin, September 3–5, 2006, p. 7; Watanabe, p. 172.

80. Heinrich Pehle, "Germany," in Mikael Andersen and Duncan Liefferink, eds., *European Environmental Policy* (New York: Manchester University Press, 1997), pp. 161–209, at pp. 187–88.

81. Kelly, p. 163; Michaelowa, "Germany," p. 5; Watanabe and Mez, p. 116; Susanne Rupp and Ian Bailey, "German Climate Change Policy Report," Internal Report, ESRC project Climate Change and Industry Reactions to New Environmental Policy Instruments, University of Plymouth, August 2003, 22–23; Hatch, "Voluntary Agreements," pp. 106, 112.

82. Weidner and Mez, p. 366.

83. Hatch, "Europeanization," p. 14; Bang, p. 229.

84. Bailey, p. 7; Hatch, "Voluntary Agreements," p. 105.

85. Steffen Hentrich, Patrick Matschoss, and Peter Michaelis, "Emissions Trading and Competitiveness," *Climate Policy*, 9 (May 2009): 316–29, at pp. 317, 324; Steffen Brunner, "Understanding Policy Change," *Global Environmental Change*, 18 (August 2008): 501–07, at p. 502; Michaelowa, "Germany," p. 37.

86. Watanabe and Mez, pp. 122–23.

87. Hatch, "Voluntary Agreements," p. 104.

88. Bang, p. 230.

89. Hatch, "Europeanization," pp. 18–19; Watanabe and Mez, p. 122; Michaelowa, "Germany," pp. 34–35.

90. Organisation for Economic Cooperation and Development, "Environmental Expenditure and Taxes," ch. 14 in OECD, *Environmental Data Compendium, 2006–2007* (Paris: *idem.*, 2007), p. 15.

91. Another, minor factor was the 3 percent rise in population, mostly due to immigration, spurred by the opening of borders after 1989. In addition, increased international trade helped increase emissions in certain ways, e.g., in the increase in road freight transportation noted below and in the decline of cogeneration due to competitive pressures produced by the EU-driven liberalization of electricity markets in 1997. In the latter case, heat generated by cogeneration plants fell by 19 percent from 1996 to 2000; from: Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft, *Arbeitsbericht 2003* (Frankfurt: *idem.*, 2003), 5; *Branchenreport 2006* (Frankfurt: *idem.*, 2006), p. 7; Michaelowa, "Germany," p. 37.

92. Ziesing, "Kräftiger Anstieg," Figure 3.

93. Data are for 1991–2003 and 1991–2007, respectively; from: Umweltbundesamt, *Data*; BVBS [Bundesministerium für Verkehr, Bau und Stadtentwicklung], *Verkehr in Zahlen 2008/2009* (Hamburg: DVV Media Group, 2008), pp. 212–13.

94. European Automobile Manufacturers' Association, *EU Economic Report* (Brussels: *idem.*, July 2011), p. 20.

95. Over the 1991–2005 period; from Umweltbundesamt, *Environmental Data for Germany*, 2007 ed. (Berlin: *idem.*, n.d. [2007]), p. 22.

96. The former over the 1991–2007 period and the latter over the 1991–2005 period; from: BVBS, pp. 236–37; Umweltbundesamt, *Environmental Data*, p. 23.

97. Jahn, "Politics of Climate Change," p. 23; Sachverständigenrat für Umweltfragen, *Umwelt und Strassenverkehr: Sondergutachten*, June 2005, pp. 74–75; BVBS, pp. 187, 189, 203; author's calculations based on 1990–2006 data.

98. Ziesing, "Kräftiger Anstieg," Table 4; Umweltbundesamt, *Environmental Data*, p. 24; the latter number is for the 1991–2005 period.

99. Federal Republic of Germany, *4th National Communication*, p. 134.

100. Over the 1990–2007 and 1990–2009 periods, respectively; from: Institut für Städtebau, Wohnungswirtschaft und Bausparwesen, "Pro-Kopf-Wohnfläche weiter gestiegen – Saarland mit 48 Quadratmetern weiterhin Spitze," *Hausbau Information*, 2008, No. 16 (6 October 2008), 2; Bundesministerium für Wirtschaft und Technologie, *Energie in Deutschland* (Berlin: *idem.*, August 2010), p. 23.

101. Sachverständigenrat für Umweltfragen, "Kontinuität in der Klimapolitik," September 2005, p. 12.

102. Sachverständigenrat für Umweltfragen, *Umweltgutachten 2008*, p. 125; Arbeitsgemeinschaft Energiebilanzen, "Auswertungstabellen zur Energiebilanz für die Bundesrepublik Deutschland: 1990 bis 2010," July 2011, Tables 4, 4.1, 4.2.1., 4.2.2.

103. Ziesing, "Milde Witterung," Table 4.

104. Wolfgang Eichhammer, et al., "Greenhouse Gas Reductions in Germany and the UK," Report prepared for the 6th Conference of the Parties (COP6), Bonn, July 16–17, 2001, pp. 27–28, 39.

105. Elim Papadakis, "Green Issues and Other Parties," in Eva Kolinsky, ed., *The Greens in West Germany* (New York: Berg, 1989), pp. 61–86; Miranda Schreurs, "Domestic Institutions and International Environmental Agendas in Japan and Germany," in Schreurs and Elizabeth Economy, eds., *The Internationalization of Environmental Protection* (New York: Cambridge University Press, 1997), pp. 134–61, at p. 153; Weidner, "Environmental Policy," p. 154.

106. Watanabe and Mez, pp. 117–18, 124; Hatch, "Europeanization," pp. 15–16.

107. Watanabe and Mez, pp. 121–22.

108. Scruggs, *Sustaining Abundance*, pp. 222–23; Bang, pp. 230–32.

109. Armingeon, p. 14.

110. *Contra* Crepaz, pp. 392–93.

111. Jost and Jacob, p. 15; Watanabe, p. 170; Frank Laird and Christoph Stepes, "The Diverging Paths of German and United States Policies for Renewable Energy," *Energy Policy*, 37 (2009): 2619–29, at p. 2627; Bang, pp. 221, 227, 231–32; Karl–Werner Brand, "Dialectics of Institutionalization," *Environmental Politics*, 8 (1999): 35–58, at pp. 51–52.

112. Laird and Stepes, p. 2627.

113. Deutscher Industrie und Handelskammertag, "Für einen Strategiewechsel in der Umweltpolitik," Position Paper, September 5, 2005; Bundesverband der Deutschen Industrie, "Mit Klimapolitik mehr Wertschöpfung in Deutschland erzeugen," Position Paper, September 2005.

114. Michael Schmidt, "Aufstand der grünen Bosse," *Der Tagesspiegel*, September 9, 2005; Gerd Rosenkranz, "Rauchzeichen aus der klimapolitischen Steinzeit," Background Paper, Deutsche Umwelthilfe, November 11, 2005.

115. McKinsey and Company, "Kosten und Potenziale der Vermeidung von Treibhausgasemissionen in Deutschland," September 2007, p. 14.

116. Organisation for Economic Cooperation and Development, "Transport," in OECD, *Environmental Data Compendium, 2006–2007* (Paris: *idem.*, 2007), Tables 3B, 3C. For passenger cars, the only exception was Luxembourg; for road freight, Luxembourg, Portugal, and Canada were exceptions.

117. International Energy Agency data, accessed March 22, 2010, at http://www.iea.org/stats/pdf_graphs/25ELEC.pdf.

118. Author's analysis of data in UNFCCC, "National Greenhouse–Gas Inventory Data," p. 15. Six others had roughly plateaued (i.e., were within 5 percent of their 1990 emissions): Luxembourg, the Netherlands, Finland, Italy, Japan, and Switzerland.

119. Jahn, "Politics of Climate Change," p. 6.

120. Armingeon, pp. 9, 11.