City University of New York (CUNY)

CUNY Academic Works

Publications and Research

Hunter College

2012

Explaining Success and Failure in Climate Policies: Developing Theory through German Case Studies

Roger Karapin
CUNY Hunter College

[How does access to this work benefit you? Let us know!](#)

More information about this work at: https://academicworks.cuny.edu/hc_pubs/652

Discover additional works at: <https://academicworks.cuny.edu>

This work is made publicly available by the City University of New York (CUNY).
Contact: AcademicWorks@cuny.edu

Published as Roger Karapin, "Explaining Success and Failure in Climate Policies: Developing Theory through German Case Studies," *Comparative Politics* 45 (October 2012), pp. 46-68.

Explaining Success and Failure in Climate Policies:
Developing Theory through German Case Studies

Roger Karapin
Department of Political Science
Hunter College and the CUNY Graduate Center
email: rkarapin@panix.com

December 2010 draft

Abstract

Theories of environmental outcomes have been developed mostly through large-N cross-national studies, which have a structuralist bias and do not include the mechanisms through which inferred causes operate. Structured, focused case studies can help overcome those limits by incorporating political processes and identifying causal mechanisms. Here, comparisons of climate policy outcomes within Germany are used to test and develop theory, by explaining the differences among nine cases with the help of process tracing. The findings suggest that environmental-outcome theories should be modified to include: external events and advocacy-coalition formation as key processes; multiple causal paths through which green parties improve environmental quality; more examination of the ways that neocorporatism can hinder environmental performance and that advocacy-coalition formation can change patterns of interest intermediation; and rising income and consumption as factors producing environmental deterioration in the absence of policies regulating consumption.

Keywords: advocacy coalitions; climate policy; consumption; external events; environmental

outcomes; environmental policy; Germany; green parties; greenhouse-gas emissions;
neocorporatism

Introduction

While many scholars have described and explained climate policies in rich industrialized countries,¹ there has been less work explaining the policy outcomes, i.e., changes in greenhouse-gas emissions.² This is surprising since environmental outcomes presumably 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 quite different from explanations of climate policies,³ 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.

Hence, the approach here is to begin with environmental outcomes (changes in greenhouse-gas emissions) and work backwards to causes, which include climate policies, other government interventions, the factors that shape policy-making and implementation, and other causes that affect emissions, such as socioeconomic trends. My aim is to contribute to theorizing about environmental outcomes in areas of persistent environmental problems, by conducting comparative analysis of nine cases within one country, defined mainly in policy and sectoral terms. This approach is meant to complement cross-national large-N studies and help overcome their limitations.⁴

Germany is a good country to study in order to develop and test theories of these phenomena, since it is the world's sixth largest greenhouse-gas emitter and a leader in reductions. It reduced its emissions by 22% from 1990 to 2008 and is on track to surpass its ambitious

Kyoto commitment of a 21% reduction in the 2008-12 period.⁵ Because its emissions reductions exceed those of all other Western countries, Germany is usually seen as a climate-policy success, but closer examination shows that it includes a mixture of partial successes and failures.⁶ Both are grist for the theoretical mill.

The next section will explain the importance of theorizing about environmental outcomes and using case-study evidence to do so, and will lay out the theoretical issues that the case study will address. Then, I briefly describe German climate policies and the immediate sources of Germany's reductions in greenhouse-gas emissions, in terms of nine cases that include areas of major success, relative failure, and stalemate. Next, I develop a causal explanation of each case in turn, searching for process mechanisms that have been left out of the cross-national studies and that could link theoretical factors to the outcomes. The conclusions will return to the theoretical issues raised initially.

Theories of Environmental Outcomes

Why outcomes? Why comparisons within one country? Why these theoretical issues?

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, it does not apply in the area of climate protection, since fairly reliable and consistent data on greenhouse-gas emissions in industrialized countries are available.⁸ Another argument against a focus on outcomes is that they are often influenced by factors out of the control of policy-makers, such as new technologies, industrial

restructuring, or recessions.⁹ While 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 policy making are involved in what appear to be extraneous factors. Examining *all* the causes of environmental outcomes may point toward unexpected 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 outcomes¹⁰ have several limitations. First, the studies are biased toward structural explanations based on geographic and socioeconomic structures or political institutions. Collectively, they find that the factors which most consistently correlate with national environmental outcomes are population density, income per capita, institutions that 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 often rely on cross-sectional rather than longitudinal data, which have difficulty capturing change.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 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 to develop theory, 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 did not specify any mechanisms, the case study suggests modification to the theory.¹⁴ Third, where scholars disagree about how a factor affects environmental outcomes, e.g., as for affluence, governmental institutions, or neocorporatism, case studies can provide good reasons for preferring one hypothesis over another on the basis of observed mechanisms. Fourth, case studies can also generate new hypotheses about the effects of combinations of variables, by examining how they interact in the generation of 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 paper, sectoral, policy, and east-west regional distinctions are used to identify nine cases within

Germany. When German climate policy is seen not a monotonic success to be explained, but rather as a patchwork of partial successes and partial failures, new variance can be identified and used to test and develop causal theories.

While 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 to this area and have advanced a wide range of causal factors, including geographic and economic structures, political and economic institutions, and political mobilization.¹⁶ To deal with this abundance, this paper will focus on four theoretical areas where the present case studies can help to specify mechanisms and adjudicate between contradictory findings.

Neocorporatist or 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 opposition and 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 freeriding 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 hence provoke broad opposition from economic interest groups, most of which are involved in the supply or consumption of fossil-fuel-based energy, including manufacturing industry. While some sectors would benefit from stronger climate policy (renewable energy, nuclear energy, and insurance), they 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 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 countries are assigned 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 Hence, if neocorporatism is a help or a hindrance to environmental performance, or both, this 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 Scruggs and Armingeon found only statistically insignificant effects.²⁷ The Greens have been relatively strong in Germany, holding more than 5% and an average of 7.5% of the Bundestag seats since 1983. Hence, in the case studies, I will examine whether this party's actions are linked to emissions reductions and, if so, will investigate the likely mechanisms. Since a correlation has been found between environmental outcomes and the vote shares or parliamentary seat shares of green parties, a 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. Jänicke and colleagues argue that improvements occur with rising incomes only if a relatively inexpensive technical solution is available for the problem, e.g., for reducing SOX 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 (e.g., in volatile organic chemical pollution, municipal waste, or deforestation), rising incomes lead to more pollution.

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 specific German cases will make it possible to explore whether and how rising income affect outcomes in this area.

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 examining change over time.³¹ For example, 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, 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, advocacy-coalition formation and development 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 coalition draw on specialists in a variety of governmental and private organizations, including government agencies, parties, parliaments, interest groups, non-profit 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 will consider whether advocacy coalitions can 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 22% in 2008, even before the surge in energy prices and worldwide recession in 2008-10 sharply reduced its emissions and those of most industrialized countries. Among western countries, only Britain's decrease of 18% came close to Germany's, and the performances of the entire EU-15 (-4%) and the U.S. (+17%) over this period were much worse than Germany's.³⁹

However, Germany's 22% aggregate reduction during the 1990-2008 period 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 how the most important interventions by the German government affected emissions, compared with "business as usual" scenarios, i.e., continued economic growth in the absence of the interventions. The table includes the most important policies that were designed to reduce emissions as well as other interventions that had significant effects. These figures rely on the estimates of government agencies, research institutes, and academic researchers; in one case where sources disagreed, I averaged their estimates.⁴⁰ Although they are affected by the

assumptions made about business-as-usual scenarios, the estimates are not very controversial and are plausible given the magnitudes claimed in relation to the absolute changes in emissions.

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.

Table 1: Estimated relative contributions of major government interventions to Germany's reductions in Kyoto greenhouse gas emissions, 1990-2008

Source of reduction or increase	Emissions reduced (-) or added (+) in MtCO ₂ eq/year	% of total emissions reductions attributable to government action (359.8 MtCO ₂ eq per year)
Eastern German economic transformation*	-112.9	31%
Renewable energy policies**	-109.0	30%
Waste regulations and biomass ordinance regarding methane	-30.0	8%
Voluntary agreement with adipic acid producers regarding NO ₂	-26.0	7%
Residential building ordinances	-24.3	7%
Ecological tax reform	-17.4	5%
Industrial ordinances for energy saving, cogeneration development	-15.0	4%
Transportation policies	-9.5	3%
Voluntary agreements with industry regarding CO ₂ and emissions trading	-8.4	2%
Coal mining regulations regarding methane	-7.3	2%
Subtotal: all reductions attributed to government action	-359.8	100%
CO ₂ reductions due to increased energy efficiency not driven by policies, reduced carbon content of fuel mix, other changes; reductions in other greenhouse gases not itemized above	-157.8	
Subtotal: all reductions (gross)	-466.8	
Increases due to growth in income per capita***	+214.7	
Increases due to growth in population***	+29.2	
Total net reductions 1990-2008	-273.7	

* through 2000; ** through 2008; *** energy-related CO₂ emissions through 2008; all other items are for the Kyoto gases estimated through 2010

In the first place, the table 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 109 Mt/year⁴¹ of reductions, respectively, and together represent 61% of the emissions reductions attributable to government interventions (see Table 1). In addition, there is a third successful policy to be explained: the setting of an ambitious reduction target of 25% of CO₂ emissions in 1990 (later modified to 21% of greenhouse-gas emissions), which underlay all the climate policies. Second, the table shows that three of Germany's most highly touted policies were largely ineffective: the ecotax, voluntary agreements with industry regarding CO₂ emissions, and emissions trading, which produced only modest reductions in emissions (totaling only 26 Mt/year, 7% of the total reductions). In fact, those policies achieved much less than did two unsung successes, methane reduction in landfills and the reduction of nitrous oxide emissions in the adipic acid industry (30 and 26 Mt/year, respectively); although deserving further research, they are beyond the scope of this article.

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 more than 28% from 1990 to 2008, and this increased annual CO₂ emissions by an estimated 215 megatons, more than counterbalancing the 160 megatons in reductions due to increased energy efficiency. As a result, emissions reductions in household heating, transportation, and electricity were much smaller than they otherwise would have been.

In the following sections, these nine cases of success and failure will be explained in ways that illuminate issues in theories of environmental outcomes (see Table 2). The three success

cases described above (target setting, eastern German transformation, and renewable energy) will be used to argue for the importance of external events and advocacy coalitions, and to specify the paths through which green parties matter. The three cases of flawed policy making (the ecotax, voluntary agreements, and emissions trading) will be analyzed to show the ways that neocorporatism can undermine environmental outcomes. Finally, the effects of socioeconomic trends on emissions in three sectors (household heating, transportation, and electricity) will be analyzed to show how increased consumption in the absence of government policies that regulate technological change can undermine climate-policy outcomes.

Table 2: Cases and Theoretical Issues Addressed

Type of Case	Policy Area	Theoretical Issues Addressed
Policies that were relatively successful	Target setting	External events, advocacy coalition, left-libertarian parties
	Eastern German economic transformation	External events
	Renewable energy	External events, advocacy coalition, left-libertarian parties
Policies that were relative failures	Voluntary agreements	Neocorporatism
	Emissions trading	Neocorporatism
	Ecological tax	Neocorporatism
Lack of policies to check increased consumption	Transportation	Increased consumption, technological change, international trade
	Household heating	Increased consumption
	Electricity	Increased consumption, technological change

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. In 1990, the German parliament and Christian-Democratic-led government agreed to cut national CO₂ emissions from energy use by 25% over the 1987-2005 period. Later, as part of the EU's burden sharing agreement, this goal was weakened somewhat, to a 21% reduction in the emissions of the six Kyoto-regulated greenhouse gases over the 1990-2010 period. Beginning in 2002, this target was supplemented with a target of a 40% reduction from 1990 to 2020, conditional on an EU commitment to 30% reductions in the same time frame.⁴² 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 (2005-09).

The 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 1985-86. In March 1985, the Vienna Convention on ozone-depleting substances was adopted and two months later, British scientists announced the discovery of ozone hole over Antarctica with an article in Nature, which spurred public attention to the issue.⁴³ Next, a January 1986 report by the respected German Physical Society warned of climate change and rising sea levels. This triggered much media coverage, which sparked public attention and fears.⁴⁴ 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.⁴⁵ Then, in December 1986, international negotiations on targets for ozone-depleting gases began, raising the political salience of both ozone and climate protection, issues which were often linked in public discourse at this time.⁴⁶ Driven by these events, public support for environmental protection reached a peak in the late 1980s.⁴⁷

In response to these events, a broad advocacy coalition for climate policy formed and achieved the adoption of ambitious emissions targets.⁴⁸ Two months after the Chernobyl accident, the conservative-liberal government, led by Helmut Kohl (CDU), created the Federal Environment Ministry, which strengthened those in the administration who favored ozone regulation and other global environmental policies.⁴⁹ In October the next year, the Bundestag created a parliamentary inquiry commission to examine ozone and climate change, headed by Bernd Schmidbauer (CDU).⁵⁰ As is typical, the commission consisted of experts and politicians from all parliamentary parties and operated mainly by consensus.⁵¹ In the area of climate protection, the commission integrated the results of 150 studies involving over 50 research institutes. Its final report called for Germany to reduce CO₂ and methane emissions by 30% compared with 1987 rates, comprehensively reform its energy policy, and adopt an electricity feed-in law to assist renewable energy, and established an interministerial working group on CO₂ reduction.⁵²

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.⁵³ The parties joined to endorse the commission's main recommendations, except on preserving nuclear energy as a solution to global warming, which the Christian Democratic and Liberal members endorsed but the Social Democrats and Greens opposed.⁵⁴

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% from 1987 to 2005, a goal reiterated in a unanimous Bundestag vote in November 1991.⁵⁵ The ambitious reduction goal became the basis of climate-protection policies adopted beginning in 1991.⁵⁶ Later, the 21% reduction target was a cornerstone of the government's broad climate-policy programs announced in 2000, 2005, and 2009.

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 the 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 political unification by 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.⁵⁷

These events and the policy responses to them sharply reduced greenhouse-gas emissions in the former East Germany. Emissions declined sharply due to a combination of industrial collapse, the ending of energy subsidies, privatization, and the subsidized restructuring of the energy sector. The extension of pre-existing policies to the new eastern states, such as the 1983 Ordinance on Large Combustion Plants (amended in 1990), also spurred the shutdown of lignite power plants. In addition, key actors in the economics and interior ministries helped shape the energy-policy aspects of unification.⁵⁸ 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 all central power plants, and investments in cogeneration facilities.⁵⁹ As a result, energy-related CO₂ emissions fell 41% in the eastern states from 1990 to 2004, with the entire decline occurring by 1996.⁶⁰

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 1991 Electricity Feed-In Law, which required utilities to purchase electricity from renewable sources at prices equaling 90% of consumer retail prices. 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.⁶¹

With the 2000 act, the German government set a target of doubling the share of electricity from renewable sources from 6.25% in 2000 to 12.5% in 2010.⁶²

These policies were very effective. Renewable-energy production grew at an average annual rate of 11% from 1997 to 2008 and had reached 9.5% of Germany's final energy production in 2008.⁶³ The 12.5% of electricity target was exceeded in 2007. Wind and biomass were responsible for almost all the increase; hydroelectric power was stable in this period, as was nuclear power. According to government estimates, renewable-energy production was avoiding 109 Mt of greenhouse-gas emissions per year by 2008.⁶⁴ Germany has been a leading country in renewable energy for the last two decades, ranking second in the world in total installed wind capacity and first in solar photovoltaic capacity in 2008.⁶⁵

Strong renewable-energy policies were adopted and effectively implemented because a strong advocacy coalition developed, partly in unpredictable ways, and the policies that it gained further strengthened the coalition. The 1991 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 an 1987 announcement by the electric utilities that they would no longer be increasing their payments for hydroelectric power, which put constraints on small hydro plants.⁶⁶ 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.⁶⁷

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.⁶⁸

Moreover, the 1991 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 4000 people to a demonstration in Bonn and defeated the proposed cuts in a Bundestag committee.⁶⁹

The advocacy coalition for renewable energy reached a new level of influence after the 1998 parliamentary elections, in which the Greens received 6.7% of the vote and joined in a national coalition government with the Social Democrats.⁷⁰ Under that government, a series of major climate policies were enacted, including a 100,000 roofs program for solar photovoltaic and the 2000 Renewable Energy Sources Act.⁷¹ 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.⁷²

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 CO₂ emissions, participation in the European emissions trading system, and ecological tax reform together produced only an estimated 26 Mt/year of reductions by 2010. The relative ineffectiveness of these policies was due largely to resistance by organized business interests, which gained major concessions in the policy-making phase and sometimes failed to comply in the implementation phase. This casts doubt on the argument that neocorporatism benefits environmental performance, which will be considered furthered in the conclusions.

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 EU 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.⁷³ Indeed, industry was able to extract four major concessions from both 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 1995-96 agreements, and no mandatory energy audit ordinance and no lifting of the ecotax's exemptions for industry in return for the 2000 agreements.⁷⁴

Moreover, the industrial associations insisted that the voluntary agreements be weak in several ways. Most important, the targets agreed to were mostly very unambitious. The reductions promised in 1995-96 were smaller than those indicated by the trend in increasing industrial energy efficiency since 1970. In fact, 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.⁷⁵ In addition, the agreements were not legally binding, and monitoring and compliance were sometimes weak. Although the German power industry agreed to reduce CO₂ emissions by 20 Mt/year through increases in cogeneration by 2005, instead, its emissions increased by 30 Mt/year.⁷⁶

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 15 trade associations, including the powerful association of electricity producers VDEW, and by 1996, the agreements covered associations responsible for 80% of industrial production.⁷⁷ The peak association BDI negotiated and signed the agreements, acting as intermediary between the government and individual trade associations.⁷⁸

For similar reasons, the outcomes of the first round of emissions trading (2005-07), 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.⁷⁹ Hence, industry and the energy sector gained overall reduction targets that were even smaller than those in the voluntary agreements, only about 1.5 Mt/year.⁸⁰

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% of the tax revenue to renewable-energy projects. In the first place, the BDI and DIHT strongly opposed any kind of energy or CO₂ tax unless it were done at the OECD level, in order to protect the competitiveness of German industry.⁸¹ 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.⁸² After Chancellor Kohl left office, the BDI and VDEW campaigned strongly against the tax when it was introduced in 1999 by the SPD-Green government led by Gerhard Schröder.⁸³

Lobbying 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% of the full rate, which was increased to 60% 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.⁸⁴ Moreover, the size of the tax is rather modest. It raised Germany's total environmental taxes only from 5.8% of tax revenue in 1998 to 7.3% in 2004, which placed the country only 12th out of 30 OECD countries.⁸⁵

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. Three major trends unfolded independently of climate policy in the 1990-2006 period:⁸⁶ a rise in income and household consumption, unregulated technological change producing new, energy-intensive products, and an increase in international competition and trade.⁸⁷ Together, these led to a 244 Mt/year increase in emissions, which offset emissions reductions due to increased energy efficiency.

Probably the most powerful socioeconomic process that tended to increase emissions was the rise in income. GDP per capita rose by 23%, and its effects, coupled with those of consumer culture, can be seen in many areas. Private car ownership increased by 21% and passenger-kilometers driven rose 24%. Moreover, due partly to trends in technology and marketing, new passenger cars became 41% more powerful and the share of four-wheel drive vehicles rose from 3% to 11% of the nation's fleet.⁸⁸ 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% to 85.4%.⁸⁹

Growth in freight transportation was even larger, with a 67% increase in freight volume (ton-kilometers). Road freight grew much faster (by 79%) than train or barge freight (which rose 16 and 30%, respectively). Hence, the share of freight hauled by trucks, which is associated with the highest emissions per ton-kilometer, rose from 62% to 70%.⁹⁰ As a result of the various trends toward physical growth in transportation, emissions in the transportation sector declined by only 7 Mt/year (4.5% of the baseline) -- in spite of large efficiency improvements, including a 20% decline in CO₂ emissions per kilometer in passenger cars over the 1991-2005 period.⁹¹

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.⁹² Hence living space per person rose by 15% from 1990 to 2005; together with a 3.4% population increase, this contributed to a 9% rise in residential fuel use.⁹³ These sources of increase offset some of the reductions in emissions due to energy-efficiency improvements and fuel switching away from lignite.⁹⁴ Hence total CO₂ emissions by households for heating declined only moderately, by about 16 Mt/year, or 12%.⁹⁵

In addition, unregulated technological change drove a 15% increase in total electricity consumption 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 electrical appliances, including air conditioning, cell phones, and other devices that are rechargeable or use energy in standby mode. Hence, they increased their use of electricity by 21%.⁹⁶ Similarly, the rise of information technology in offices, commerce, and industry produced an 18% increase in electricity consumption in the service sector and a 10% increase in manufacturing and mining.⁹⁷ These sources of increases offset the emissions reductions due to the energy sector's fuel switching away from lignite to natural gas; therefore, emissions in the electricity sector declined by only 7% from 1990 to 2007.⁹⁸

Theoretical Conclusions

External focusing events, advocacy coalitions, and structural change

These conclusions examine the theoretical issues raised earlier, each in light of those cases most relevant to it and with concern for issues that cut across the cases. The case studies have four main implications for theories of environmental outcomes, especially in areas with broad economic costs and high conflict potential, such as climate protection.

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. The relative strength of advocacy and opposing coalitions depends in part on their economic bases, with advocacy coalitions likely to gain strength as the renewable-energy and energy-efficient economic sectors grow. Hence, differentiated analyses of those economic bases are needed, and the ways that policy feedback affects economic sectors and their political organizations deserves more theoretical attention.

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 structural differences between East and West Germany in democracy, affluence, and pre-existing laws, as well as the availability of technical solutions to the problem of high emissions.

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., which is the Western country with the second greatest emissions reductions (down 18% from 1990 to 2008). There, 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, which produced about half of Britain's greenhouse-gas reductions over the 1990-2000 period.⁹⁹

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 the 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 the intense and sometimes violent conflicts over nuclear energy, led the established parties to try to make up for lost time. The Christian Democrats and Social Democrats quickly adopted environmental positions in an effort to contain or undermine the Greens. During the 1980s, the Christian Democrats moved strongly to regulate SOX emissions in an effort to limit forest dieback, while the Social Democrats backed off their earlier support for nuclear energy.¹⁰⁰ This set the stage for the consensus on climate policy that emerged in the inquiry commission in the late 1980s and the adoption of the feed-in law. 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 Greens.

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.¹⁰¹ 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% to 8.6%, strengthened its position within the coalition with the Social Democrats. After the election, the Greens successfully pressed for a further expansion of renewable energy, the adoption of a 40% emissions reduction goal, emissions trading, and a halving of the ecotax exemptions for industry, agriculture, and forestry.¹⁰²

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, 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 were largely relegated to pluralist-style pressure from the outside, assisted by the Greens and other members of the advocacy coalition.¹⁰³

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 counterbalanced by disadvantages. Business and labor 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.¹⁰⁴ As Armingeon writes, most or all producer groups may oppose environmental policies due to their perceived costs.¹⁰⁵ 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 the 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 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 1991 Feed-In Law, and later, their vigorous opposition in the late 1990s was narrowly overcome by the growth of an 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 SPD-Green government (1998-2005), environmental organizations in Germany gained more access to officials than before and gained influence on some aspects of climate policy.¹⁰⁶ The shift in the interest-group system has gone beyond the years of the SPD-Green government, with the electricity utilities and their associations in political decline since 2005, renewable-energy interests creating more centralized organizations, and increased transparency in environmental decision-making benefiting the environmental organizations.¹⁰⁷

Finally, strategic choices and political conflict are also important in these changes, as shown by the changing position of business on climate policies. German industry publicly endorsed the government's climate policy while more quietly resisting it for 15 years, 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 red-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% reduction in greenhouse-gas emissions by 2020.¹⁰⁸ 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 conservatives and Social Democrats.¹⁰⁹ 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% in 2020 (compared with 1990) at minimal cost.¹¹⁰

Rising incomes, consumption, and expanding international trade

The final theoretical conclusion is that certain common kinds of socioeconomic change in rich, Western, industrialized countries -- and the lack of government policy addressing them -- deserve more attention in theories of environmental performance. Increasing incomes, unregulated technological change, and the expansion of international trade 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. For example, almost all of the 22 high-income OECD countries had substantial increases in passenger car travel and in road freight transportation over the 1990-2004 period.¹¹¹ Electricity consumption also increased in all these countries, with a total rise of about 30% in the OECD European countries over the 1990-2007 period.¹¹² 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 2007, five high-income, western, industrialized countries had clearly passed their peaks in greenhouse-gas emissions (Germany, Britain, Sweden, Belgium, and France), yet 13 others remained on trajectories of increasing emissions.¹¹³ Moreover, climate protection is a mixed case within countries, too. This is shown by the German cases and by Jahn's recent study of 21 highly industrialized OECD countries, which shows that industrial CO₂ emissions follow an inverted U-shaped curve as incomes rise, while CO₂ emissions from transportation rise continuously.¹¹⁴ It appears that while governments and industry follow an environmental Kuznets curve, the mass of individual households still follow a prosperity-pollution curve.

Summary

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 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. Given the complexity of the climate-policy area and the dearth of outcomes studies, at this point we need more country-specific studies that compare the effects of different government interventions in reducing greenhouse-gas emissions. With those in hand, we could carry out more productive cross-national comparisons of successes and failures.

The case-study analyses done here suggest that present theories should be modified in four ways. External events and advocacy-coalition formation should be included as key processes, and there are at least four specific causal paths through which green parties improve environmental quality should be investigated. We also need to examine the ways that neocorporatism can hinder environmental performance and that advocacy-coalition formation can change patterns of interest intermediation. Finally, we need to place more attention on rising consumption and the lack of policies concerning it as factors producing environmental deterioration.

Notes

1. E.g., Schreurs 2002; Oshitani 2006; Harris 2007; Compston and Bailey 2008.
2. Those who do include Crepaz (1995) and Neumayer (2003), who use CO₂ emissions per capita in 1990 or 2000 as dependent variables; however, these cannot capture the effects of recent policies. Armingeon (2008) and Jahn (2008) use measures of changes in emissions.
3. Cf. Bättig and Bernauer 2009.
4. George and Bennett 2005.
5. UNFCCC 2008, 9.
6. Schleich, et al. 2001; Michaelowa 2003, 2008.
7. A number of major studies of environmental outcomes were done in the mid and late 1990s (Crepaz 1995; Jänicke and Weidner 1995, 1997; Jänicke 1996; Ricken 1997; Jahn 1998; Scruggs 1998, 1999), but less has been published since then (e.g., Neumayer 2003; Scruggs 2003; Duit, et al. 2009; Jahn 2008).
8. E.g., UNFCCC 2009 and the National Communications and National Inventory Reports available at unfccc.int.
9. Ricken 1997, 40-41; Busch, Jacob, and Künkel 2007; Duit 2005, 14.
10. The most important include Jänicke and Weidner 1995, 1997; Crepaz 1995; Jänicke 1996; Jahn 1998; Scruggs 1999, 2003; Neumayer 2003.
11. Exceptions include Neumayer 2003 and Jahn 2008.
12. George and Bennett 2005, 19-21.
13. Lieberman 2005, 440.
14. George and Bennett 2005, 20-21.
15. Duit 2005, 6.
16. E.g., Scruggs 2003; Jahn 1998.
17. Scruggs 2003, 13-14; Crepaz 1995, 391-92, 395-400; Neumayer 2003, 205.
18. Crepaz 1995, 394-5; Scruggs 1999, 3-4; [Oshitani 2006, 44-45;] Jahn 1998, 119; Neumayer 2003, 206.

19. Falkner 2008, 97-99.
20. Scruggs 2003, ch. 5; 1999, 30-31; Jahn 1998, 125; Crepaz 1995; Ricken 1997, 205-10, 238.
21. Armingeon 2008.
22. Neumayer 2003, 219.
23. Hancock 1989; Hatch 2005, 104; 2007, 8-9; Scruggs 2003, 222-23.
24. Beuermann and Jäger 1996, 189.
25. Siaroff (1999) gives Germany a score of 4.125 for the 1990s, with other countries ranging from 1.875 to 4.625; Scruggs (2003, 219-28) ranks Western Germany as "strong/very strong," effectively at 3.5 on a scale of 1-4 (from very weak to very strong). Thus, the Federal Republic would score 82 or 83 if these indices were placed on a 0-100 scale.
26. Jahn 1998, 124; Neumayer 2003, 218.
27. Scruggs 1999, 27-28; Armingeon 2008, 10.
28. Scruggs (2003, 56-62) reviews the debate; see also Jänicke, Mönch, and Binder 1996.
29. Jänicke, Mönch, and Binder 1996, 129-30; Jänicke 2008, 172-75.
30. Shafik and Bandyopadhyay 1992, 10; Jahn 2008.
31. However, Neumayer (2003) uses panel data to investigate the relationship between traditional left and green-party strength and environmental outcomes.
32. Scruggs 2003, 111, 120.
33. Jahn 1998, 123-25.
34. E.g., Sabatier 1988; Sabatier and Weible 2007; Jänicke 2005, 138; Jost and Jacob 2004; Watanabe 2009.
35. Another main dimension of the theory, involving policy learning by coalition members, will not be treated here.
36. Sabatier and Weible 2007, 202.
37. Sabatier 1988, 131-34.
38. Weidner and Eberlein 2009, 319-21.

39. UNFCCC 2010, 18; these data include the six Kyoto greenhouse gases while excluding contributions from land use, land use changes, and forestry. The EU-15 datum is for 2007 from UNFCCC 2009, 16.
40. UNFCCC 2010, 18; FRG 2006, 100-44; Eichhammer, et al. 2001, 15; Ziesing 2009, Fig. 3; Bach, Kohlhaas, and Praetorius 2001, 166 & Figure 1; BMU 2009, 20-24; Kelly 2008, 160. While the endpoint for estimates of many of the items is 2010, this makes little difference to the overall results since they are relatively small items; the endpoint for the unification estimate is 2000, since the reductions due to unification had all occurred by 1995 (Eichhammer, et al., 2001, 9-10).
41. Unless otherwise specified, figures are for the Kyoto greenhouse gases in megatons of CO₂ equivalent.
42. UBA 2005, 27-28.
43. Cavender and Jäger 1993, 11.
44. Beuermann 2000, 100; Kords 1996, 204; Spiegel 1986.
45. Peplow 2006, 983.
46. Watanabe and Mez 2004, 111.
47. Bang 2003, 217.
48. 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 '80s (Weidner and Eberlein 2009, 318, 333).
49. Watanabe and Mez 2004, 111.
50. Watanabe and Mez 2004, 112; Jänicke 2008, 92; Beuermann 2000, 100-1.
51. Bang 2003, 107.
52. Lauber and Mez 2006, 105-6; Enquete Commission 1990, 60, 392-439, 464-516, 854-55; Kords 1996, 205, 207.
53. Rosenkranz 1990.
54. Enquete Commission 1990, 464-568; Bang 2003, 103; tageszeitung 1990; Watanabe 2009, 146.
55. Beuermann 2000, 101; Ganseforth 1996, 219.

56. Bang 2003, 106-10.
57. Baylis 1993, 83-89; Smith 1994, 478-99.
58. Watanabe and Mez 2004, 115 & n. 11.
59. Müller 1998, 464-65.
60. Data from SAL 2008, Table 8.4.
61. Michaelowa 2003, 38.
62. UBA 2005, 38; Bechberger and Reiche 2004, 52.
63. BMU 2009, 20.
64. BMU 2009, 24.
65. REN21 2009, 24.
66. Bechberger 2000, 4-5.
67. Lauber and Mez 2006, 106.
68. Lauber and Mez 2006, 106.
69. Jacobsson and Lauber 2006, 265; Michaelowa 2005, 195; Watanabe 2009, 151-52, 160, 166, 179, 184.
70. Jänicke 2005, 138; Weidner 2002, 182.
71. Bechberger and Reiche 2004, 50.
72. Jacobsson and Lauber 2006, 267.
73. Müller 1998, 472-73; Watanabe 2009, 157-58, 161.
74. Bailey 2006, 7; Watanabe 2009, 172.
75. Kelly 2008, 163; Michaelowa 2003, 5; Watanabe and Mez 2004, 116; Rupp and Bailey 2003, 22-23; Hatch 2005, 106, 112.
76. Weidner and Mez 2008, 366.
77. Hatch 2007, 14; Bang 2003, 229.

78. Bailey 2006, 7; Hatch 2005, 105.
79. Hentrich 2009, 317, 324; Brunner 2008, 502; Michaelowa 2003, 37.
80. Watanabe and Mez 2004, 122, 123. Hence, any effects of emissions trading are already included in those attributed to the voluntary agreements.
81. Hatch 2005, 104.
82. Watanabe 2009, 156, 164-65.
83. Bang 2003, 230.
84. Hatch 2007, 18-19; Watanabe and Mez 2004, 122; Michaelowa 2003, 34-35.
85. OECD 2007, 15.
86. Unless otherwise indicated, numbers in this section refer to changes during this period.
87. Another, minor factor was the 3% rise in population, mostly due to immigration, spurred by the opening of borders after 1989.
88. Figures are for the period from 1990 or 1991 to 2006 or 2007, except those for car ownership, which are for 1991-2003 (ACEA 2008, 13, 15; BVBS 2008, 212-13; UBA 2005, 53).
89. UBA 2007, 22-23.
90. BVBS 2008, 236-37; UBA 2007, 23.
91. Ziesing 2009, Table 4; UBA 2007, 24.
92. FRG 2006, 134.
93. SRU 2008, 114; AGEB 2008, Table 4.2.1.
94. SRU 2005, 12.
95. SRU 2005, 12; Ziesing 2009, Table 4.
96. Michaelowa 2003, 41; SRU 2008, 125.
97. AGEB 2008, Tables 4.1, 4.2.2.
98. Ziesing 2009, Table 4.
99. Eichhammer, et al. 2001, 27-28, 39.

100. Papadakis 1989; Schreurs 1997, 153; Weidner 2002, 154.
101. Watanabe and Mez 2004, 117-18, 124; Hatch 2007, 15-16.
102. Watanabe and Mez 2004, 121-22.
103. Scruggs 2003, 222-23; Bang 2003, 230-32.
104. contra Crepaz 1995, 392-93.
105. Armingeon 2008, 14.
106. Jost and Jacob 2004, 15; Watanabe 2009, 170; Laird and Stepes 2009, 2627; Bang 2003, 221, 227, 231-32; Brand 1999, 51-52.
107. Laird and Stepes 2009, 2627.
108. DIHK 2005; BDI 2005.
109. Schmidt 2005; Rosenkranz 2005.
110. McKinsey 2007, 14.
111. OECD 2007, Tables 3B, 3C. For passenger cars, the only exception was Luxembourg; for road freight, Luxembourg, Portugal, and Canada were exceptions.
112. IEA data accessed 22 March 2010 at http://www.iea.org/stats/pdf_graphs/25ELEC.pdf.
113. Author's analysis of data in UNFCCC 2007, 2009. "Clearly past their peaks" means their 2007 emissions were below their 1995 and 2000 emissions and more than 5% below their 1990 emissions. Four others had roughly plateaued: Netherlands, Denmark, Switzerland, and Luxembourg.
114. Jahn 2008, 6.

Acknowledgements

I would like to thank Martin Jänicke, Helmut Weidner, Lutz Mez, Avi Gottlieb, Miranda Schreurs, and the anonymous reviewers for this journal for their comments, suggestions, and help with sources. Thanks to Miranda Schreurs also for arranging for me to be a visiting researcher at the Environmental Policy Research Centre, Free University of Berlin, where an earlier version of this paper was presented on 16 September 2009.

References

ACEA [European Automobile Manufacturers' Association], EU Economic Report. Brussels: idem., February 2008.

AGEB [Arbeitsgemeinschaft Energiebilanzen], "Auswertungstabellen zur Energiebilanz für die Bundesrepublik Deutschland: 1990 bis 2007," September 2008.

Armingeon, Klaus, "Encompassing Institutions and CO2 Emissions: Institutional and political solutions to collective action problems in comparative perspective," Paper for ECPR Joint Sessions, Rennes, 11-16 April 2008.

Bach, Stefan, Michael Kohlhaas, and Barbara Praetorius, "The Effects of the Ecological Tax Reform in Germany," Economic Bulletin 38 (May 2001), 165-70.

Bailey, Ian, " 'Voluntary' Environmental Agreements and Climate Policy," paper presented at the Corporate Responsibility Research Conference, Dublin, 3-5 September 2006.

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

Bättig, Michele and Thomas Bernauer, "National Institutions and Global Public Goods," International Organization 63 (2009), 281-308.

Baylis, Thomas, "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, 77-92.

BDI [Bundesverband der Deutschen Industrie], "Mit Klimapolitik mehr Wertschöpfung in Deutschland erzeugen, position paper, September 2005.

Bechberger, Mischa, "Das Erneuerbare-Energien-Gesetz (EEG)," FFU-report 00-06, Environmental Policy Research Centre, Free University of Berlin, 2000.

Bechberger, Mischa and Danyel Reiche, "Renewable Energy Policy in Germany," Energy for

Sustainable Development 8 (2004), 47-57.

Beuermann, Christiane, "Germany," in William Lafferty and James Meadowcroft, Implementing Sustainable Development. New York: Oxford University Press, 2000, 85-111.

Beuermann, Christiane and Jill Jäger, "Climate Change Politics in Germany," in Tim O'Riordan and Jill Jäger, The Politics of Climate Change. London: Routledge, 1996, 186-227.

BMU [Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit], Erneuerbare Energien in Zahlen. Berlin: idem., June 2009.

Brand, Karl-Werner, "Dialectics of Institutionalization," Environmental Politics 8 (1999), 35-58.

Brunner, Steffen, "Understanding Policy Change: Multiple streams and emissions trading in Germany," Global Environmental Change 18 (2008), 501-507.

Busch Per-Olof, Klaus Jacob, and Nana Künkel, "Modelling Environmental Capacities of Nation States," paper presented at the Amsterdam Conference on the Human Dimensions of Global Environmental Change, 2007.

BVBS [Bundesministerium für Verkehr, Bau und Stadtentwicklung], Verkehr in Zahlen 2008/2009. Hamburg: DVV Media Group, 2008.

Cavender, Jeannine and Jill Jäger, "The History of Germany's Response to Climate Change," International Environmental Affairs 5 (1993), 3-18.

Compston, Hugh and Ian Bailey, eds., Turning Down the Heat: The Politics of Climate Policy in Affluent Democracies. New York: Palgrave Macmillan, 2008.

Crepaz, Markus, "Explaining National Variations of Air Pollution Levels," Environmental Politics 4 (1995), 391-414.

DIHK [Deutscher Industrie und Handelskammertag], "Für einen Strategiewechsel in der Umweltpolitik: Erwartungen der Wirtschaft an die künftige Bundesregierung," position paper, 5 September 2005.

Duit, Andreas, "Understanding Environmental Performance of States," Quality of Government Working Paper 7, Göteborg University, 2005.

Duit, Andreas, et al., "Saving the Woodpeckers," Journal of Environment and Development, 18 (March 2009), 42-61.

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

Enquete Commission, "Dritter Bericht der Enquete Kommission Vorsorge zum Schutz der Erdatmosphäre, zum Thema Schutz der Erde," Bundestag Drucksache 11/8030 (24 May 1990).

Falkner, Robert, Business Power and Conflict in International Environmental Politics. New York: Palgrave/Macmillan, 2008.

FRG [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.

Ganseforth, Monika, "Politische Umsetzung der Empfehlungen der beiden Klima-Enquete-Kommissionen des Deutschen Bundestages (1987-1994)," in Hans Günther Brauch, ed., Klimapolitik. Berlin: Springer, 1996, 215-24.

George, Alexander and Andrew Bennett, Case Studies and Theory Development in the Social Sciences. Cambridge, Mass.: MIT Press, 2005.

Hancock, M. Donald, West Germany: The politics of democratic corporatism. Chatham, N.J.: Chatham House Publishers, 1989.

Harris, Paul G., Europe and Global Climate Change. Northampton, Mass.: Edward Elgar, 2007.

Hatch, Michael, "Voluntary Agreements: Cornerstone or Fig-leaf in German Climate Change Policy?" in Hatch, ed., Environmental Policymaking: Assessing the Use of Alternative Policy Instruments. Albany, N.Y.: SUNY Press, 2005, 97-124.

Hatch, Michael, "The Europeanization of German Climate Change Policy," paper prepared for the EUSA Tenth Biennial International Conference, Montreal, Canada, May 17-19, 2007.

Hentrich, Steffen, Patrick Matschoss, and Peter Michaelis, "Emissions Trading and Competitiveness," Climate Policy 9 (2009), 316-29.

Jacobsson, Staffan and Volkmar Lauber, "The Politics and Policy of Energy System Transformation: Explaining the German diffusion of renewable energy technology," Energy Policy 34 (2006), 256-76.

Jahn, Detlef, "Environmental Performance and Policy Regimes: Explaining Performance in 18 OECD Countries," Policy Sciences 31 (1998), 107-31.

Jahn, Detlef, "The Politics of Climate Change," Paper prepared for the ECPR Joint Sessions of Workshops, 11-16 April 2008, Rennes, France.

Jänicke, Martin, ed., Umweltpolitik der Industrielaender: Entwicklung -- Bilanz --

Erfolgsbedingungen. Berlin: Edition Sigma, 1996.

Jänicke, Martin, "Trend Setters in Environmental Policy," European Environment 15 (2005), 129-42.

Jänicke, Martin, Megatrend Umweltinnovation. Munich: Oekom Verlag, 2008.

Jänicke, Martin and Helmut Weidner, Successful Environmental Policy. Berlin: Sigma, 1995.

Jänicke, Martin and Helmut Weidner, National Environmental Policies: A Comparative Study of Capacity Building. Berlin: Springer Verlag, 1997.

Jänicke, Martin, Harald Mönch and Manfred Binder, "Umweltindikatorenprofile im Industrieländervergleich: Wohlstandsniveau und Problemdruck," in Martin Jänicke, ed., Umweltpolitik der Industrieländer: Entwicklung, Bilanz, Erfolgsbedingungen. Berlin: edition sigma, 1996, 113-31.

Jost, Gesine and Klaus Jacob, "The Climate Change Policy Network in Germany," European Environment 14 (2004), 1-15.

Kelly, Geoffrey, National Policy Choices for an International Problem: Case studies in greenhouse policy, Ph.D. thesis, Faculty of Commerce, University of Wollongong, Australia, 2008.

Kords, Udo, "Tätigkeit und Handlungsempfehlungen der beiden Klima-Enquete-Kommissionen des Deutschen Bundestages (1987-1994)," in Hans Günther Brauch, ed., Klimapolitik. Berlin: Springer, 1996, 203-14.

Laird, Frank and Christoph Stepes, "The diverging paths of German and United States policies for renewable energy," Energy Policy 37 (2009) 2619-29.

Lauber, Volkmar and Lutz Mez, "Renewable Electricity Policy in Germany, 1974 to 2005," Bulletin of Science, Technology and Society 26 (2006) 105-20.

Lieberman, Evan, "Nested Analysis as a Mixed-Method Strategy for Comparative Research," American Political Science Review 99 (2005), 435-52.

McKinsey and Company, "Kosten und Potenziale der Vermeidung von Treibhausgasemissionen in Deutschland," September 2007, at www.bdi.eu.

Michaelowa, Axel, "Germany: A Pioneer on Earthen Feet?" Climate Policy 3 (2003), 31-43.

Michaelowa, Axel, "German Climate Policy between Global Leadership and Muddling Through," in Hugh Compston and Ian Bailey, eds., Turning Down the Heat: The Politics of

Climate Policy in Affluent Democracies. New York: Palgrave Macmillan, 2008, 144-63.

Müller, Edda, "Differences in Climate Change Policies in Germany and the United States from a Political Science Perspective," Energy and Environment 9 (1998), 463-77.

Neumayer, Eric, "Are left-wing party strength and corporatism good for the environment?" Ecological Economics 45 (2003) 203-20.

OECD [Organisation for Economic Cooperation and Development], "Environmental Expenditure and Taxes," ch. 14 in Environmental Data Compendium, 2006-2007. Paris: idem., 2007.

Oshitani, Shizuka, Global Warming Policy in Japan and Britain. Manchester, U.K.: Manchester University Press, 2006.

Papadakis, Elim, "Green Issues and Other Parties," in Eva Kolinsky, ed., The Greens in West Germany. New York: Berg, 1989, 61-86.

Peplow, Mark, "Counting the Dead," Nature 440 (20 April 2006), 982-83.

REN21, "Renewables Global Status Report: 2009 Update." Paris: REN21 Secretariat, 2009.

Ricken, Christian, Determinanten der Effektivität der Umweltpolitik. New York: Peter Lang, 1997.

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

Rosenkranz, Gerd, "Rauchzeichen aus der klimapolitischen Steinzeit," Deutsche Umwelthilfe background paper, 11 November 2005.

Rupp, Susanne and Ian Bailey, "German Climate Change Policy Report," ESRC project Climate Change and Industry reactions to New Environmental Policy Instruments, Internal Report, University of Plymouth, August 2003.

Sabatier, Paul, "An Advocacy-Coalition Framework of Policy Change and the Role of Policy-Oriented Learning Therein," Policy Sciences 21 (1988), 129-68.

Sabatier, Paul and Christopher Weible, "The Advocacy-Coalition Framework," in Sabatier, ed., Theories of the Policy Process, 2nd ed. Boulder, Colo.: Westview Press, 2007, 189-220.

SAL [Statistische Ämter der Länder], Umweltökonomische Gesamtrechnungen der Länder: Fläche und Raum, Tabellenteil. Düsseldorf: Landesamt für Datenverarbeitung und Statistik NRW, October 2008.

Schleich, Joachim, et al., "Greenhouse Gas Reductions in Germany: Lucky strike or hard work?" Climate Policy 1 (2001), 363-80.

Schmidt, Michael, "Aufstand der grünen Bosse," Tagesspiegel, 9 September 2005.

Schreurs, Miranda, "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, 134-61.

Schreurs, Miranda, Environmental Politics in Japan, Germany, and the United States. New York: Cambridge University Press, 2002.

Scruggs, Lyle, "Political and Economic Inequality and the Environment," Ecological Economics 26 (1998), 259-75.

Scruggs Lyle, "Institutions and Environmental Performance in Seventeen Western Democracies," British Journal of Political Science 29 (1999), 1-31.

Scruggs, Lyle, Sustaining Abundance: Environmental Performance in Industrial Democracies. New York: Cambridge University Press, 2003.

Shafik, Nemat and Sushenjit Bandyopadhyay, "Economic Growth and Environmental Quality," Background Paper for the World Development Report. Washington, D.C.: World Bank, 1992.

Siaroff, Alan, "Corporatism in 24 Industrial Democracies," European Journal of Political Research 36 (1999), 175-205.

Smith, Eric Owen, The German Economy. New York: Routledge and Kegan Paul, 1994.

Spiegel, Der, "Die Klima-Katastrophe - Ozon-Loch, Pol-Schmelze, Treibhaus-Effekt: Forscher warnen," 1986/33, 11 August 1986.

SRU [Sachverständigenrat für Umweltfragen], "Kontinuität in der Klimapolitik -- Kyoto-Protokoll als Chance: Stellungnahme," September 2005, available at www.umweltrat.de.

SRU [Sachverständigenrat für Umweltfragen], Umweltgutachten 2008: Umweltschutz im Zeichen des Klimawandels (Hausdruck), June 2008.

tageszeitung, "Klimagau auf 2000 Seiten," die tageszeitung, 6 October 1990.

UBA [Umweltbundesamt], Data on the Environment: The State of the Environment in Germany, 2005 edition. Dessau, Germany: idem., 2005.

UBA [Umweltbundesamt], Environmental Data for Germany: Environmental Indicators, 2007

edition. Berlin: idem., n.d. [2007].

UNFCCC, "National Greenhouse Gas Inventory Data for the Period 1990-2005," Submitted to the Subsidiary Body for Implementation, 24 October 2007.

UNFCCC, "National Greenhouse Gas Inventory Data for the Period 1990-2006," Submitted to the Subsidiary Body for Implementation, 17 November 2008.

UNFCCC, ""National Greenhouse Gas Inventory Data for the Period 1990-2007," Submitted to the Subsidiary Body for Implementation, 21 October 2009.

UNFCCC, ""National Greenhouse Gas Inventory Data for the Period 1990-2008," Submitted to the Subsidiary Body for Implementation, 4 November 2010.

Watanabe, Rie, "A Comparative Analysis on Climate Policy Change Processes Between Germany and Japan," Ph.D. dissertation, Free University of Berlin, 2009.

Watanabe, Rie and Lutz Mez, "The Development of Climate Change Policy in Germany," International Review for Environmental Strategies 5 (2004), 109-26.

Weidner, Helmut, "Environmental Policy and Politics in Germany," in Uday Desai, ed., Environmental Politics and Policy in Industrialized Countries. MIT Press, 2002, 149-202.

Weidner, Helmut and Burkard Eberlein, "Still Walking the Talk? German Climate Change Policy and Performance," in Eberlein and Bruce Doern, eds., Governing the Energy Challenge: Germany and Canada in Multi-Level Regional and Global Context. Toronto: University of Toronto Press, 2009, 314-43.

Weidner, Helmut and Lutz Mez, "German Climate Change Policy: A Success Story With Some Flaws," Journal of Environment and Development 17 (2008) 356-78.

Ziesing, Hans-Jochen, "CO2-Emissionen in Deutschland im Jahr 2008 im Abschwung," Energiewirtschaftliche Tagesfragen 59 (April 2009), accessed at www.et-energie-online.de on 28 October 2009.