Environment, Wealth, and Authority: Global Climate Change and Emerging Modes of Legitimation

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A central feature of modernity is that state authority has been conceived as resting on the consent of the governed, which in turn depends upon governments' ability to promote economic prosperity. The performance criteria upon which political authority has been judged in large part are positively correlated with the exponential growth in the use of fossil fuels. An international scientific consensus has emerged: the burning of fossil fuels will cause global climate change sometime in this century. This suggests that the authority of science presents a challenge to a key source of the state's political authority: its role as guarantor of wealth production. Moreover, since the real impact of global climate change will not be felt for several decades, the notion of intergenerational responsibility is implicit in contemporary efforts to reduce greenhouse gas (GHG) emissions. Given that the liberal notion of political authority entails consent of currently living self-interested citizens, efforts to promote intergenerational responsibility suggest that the basis of political authority is being revised by efforts to cope with global environmental degradation.

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The Argument

With the manmade patchwork of territorial states standing in apparent contradistinction to the web of nature, efforts to cope with transnational and global environmental degradation are generally construed as posing a challenge to state sovereignty. Yet the popular "erosion-of-sovereignty" thesis fails to disaggregate a complex and variegated set of domestic and international pressures on states to engage in environmental protection (Conca 1994). Sovereignty may be understood as comprising three interrelated yet conceptually distinct elements: autonomy, control, and authority (Litfin 1997). Control, like power, is the ability to produce an effect. Autonomy, or independence, is closely related to control since genuine independence requires some degree of power. Changes in authority, or the legitimate exercise of power, are the most difficult to measure because of the intersubjective nature of legitimacy. Of the three, autonomy is most obviously reduced by ecological interdependence and international environmental cooperation. Problems such as acid rain, marine pollution, ozone depletion, and climate change, in a sense representing nontraditional forms of foreign intervention, also undercut states' ability to control events within their own territorial jurisdiction. On the other hand, efforts to cope with environmental degradation may require enhanced state capacity, or control. Thus, rather than diminishing some monolithic principle of sovereignty, international environmental responses typically involve trade-offs among autonomy, control, and authority (Litfin 1997).

The "erosion-of-sovereignty" thesis is most commonly articulated with respect to the dimensions of control and autonomy, rarely taking into consideration questions of authority. Political authority is generally conceived as the recognized right to make rules or to wield power legitimately (Weber 1947:153). As such, it contains a strong normative component, albeit one that is reinforced by control and autonomy. Domestically, a state's authority depends upon its citizens *believing* in the legitimacy of its institutions; internationally, it rests substantially on *recognition* by other states. Authority, whether granted internally or externally, entails a perception of rightfulness, although what counts as "rightful" could include superior virtues or expertise, historical pedigree or practice, consent or a fiduciary relationship. This paper examines the impact of scientific authority on political authority for one global environmental problem: climate change.

Of the three dimensions of sovereignty, authority is the most problematic for international relations (IR) theorists both because of its intersubjective character and because of its close association with state–society relations. Conventional models of the state as a rational unitary actor preclude a focus on either of these factors. Consequently, IR theorists have tended either to rely on overly juridical notions of authority linked to states' standing in international law or

else collapse authority into power or control. One could certainly argue that these approaches have never been adequate, that the international arena has always been ordered according to consensually legitimated norms (Wendt 1992; Katzenstein 1996) and that states' authority with respect to their international behavior has always required some degree of consent from their citizens. Even putting these claims aside, conventional approaches to authority in IR are utterly deficient in the face of both transnational societal pressures and efforts to address global environmental problems. The politics of global climate change, perhaps more so than any other international issue, highlight the emergence of new patterns of authority rooted in scientific legitimation and Earth stewardship.

A central feature of modernity, and one that has been neglected by IR scholars, is that state authority has been conceived as resting on the consent of the governed. While the Westphalian order legitimated the power of monarchs within territorially delineated jurisdictions, and to that extent gave birth to the modern notion of sovereignty, its authoritative basis was conceived more in terms of "divine right" than any notion of popular consent. The Treaty of Westphalia may have established the territorial state,[2] but it did not establish the modern state as we know it. The whole meaning of democracy in the modern era is that state authority is grounded upon the consent of the governed, which in turn is institutionalized through fair and open elections. Modernity, especially in the second half of the twentieth century, has been substantially about the spread of democracy, or the notion that rightful political authority depends upon consent of the governed (Huntington 1991; Shin 1994).

Political authority based upon consent takes two forms: an acceptance of the deep constitutional principles of a polity, and popular support for (or at least acquiescence to) the governmental policies, a distinction that grows out of the distinction between state and government. Were we to reduce legitimacy to its constitutional foundations, democratic elections would lose their significance as the key mechanism through which consent is granted or revoked. Although it is true that modern states rarely undergo full-scale revolutions, we should not therefore assume that all matters of political authority have been settled. Indeed, some have argued that globalization in its various guises is precipitating an authority crisis for the state—not just for specific governments (Rosenau 1990; Strange 1996). While that argument is beyond the scope of this paper, the key point is that modern political authority rests upon consent of the governed, and consent refers not only to the deep constitutional principles of the state but also to the actual performance of governments. More concretely, the performance criteria according to which the modern state is judged derive from its dual role as guarantor of territorial integrity and wealth production. In the absence of

[2] Although even this is debatable. See Buena de Mesquita's article in this volume.

major threats from foreign aggressors, elections tend to be decided on the basis of key economic performance criteria: jobs and economic growth. Moreover, rule based upon consent of the governed is increasingly an international norm (Franck 1992).

Throughout the industrial era, economic performance has been positively correlated with exponential growth in fossil fuel production—first from coal and later from petroleum and natural gas. Besides generating local and regional pollution, the burning of fossil fuels emits large quantities of carbon dioxide, which scientists believe is the primary greenhouse gas responsible for global climate change. Aside from a small handful of dissenters, the scientific community has urged governments to take action to reduce greenhouse gas (GHG) emissions. Barring a major technological shift in the direction of alternative energy resources or a dramatic commitment to energy efficiency, the authority of science can therefore be interpreted as being deployed to challenge a key source of the state's political authority: its role as guarantor of wealth production. Thus, while the 1997 Kyoto Protocol requiring industrialized countries to reduce greenhouse gas emissions by seven to eight percent by 2012 may be relatively meaningless in terms of ameliorating climate change, it is nonetheless remarkable as evidence of a tangible commitment of political leaders to the authority of climate science.

This interplay between scientific and political authority is of great interest not only because of its policy relevance to the future ecological health of the planet, but also because of the theoretical issues raised by the juxtaposition of these two rather different forms of authority. The authority of science rests on its claim to objective, disinterested, and verifiable knowledge, whereas political authority rests on the consent of the governed and is exercised on the basis of power. Because of its unrivaled status as universal legitimator in the modern era, science may facilitate international cooperation. Yet, for the same reason, political actors on all sides have an incentive to deploy it on behalf of their policy goals, with the ironic outcome that the demand for legitimation results in a process of delegitimation (Litfin 1994). Once science enters the political fray, especially for a high-stakes issue like global climate change, it risks being perceived as contaminated and thereby losing its authority. The Intergovernmental Panel on Climate Change (IPCC), the scientific body charged with producing periodic international assessments on global climate change, has continually faced these dilemmas since its inception in 1988. Yet it has managed, for the most part, to maintain its authority. If the international agenda of the twenty-first century is increasingly concerned with science-driven questions, as we have good reason to assume that it will be, then the experiences of the IPCC offer an important precedent for understanding the evolution of authority.

The climate change issue also highlights an anomaly with respect to prevailing accounts of political authority rooted in liberal notions of consent. Even

if scientists have detected "a discernible human influence on climate" (IPCC 1996:5), the brunt of that influence will not be felt until sometime in the next fifty to one hundred years. The modern notion of consent refers to the sanction of *contemporary* self-interested citizens who not only accept the deep constitutional principles of the polity but also evaluate their government's performance in fostering security and prosperity. Claims about intergenerational responsibility are foreign to liberal notions of consent and political authority, yet efforts to address climate change hinge, either explicitly or tacitly, upon such claims. In their efforts to induce governments to adopt meaningful reductions in greenhouse gas emissions, both scientists and nongovernmental organizations are in effect revising the basis of political authority to include obligations to future generations. To the extent that these efforts are successful, the performance criteria according to which governments are evaluated entail safeguarding the welfare of those who cannot voice their consent: the unborn. If political authority in the modern era has rested on the consent of the governed, such a shift would represent a meaningful reorientation of the basis of state authority.

In the following section, I argue that IR theorists, with their focus on interstate relations, have traditionally ignored the consensual dimension of authority. They have generally evaded the troublesome question of legitimacy either by adopting a juridical conception of authority or by conflating authority with power and control. While external factors (e.g., recognition by other states or the ability to exercise legitimate leadership in the international arena) are significant sources of authority, the internal bases of authority are equally important, perhaps even more so. Indeed, if democratic governance is becoming a normative rule in the international system, as some have argued it is (Franck 1992), then IR scholars will be compelled to include public consent in their notions of authority, legitimacy, and sovereignty. Under a pluralist system, a government that fails to protect the state's territorial integrity or enhance the production of wealth will likely find itself out of office, a fact that is no less true in the international arena than in domestic politics. Thus, authority should be grasped in internal and popular terms as well as external and statist terms.

Authority in IR Theory

Authority should not be confused with power or control; they may facilitate authority, they do not supply legitimacy. Authority in the Western tradition of political thought is construed as the *rightful* governance of human action by means other than coercion or persuasion (Arendt 1968:92; Friedman 1990:63). Hannah Arendt offers a colorful illustration: "Its hallmark is unquestioning recognition by those who are asked to obey; neither coercion nor persuasion is needed. (A father can lose authority either by beating his child or by starting to argue with him, that is, either by behaving like a tyrant or by treating him as an

equal)" (1970:45). The core question is: What constitutes rightfulness? Increasingly in the modern era, that question has been answered in terms of consent of the governed and institutionalized through democratic elections.

Authority is a vexing concept for international relations theorists because of its intersubjective character and its close association with state-society relations. Legitimacy, which is key to the modern notion of authority, depends upon the extent to which those addressed by a rule understand themselves as being obliged by it, rather than merely coerced by whatever power created and supported the rule (Stokke 1997:48; Franck 1990). Legitimacy therefore requires a reflective subject capable of judging whether an action, rule, or proposal is in accordance either with its interests or else with established rules, principles, or standards. That requirement, which is not particularly problematic in the domestic context of pluralist democracies, becomes much more so in the international arena. Citizens, unlike states, are reflective subjects.

IR theorists have generally sidestepped the thorny question of legitimacy by either embracing a juridical model of authority or by conflating authority with power. For those taking the former approach, legitimacy is externally derived from gaining recognition from other states or by having standing in international law (Bull and Watson 1982; James 1986). While this conception at least recognizes the normative character of legitimacy, it ultimately rests on interstate rather than state-society relations; the latter are effectively blackboxed. This juridical conception of authority reduces legitimacy to "the collective judgement of international society about rightful membership in the family of nations" (Wight 1977:153). Even if they fail to incorporate citizens into their conceptions of authority, with the attendant risk that international relations appears as a set of practices devoid of people, these theorists at least recognize that authority (and thus sovereignty) rests ultimately on normative grounds.

The other tack, most commonly taken by realists, is to conflate authority with power or autonomy. Even Thomson (1995), who emphasizes the analytical distinction between authority ("the claim to the exclusive right to make rules") and control ("the capability of enforcing that claim"), leaves the normative basis of the state's "exclusive right" indeterminate. Consequently, the distinction she attempts to articulate becomes blurred as authority slides over into control. A kind of solipsism emerges here, such that a state's authority is legitimated by the behavior or perceptions of other sovereign states, rendering citizens invisible.

Properly speaking, the state is a reification that neither acts nor judges. Governments, individual leaders, and policymakers are the real actors in international politics and, at least in modern democracies, their political fate is intimately tied to the consent of the governed. There is no reason to presume that they forget this fact when they turn their attention to the international arena. Indeed, the pervasive background presence of electorates in international nego-

tiations can be profoundly influential. Proponents of two-level game approaches recognize that negotiators are constrained simultaneously by domestic and international factors (Putnam 1988). Ultimately, political leaders depend upon the consent of their citizens in order to retain their positions of power. In the modern era, the mechanism for granting that consent has been elections.

While "consent" entails a number of thorny practical and philosophical problems, it has nonetheless enjoyed considerable staying power in political thought, even serving as the principal basis for international political obligation.[3] Yet problems abound. Philosophical anarchists argue that consent, which entails autonomy, conflicts with the abdication of autonomy implicit in accepting authority, thereby concluding that no authority can be morally legitimate (Wolff 1990).[4] Social contract theorists and their critics have wrestled with the practical question of how consent is granted (Pateman 1980; Greenwalt 1990; Lincoln 1991). Critical theorists contend that "the notion of consent tends to equalize the positions of subjects and obscures the asymmetry of power relations between the governed and the governed" (Cutler 1999:65). Feminist theorists have challenged the notion of the atomistic individual and highlighted the invisibility of women in notions of authority based upon consent (Pateman 1988; Jones 1993).

Other than the anarchist challenge, which would abolish political authority altogether, the full range of critique paradoxically serves to reinforce the sense that consent remains central to legitimate political authority. Consent may require more than an originary covenant; we may have trouble measuring it; the disempowered members of society may not have truly given it. Nonetheless, it remains a touchstone for discerning legitimate political authority, for the aim of theorists and critics alike is "to develop a doctrine of political authority which makes its legitimacy conditional on the existence of a population which regards the government as its representative" (Raz 1990:17).

The notion of popular sovereignty, so critical to domestic politics, is nonexistent in traditional approaches to international relations. Yet the dramatic increase in transnational citizen activity over the past two decades suggests that the field must begin to consider the impact of popular participation on international patterns of authority (Keck and Sikkink 1998). There is no *a priori* rationale for confining democratic practices to the territorial container of the state (Connolly 1993). That they were so restricted in the past was a result of

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[3] International law explicitly depends upon the consent, in the form of signing and ratification, of sovereign states. See Linklater 1982.

[4] For a response to the anarchist dilemma based upon the similarities between political authority and the authority of experts, see Raz 1990. For communitarian responses, see Green 1990 and Dworkin 1990.

specific historical conditions that are now changing under the dynamic processes variously referred to as globalization (Held 1995). This is one of the implications of the literature on global civil society (Peterson 1992; Lipschutz 1996) and world civic politics (Wapner 1996). Transnational environmental activism is not merely about the growing importance of nonstate actors, but it is also about the emergence of new modes of legitimation and the recognition of new authorities.

Transnational environmental activism may be understood as an attempt to modify existing authority relations by erecting alternative criteria for legitimation (McCormick 1989). At its most fundamental level, the politics of environmental accountability seeks to inculcate a sense of intergenerational responsibility at all levels of social organization, a norm that would significantly reconfigure state sovereignty. As Edith Brown Weiss (1989) argues, only areas beyond any national jurisdiction have been considered global commons. But from the intergenerational perspective, the planet is a global commons shared by all generations, such that those of us living today are bound by a "planetary trust" that entails certain rights and obligations. At least implicitly and even though it is not monolithic, transnational environmentalism aims to transform the modern conception of authority to include not only popular legitimacy, which has emerged in tandem with the spread of democracy, but also intergenerational and even interspecies criteria of accountability.

Before turning to an analysis of political and scientific authority and a subsequent examination of the politics of global climate change, the following section looks briefly at the historical origins of sovereignty and the territorial state. While the Treaty of Westphalia did promote the emergence of the territorial state, the modern notion of sovereignty developed later. Rather, the foundations of modern political authority were laid by thinkers and activists in Restoration England who conceptualized it in terms of consent of the governed. The twin principles of territoriality and consensual authority, both central to the modern conception of sovereignty, have important yet neglected implications for an era in which the human species has become a geophysical force.

Westphalia and the Modern State in Ecological Perspective

In innumerable international relations courses, the signing of the Treaty of Westphalia in 1648 is cited as the birth of the nation-state and the origin of the modern conception of sovereignty. Yet this account is only partially correct. The Thirty Years' War, which devastated central Europe, began as a civil war between Protestants and Catholics and devolved into a continent-wide scramble for political power and territory. The Treaty's primary objectives were to

rectify debts incurred during the war; to reestablish lineages of heirs; and to reconcile religious practice with political authority, with the latter having the greatest significance for the development of the modern nation-state." "To prevent for the future any Difference arising in the Politick State," rulers were granted "free exercise of Territorial Right, as well as Ecclesiastick" (Article LXIV). The rights of monarchs and princes included making and interpreting laws, declaring war, imposing taxes, and forging alliances (International Law Database). Thus, the norm of territorial exclusivity, which is central to the modern notion of sovereignty and had been blocked by the continental predominance of the Holy Roman Emperor, was advanced at Westphalia. Yet only a handful of the political entities sanctioned by the Treaty were recognizable as nation-states. For two centuries after Westphalia, Europe remained a hodgepodge of states, city-states, and other principalities (Spruyt 1994).

The carving up of Europe, and eventually the entire planet, into a patchwork of mutually exclusive territorial states is modernity's political rendering of nature. Nature is not inherently constituted so as to become subject to state sovereignty, but rather must first be mapped and constructed as territory (Kuehls 1998). Maps are powerful political documents, yet they have little or no relation to ecosystems and geophysical processes. Territoriality presumes that political authorities can address, if not solve, problems that arise within their specific jurisdictions, a presumption rendered problematic under conditions of global ecological interdependence. Territorial exclusivity stands in sharp contrast to the outlook of global ecology, based on holism and the mutual dependence of Earth's ecosystems (Ruggie 1993).

By itself, the territorial state did not articulate a fully modern conception of sovereignty. Rather, Westphalia signified the Age of Absolutism (Anderson 1974). While the Westphalian order enshrined the political and religious authority of princes within their own jurisdictions, and to that extent gave birth to the modern system of mutually exclusive territorial states, the basis of that right was conceived more in terms of "divine right" than any notion of popular consent. That basis was being laid in England, which was isolated from the bloody war on the continent but experienced its own civil war between the constitutionalists and monarchalists from 1642 to 1646. Despite being an absolutist, Thomas Hobbes, whose *Leviathan* was published in 1651, is widely considered the father of modern political thought. Rather than founding his theory of political authority on any considerations of religion, tradition, or even brute force, Hobbes deduced the political rights and obligations from the interests of atomistic individuals. Individuals in the state of nature, conceived by Hobbes as bundles of matter in motion driven by their desire for power yet also capable of authoring their own actions, experience life as "nasty, short, and brutish." Thus, they enter into a "covenant," or a transfer of authority from individuals to an all-powerful sovereign who becomes the "author" of their actions (Hobbes 1976

[1651]:217, 222). In Restoration England, even the monarchicalist Hobbes found it necessary to root his conception of authority in the consent of the individual. Moreover, in contrast to the organic worldview linking the individual to God in a "great chain of being," Hobbes conceived of both the state and the individual as machines, and may thus be considered a founder of modern thinking on the basis of his contribution to a mechanistic worldview (Merchant 1990).

While Hobbes may deserve the title of "father of modern political thought" on the basis of his radical individualism and his secular materialism, the constitutionalists' understanding of the basis of political authority has been far more influential in the modern era. For them, consent was not a once-and-for-all occurrence; rather, it could be revoked. In his *Two Treatises of Government,* published in 1690, John Locke argued that the purpose of the state is to protect men's fundamental rights, most importantly the right to property. Consequently, citizens are entirely justified in overthrowing any government that systematically violates these rights. Locke's thinking, which had a direct influence on the American and French Revolutions, encapsulated two core ideas of modern political thought: the viability of both popular revolutions and parliamentary democracy as the means of ensuring that political authority is grounded in citizens' consent.

Locke's approach to ethics and his conception of property rights are also noteworthy for their ecological implications. For Locke, ethical action entails the pursuit of pleasure. Because "man has property in his own person," he therefore owns whatever he mixes his labor with (1965: 328–9). Thanks to the invention of money, men can pursue pleasure by accumulating wealth without letting nature's goods spoil. Taking a less secular approach than Hobbes, Locke also grounds his understanding of individual property rights in Biblical injunction. Because He commanded man to "subdue the Earth," God gave the world "to the use of the Industrious and Rational" (333). Land that is left to nature, for Locke, is wasted. (Likewise, those who are not industrious and rational are not truly human and can therefore be justifiably treated as animals.) Given that communal ownership of land was the norm throughout most of the world at the dawn of modernity, the liberal theory of "possessive individualism" represented a major change requiring the sort of rhetorical justification offered by Locke. Combining the various strands of Locke's thought, political authority is premised upon the state's ability to guarantee property rights and thereby facilitate market relations, and ethical action involves both the conquest of nature and the pursuit of pleasure. Acting upon these premises in a world of finite resources will inevitably produce dire ecological consequences at some point in time. Thus, Locke's ideas on both political authority and the relationship between humans and nature have found a comfortable home in modernity.

Although the Westphalian order enthroned the right of princes to exercise political and ecclesiastical authority within specified jurisdictions, and to that

extent gave birth to the modern system of mutually exclusive territorial states, the basis of that right was conceived as "divine right" rather than popular consent. From Hobbes onward, both in terms of political theory and the founding constitutions of states, the basis of state authority has been explicated in terms of citizens' consent. Historically, the material basis of that consent was conceived in terms of a range of goods that the state could be expected to provide, especially common defense and protection of property rights. Thus, the authority of the modern state derives from its role as guarantor of territorial integrity and wealth production. This does not preclude the possibility of states failing to fulfill these expectations, for many have so failed. Robert Jackson's analysis of "quasi-states" suggests that the authority of many Third World states derives more from their international recognition than from their indigenous capacity to facilitate wealth production (1990). Yet the fact that their authority comes more from external than internal sources does not diminish the crucial importance of the latter. It is precisely the deficit in indigenous capacity and consensual authority that engenders political instability in many of these countries.

Since the Great Depression, states' authority (at least in the West) has rested substantially on governments' ability to protect their citizens from the vagaries of markets, which in turn has required greater collaboration in the management of international economic transactions (Polanyi 1944). As a consequence of this shift in expectations, state authority has been internationalized to some extent (Ruggie 1993). Moreover, the persistence of rule-governed behavior in international relations offers strong circumstantial evidence for the proposition that international law and regimes are generally accepted as legitimate (Franck 1990). Nonetheless, the internal legitimacy of state authorities varies according to citizens' assessment of their performance. Elections are decided in large measure on the basis of key economic performance criteria: joblessness and economic growth. Edward Tufte (and others) find a tight correlation between incumbent electoral results and changes in real disposable income per capita (1974:139–148). Put bluntly, "It's the economy, stupid!" Whatever political leaders' commitments to international institutions and ethical responsibility might be, performance criteria remain crucial.

Authority, Political and Scientific

From the seventeenth century onward, and from left to right across the political spectrum, Western thought has been characterized by an overarching faith in science. The belief in the authority of science to improve human life is perhaps the quintessential hallmark of modernity, a belief that is reinforced by the material achievements of industrialization (Ezrahi 1990; Heineman 1994). During the second half of the twentieth century, that belief spread across the globe (Finnemore 1993).

The relationship between scientific and political authority is many-faceted. That the rise of liberal understandings of political authority during the seventeenth century paralleled the rise of modern science is not coincidental. Liberal political theory was informed by a mechanistic worldview that understood nature as composed of atomistic components. Indeed, the Newtonian image of particles in motion was the guiding metaphor in the emerging liberal conception of "possessive individualism" (MacPherson 1962). Consent was to be granted by atomistic individuals who "owned" the "property" of themselves. Thus, science and politics were grounded in the same ontological assumptions, even if their practices were conceived as distinct. The replicability of scientific experiments means that, at least in principle, knowledge can be obtained by anyone, regardless of class, nationality, or political persuasion. Thus, there is a strong link between democratic thought and modern science.

Interestingly, although the appeal of science throughout modernity has rested on its supposed access to objective truth, the liberal notion of consent also pervades science. Scientific truths are those that enjoy a consensus within a scientific community. Authoritative knowledge claims are those that enjoy a scientific consensus, suggesting that any capable scientist who applies the scientific method will reach the same conclusion. Science is conceived as functioning in a rather rarefied atmosphere, immune to the vagaries of political power and subjective opinion, but, as in politics, consensus stands as the touchstone of authority. The role of consensus, a social process, in generating authoritative knowledge claims raises the possibility that science might be tainted by nonscientific forces such as peer pressure, the power of tradition, the desire for funding, or socio-psychological identities (Kuhn 1962; Ziman 1968; Keller 1985).

Though science is an inherently social institution, the important point is that it is *perceived* as operating in a different realm and according to very different norms than politics. This perception, prevalent among both policymakers and the general public, is a crucial source of scientific authority. The dynamics of bargaining, coercion, and manipulation that characterize political practice contrast dramatically with the disinterested pursuit of truth, which is thought to characterize science. Therefore, if the authority of science depends upon its perceived isolation from social and political forces, then the deployment of scientific knowledge in the policy realm jeopardizes its legitimacy. The image of scientific knowledge as an objective and value-free source of competence makes it a powerful source of legitimation for all sides in a policy debate. In its application to policy problems, science thus finds itself in a double bind: In addressing socio-physical problems it must enter the political fray, but if it is to preserve its legitimacy it must remain isolated from politics. This dilemma is especially acute for environmental policy problems, which often depend upon science to both identify and address them.

The authority of science is inevitably undermined by uncertainty. Responsible policymakers, in order to make the best decisions, require as much certainty as possible, yet policy relevance typically has the ironic effect of increasing uncertainty. Scientific uncertainty is not an isolated dimension of environmental problems, for it casts its shadow across all aspects of a problem. Under conditions of uncertainty, the gravity of the problem is in dispute; actors cannot easily infer their preferences; proposed control measures may fail to alleviate the problem; and specific dramatic events may or may not be related to the issue at hand.

Uncertainty is far greater in certain fields than in others. Stephen Cole contrasts the *core* of a scientific discipline, which enjoys the greatest legitimacy, with research at the *frontiers* of the discipline (Cole 1992). Controversy, including policy-relevant controversy, generally involves science beyond the core. Eugene Rosa and Thomas Dietz (1998) add to Cole's typology the notion of scientific *horizons*—not simply an incremental extension from a disciplinary core to its frontiers, but a qualitative leap beyond the core. Horizon science, which is typically transdisciplinary, may involve discovery of a new problem or new tools to understand an old problem, or it may approach a problem at a wholly different level of abstraction. Because uncertainty is greatest for horizon science, its perceived legitimacy in policy-relevant questions should be especially low.

As Rosa and Dietz argue, global climate change qualifies as horizon science in several respects. It is certainly transdisciplinary. Since the world's climate involves a continually changing and highly complex set of relations, climate research faces severe obstacles in linking theory and empirical evidence. Climate science relies heavily on elaborate computer models, which convert fundamental laws from Newtonian mechanics and thermodynamics (core science) into long strings of mathematical equations, which are then applied to each of many thousands of cells of a planetary grid representing the earth's atmosphere. The most sophisticated of these models are General Circulation Models (GCMs), whose accuracy is tested by comparing their "predictions" of past global climate with historical data. Modeled predictions of future climate change are based upon incorporating current and projected greenhouse gas emissions into GCMs. Because of gaps in the data (e.g., cloud behavior; methane and emissions due to agricultural practices in developing countries; the ability of the oceans to absorb atmospheric CO_2), GCMs should be viewed as "heuristic devices rather than reality maps" (Elzinga 1997:79). Whether or not the models' predictions are valid cannot be known until sometime in the future, but they currently constitute the most authoritative knowledge available to guide climate change policy.

Science both renders the invisible visible and extends the temporal horizons of citizens and policy actors. As one long-time analyst of international environ-

mental problem solving observes, "Science makes the environment speak. Without science, trees have no legal standing, ecosystems degrade unrecognized, and species are lost without our knowing" (Moltke 1997:265). Science interjects an intergenerational time frame into environmental policy discussions, especially with respect to climate change. Without scientists' predictions based upon computer models, climate change would not even exist as a political issue.

Because scientists do not expect the real impact of human-induced climate change to be felt until sometime towards the middle of the next century, action to ameliorate the problem therefore must be justified primarily on grounds of intergenerational responsibility. But, as I have argued above, the modern notion of political authority rests on consent of the governed, with performance criteria being largely focused on the promotion of economic well-being. Thus, the authoritative knowledge claims of climate science appear to impinge directly upon a significant source of state authority.

If, as argued above, social and political controversy erodes the authority of policy-relevant science, then this should be especially true for climate change science. Unlike past transnational environmental problems, such as acid rain, whaling, or ozone depletion, which involved relatively small segments of economic activity, the sources of climate change are seemingly ubiquitous. More importantly, the primary greenhouse gas, carbon dioxide (CO_2), is a by-product of fossil fuel consumption, which in turn has been positively correlated with economic growth for the past two hundred years. Since climate change uniquely touches the heart of industrial society, we may anticipate that states would strongly resist any proposals to reduce greenhouse gas emissions. Granted that the economic growth of some countries depends on fossil fuel use less than others, and that some countries (especially small island states) can expect to be more negatively affected than others, we would expect most states to protect their principal long-standing sources of wealth production. Furthermore, given the significant uncertainties in both the models and the data, we might expect some strong challenges to the authority of climate science—not just from interest groups like the automobile, coal, and petroleum industries, but also from states themselves.

Yet, as I argue below, an international political consensus has emerged that recognizes the authority of climate change science. Moreover, the precautionary principle, which affirms that in the face of scientific uncertainty, regulators should act to prevent harm rather than wait until damage occurs (Bodansky 1991), has figured prominently in international discussions of climate change, and has been formalized in the Framework Convention of Climate Change. This embryonic norm legitimated the negotiation of the 1997 Kyoto Protocol, the first international regulatory treaty addressing climate change. While statements about intergenerational responsibility are found in earlier documents, such as the 1992 Rio Declaration and Agenda 21, the Kyoto Protocol raises the

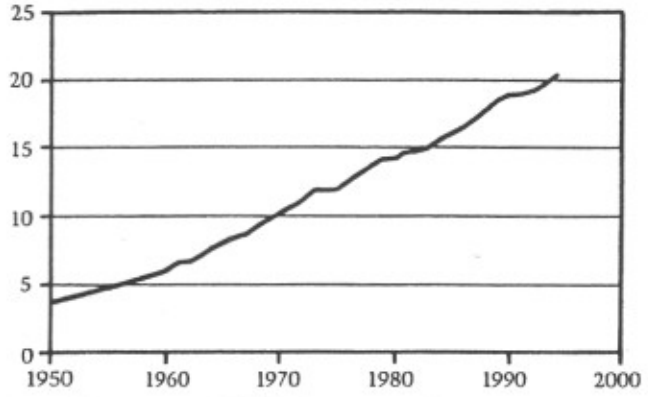
bar because, once ratified, it is a binding treaty rather than a statement of principles or a guide to action.[5] Thus, the Kyoto Protocol offers some tentative evidence for the emergence of a new international norm of intergenerational responsibility, a norm that could have momentous implications for political authority in the twenty-first century.

Fossil Fuels, Wealth, and National Interests

The close correlation between economic growth and fossil fuel consumption is striking. In Europe and North America the first wave of industrialization was fueled by coal, with petroleum taking the lead in most Western countries during the twentieth century. Where abundant, coal is still widely used, but petroleum is the primary fuel of the world's economy because it is more easily traded and is used for transportation. Despite the fact that petroleum is relatively cleaner than coal, both in terms of local pollution and climatic effects, the exponential increase in its consumption contributed to a worldwide quadrupling of greenhouse gas emissions between 1950 and 1995. This corresponds to a quadrupling of Gross World Product during the same period (see Figures 1 and 2). Not surprisingly, given the close relationship between energy production and economic prosperity, governments have heavily subsidized the fossil fuel industry, albeit to a lesser degree in Western Europe than North America (Koplow 1993).

Nor, given the historical dependence of wealth production on greenhouse gas emissions, is it surprising that proposals to reduce the latter have encountered strong resistance. In 1988, scientists estimated that stabilizing atmospheric concentrations of carbon dioxide at then-current levels would mean reducing fossil fuel use by 50 to 80 percent, bringing it back to 1950 levels (Flavin 1990:20). Two years later, U.S. economist William Nordhaus put the cost to the United States alone of halving greenhouse gas emissions at $180 billion (Nordhaus 1990a; 1990b), a calculation that figured prominently in a subsequent National Academy of Sciences study (NAS 1991). While the most detailed analyses have been done for the United States, most country studies suggest that the costs of reducing greenhouse gas emissions will be substantial (Grubb et al. 1991). Even the small emissions reductions adopted in the Kyoto Protocol, ranging from 5 to 8 percent, have caused alarm in some quarters. According to critics, "if implemented, the treaty would force the most productive societies on earth—the ones that have led the way in making human life comfortable, safe, and prosperous—to slow their economic growth and degrade their standard of living" (Jacoby 1998). While certain state governments have an especially strong interest in opposing greenhouse gas reductions (e.g., OPEC

[5] I am grateful to Matthew Auer for clarifying this point.

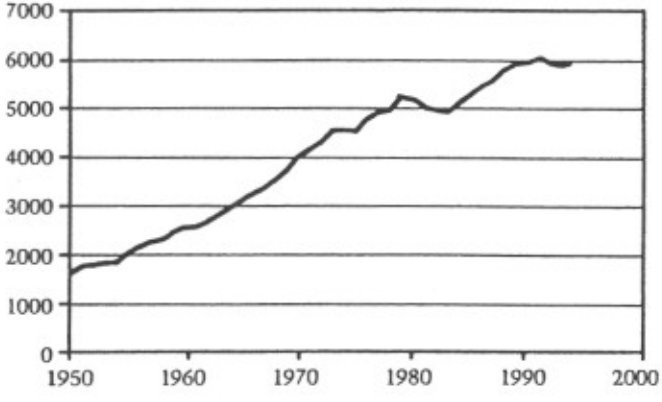


Source: Lester Brown, Nicholas Lenssen, Hal Kane, *Vital Signs 1995*. New York: Norton, 1995.

FIGURE 1. Gross World Product, 1950–94 (in trillions of 1987 U.S. dollars)

countries and the highest per capita consumers), *all* countries are utterly dependent on fossil fuels. Thus, in the absence of scientific claims about climate change, no country would have an obvious interest in reducing its use of fossil fuels.

At first glance, the Kyoto Protocol's requirement that industrialized countries reduce their greenhouse gas emissions by 5 to 8 percent by 2012 may seem minimalist. Yet this would be a serious misreading of the treaty's practical and symbolic significance. Given that projected emissions would have been 30 per-



Source: Lester Brown, Nicholas Lenssen, Hal Kane, *Vital Signs 1995*. New York: Norton, 1995.

FIGURE 2. World Carbon Emissions from Fossil Fuel Burning, 1950–94 (in millions of tons)

cent higher, the protocol actually requires meaningful reductions from where they would have been (Bolin 1998). Moreover, the Kyoto Protocol should not be viewed as the last word, but rather as an important first step. From toxic waste trade to ozone depletion, global environmental regimes have been negotiated and amended on an incremental basis. Thus, Kyoto sets the course for future developments. Given the close correlation between wealth production and fossil fuel consumption, explanations of the climate change regime based upon traditional economic interests cannot account for the general willingness of industrialized countries to commit themselves to reducing greenhouse gas emissions. That willingness, even for the most reluctant countries like the United States, can only be explained on the basis of scientific authority.

The International Authority of Climate Change Science

Although the theory of the "greenhouse effect," caused by the radiation-trapping properties of certain gases, is one of the oldest and most widely accepted theories in the atmospheric sciences, global warming has only recently become an international policy problem (Elzinga 1997). As early as 1896, the Swedish scientist Svante Arrhenius calculated that a doubling of carbon dioxide would increase average global temperatures by 6°C, an estimate that was remarkably close to those of today's computer models (Rodhe et al. 1997). Until 1957, however, most scientists believed that the oceans would absorb virtually all anthropogenic CO_2. In that year, two scientists concluded that only half of the CO_2 produced by humans was being absorbed by the oceans. In an oft-repeated phrase, they declared that "mankind is conducting a great one-time geophysical experiment" (Revelle and Suess 1957:27). This dire warning, however, attracted neither policy attention nor research funding until the emergence of environmentalism in the 1970s (Hart and Victor 1993). Concern was amplified in the 1980s by the discovery that other trace gases, including methane, chlorofluorocarbons (CFCs), and nitrous oxides, would nearly double the warming trend expected from CO_2 alone (Kellogg 1987).

The level of political involvement by climate change scientists is unprecedented in global environmental politics, a fact that could arguably decrease the authority of their knowledge claims. While scientists were responsible for putting acid rain, ozone depletion, and climate change on the political agenda, only on the last issue have they spoken out in large numbers—even in the face of significant uncertainties. Beginning in the mid-1980s, scientific conferences generated a plethora of declarations in favor of serious, concrete efforts to reduce greenhouse gas emissions. Prior to the formation of the IPCC, scientific conferences in Villach and Bellagio during the 1980s called for a rapid reduc-

tion in the use of fossil fuels, for increasing energy efficiency by 50 percent, and for a cessation of deforestation, with the objective of limiting the rate of global warming to 0.1°C per decade (WMO 1985). At the Toronto Conference on the Changing Atmosphere, over three hundred scientists and policymakers called for reducing carbon dioxide emissions by 20 percent of 1988 levels by 2005. Although the declaration was considered quite sweeping, the 20 percent target, which scientists believed would fall far short of stabilizing the atmosphere, was a matter of political feasibility (WMO 1988). The U.S. EPA, for instance, estimated that stabilizing atmospheric concentration of CO_2 at 1988 levels would require reducing greenhouse gas emissions by 50 to 80 percent, putting them at 1950s levels (Flavin 1990:20).

Given the persistence of significant uncertainties, this intensity of political activism by scientists is somewhat surprising. The puzzle can be explained in terms of the *character* of the scientific uncertainties and the *precautionary values* of the scientists. First, for the most part, the uncertainties revolve around the *timing* and the *degree* of anticipated climate, not *whether* climate change will occur. The models differ somewhat in their predictions of future climate, and (until the mid-1990s) most climate experts declined to pinpoint the precise timing in order to avoid the embarrassment of having to explain the inevitable cold years. Nonetheless, there has been a broad consensus for over a decade that humanity is moving the climate into uncharted territory. Second, the values implicit in scientists' policy recommendations reflect an underlying precautionary approach—a belief that it is unwise to tamper with the global climate system in ways that might induce conditions with which the human species has no experience. One important set of uncertainties, "climate change surprises," could include disturbances of the gulf stream and possible triggering of an ice age in the Northern Hemisphere (Kerr 1998).

Within months of the Toronto conference, the IPCC was established in 1988 by the WMO and UNEP, with a twofold mandate reflecting its existence in two worlds: 1) to assess both available scientific information on climate change (Working Group [WG1]) and the environmental and socioeconomic impacts of climate change (WGII); and 2) to formulate "realistic response strategies" for managing climate change (WGIII). The IPCC assessment reports, peer-reviewed and prepared by international expert communities, also include user-friendly executive summaries for the policy community. In 1990, the First IPCC Assessment Report was accepted as the scientific basis for international negotiations. Shortly thereafter, the UN General Assembly established the International Negotiating Committee for a Framework Convention on Climate Change (FCCC).

The first IPCC assessment, which drew on the work of over three hundred scientists, only accepted as certain the greenhouse effect and that human activities were increasing atmospheric concentrations of greenhouse gases; that mean

global temperatures had risen between 0.3°C and 0.6°C during the twentieth century; and that predicted global warming of 1.5°C to 5.0°C would occur sometime towards the middle of the next century. As for environmental effects, only sea level rise was predictable with any certainty, and even then the range was quite sizable: between 20 and 140 centimeters as a result of thermal expansion. The observed warming was consistent with the modeled predictions, but it also fell within the range of natural variability (IPCC 1990:2–5). Since the effects of global warming will be local and regional, but the models generate global averages, there is even greater uncertainty surrounding environmental and socioeconomic predictions. Paradoxically, it is simpler to predict what will happen to the planet, a closed system, than to make forecasts for specific regions. Similarly, scientists are more certain about what will happen over the long term than over a shorter one. While they can predict with confidence that, over the next several hundred years, continued use of fossil fuels will "dramatically alter the Earth's climate in ways that will impact nearly every living thing," predictions for the next fifty years are less certain (Kasting 1998:16). Thus, the complexity and uncertainties of climate change science make it extremely difficult for policy actors to ascertain costs and benefits, and also lend credence to those who would question its authority.

Nonetheless, the stated objective of the FCCC, which was signed at the 1992 Earth Summit in Rio and entered into force in 1994, is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (Article 2). More importantly, Principles 1 and 3 declare that the parties "should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities" and that they should "take precautionary measures to anticipate, prevent, or minimize the causes of climate change and mitigate its adverse effects" (Article 3). These commitments, which served as the basis for the ensuing negotiations towards a regulatory protocol, offer evidence for two notable normative innovations with respect to the interaction of scientific and political authority. First, science can serve as an important source of international authority—even in the face of significant uncertainties, even when scientists involve themselves in the policy realm, and even when the recommended policies entail action that might seem to undercut one of the traditional bases of state authority. Second, scientific authority, despite all these factors, can also serve as the basis for an evolving norm of intergenerational accountability.

The IPCC released its second assessment report late in 1995, concluding that "the balance of evidence, from changes in global mean surface air temperature and from changes in geographical, seasonal, and vertical patterns of atmospheric temperature, suggests a discernible human influence on global climate"

(IPCC 1996:5). Once climate change was scientifically documented as empirical reality rather than modeled prediction, the stage was set for negotiation of a legally binding regulatory agreement. The Kyoto Protocol, signed in December 1997, mandates reductions in overall greenhouse gas emissions by thirty-nine industrialized countries by 5.2 percent of 1990 levels by the year 2012. The targeted reductions are not the same for all, with most European countries bound by 8 percent targets, the United States by 7 percent, and Australia permitted to increase emissions by 8 percent. The Kyoto Protocol also authorizes tradeable permits, enabling countries to buy "credits" from other countries whose emissions levels are below the 1990 level. The treaty allows countries to count forests as carbon "sinks," so that their overall reductions in actual emissions could be somewhat lower than the mandated targets. Developing countries are not bound by any formal regulations, but do commit themselves to a "clean development mechanism."

The United States, accounting for about 25 percent of the world's greenhouse gas emissions, is a crucial player. Yet, as home to five of the seven major oil companies and the center of global automobile production, it has a powerful incentive to oppose international regulatory action. The Global Climate Coalition (GCC), the largest industry group involved in the climate change issue and closely tied to the fossil fuel industry, has been especially influential in the United States, where its member companies are among the largest contributors to congressional campaigns. In opposing a regulatory protocol, the fossil fuel industry has made tremendous efforts to contest the scientific authority of the IPCC. The tactics of industry groups, especially the GCC and the American Petroleum Institute, include sponsoring their own studies that dispute the IPCC findings and going directly to the mass media with their criticisms (Levy and Egan 1998).

Yet, as David Levy and Daniel Egan argue, industry's influence since Rio has been much greater in the United States than at the international level. In comparison to the governmental apparatus of states, international institutions are relatively more insulated from the structuralist pressures of capital. Ironically, "the very lack of democratic accountability within international institutions that worries some observers also serves to insulate [international institutions] from popular concerns about jobs and fuel prices" (1998:347). In other words, because the political authority of international institutions is not rooted in popular consent, they need not be so preoccupied with economic performance. Thus, industry groups like the GCC enjoy their greatest influence at the national level. Indeed, NGOs appear to have the upper hand in the international arena. Most noteworthy is the transnational Climate Action Network, which has distributed daily newsletters to the delegates to every Conference of the Parties since Rio. Unlike industry groups, NGOs have used the IPCC science as the basis for their positions. Nonetheless, industry groups may well be successful

in preventing ratification of the Kyoto Protocol by the U.S. Senate, a development that could seriously hamper implementation elsewhere.

Given the 1988 "Toronto Target" of a 20 percent cut in greenhouse gas emissions, which itself was set more on the basis of political feasibility than rational prevention, the Kyoto Protocol represents only a small first step. Yet from the perspective of the interaction between political and scientific authority, it represents a significant development. On the basis of an international scientific consensus that human activities are poised to alter the earth's climate, states have acted upon that authority by committing themselves to reducing emissions which have traditionally been a by-product of economic growth. Whatever its tangible results in terms of the Earth's climate, the Kyoto Protocol provides evidence for a growing commitment of political leaders to the authority of climate science, even if that authority might encroach on a central dimension of their political authority—their ability to promote economic growth.

Conclusions

Before drawing any conclusions about the reconfiguration of political authority in the international system, we should consider alternative readings of this story. I have argued that a central feature of modernity is the notion that political authority rests upon consent of the governed, that elections are a key mechanism through which consent is granted or retracted, that election results are determined in large measure by economic performance criteria, and that fossil fuels historically have driven economic productivity. With an emerging scientific consensus that fossil fuel consumption must be decreased if the earth's climate system is to be stabilized, the authority of science presents a challenge to a key source of the state's political authority: its role as guarantor of wealth production.

One interpretation is that governments have accepted the authority of science to such an extent that they are willing to risk diminishing economic productivity against the wishes of their citizens. This would represent the strongest polarization between the authority of science and consent-based political authority. The facts, however, support only a more nuanced interpretation. Cross-national polling data indicate that citizens of both industrialized and developing countries generally view climate change as a serious problem (Dunlap 1998), suggesting that governments may be acting with the implicit consent of their citizens in agreeing to reduce fossil fuel consumption.

This suggests a second interpretation: that citizens do consent to government action to reduce the risk of climate change for future generations, even at the risk of decreasing their own wealth. In this case, the apparent tension between political and scientific authority would be resolved by popular acceptance of the latter. Given the widespread media coverage of global warming, especially prior to the 1992 Earth Summit in Rio (Mazur and Lee 1993), citizens (and not

just governments) may have accepted the authority of climate science and consequently became willing to reduce their fossil fuel consumption. Yet the polling data also reveal a good deal of misinformation and confusion about the issue, as well as substantial ambivalence towards the prospect of making material sacrifices to address it. Moreover, the link between climate change and fossil fuel consumption in the public mind is not at all clear (Kempton 1997). This implies that the tension between scientific and political authority persists for two reasons. First, if citizens fail to understand even the basics of the issue, it cannot be said that they have granted consent on the basis of their acceptance of scientific authority. Second, and more importantly, governments at least run a real risk of antagonizing their publics when they agree to reduce greenhouse gas emissions. It is one thing for people to believe that climate change is "a serious problem"; it is quite another for them to be willing to incur economic sacrifices in order to address it. Thus, the tension persists. The authority of science poses a challenge to a crucial basis of the state's political authority: its role as guarantor of wealth production.

A third interpretation is that while the Kyoto Protocol commits industrialized countries to reduce their greenhouse gas emissions, either the levels of reductions are meaningless in terms of their impact on fossil fuel consumption or else states have no intention of making good on their commitments. In either case, the treaty's requirements could be interpreted as merely symbolic, representing no substantial reorientation of political authority on the basis of science. Yet neither argument is compelling. While the reductions mandated by the Kyoto Protocol, ranging from 5 to 8 percent for industrialized countries by 2012, do not appear to be substantial, they should be viewed in light of *projected* rather than existing emissions. In that light, the reductions represent roughly a 30 percent decrease in the expected emissions. Referring back to Figure 2, such a decrease would mean a negative slope to a curve climbing steadily since 1950, save for brief disruptions caused by the oil crises of the 1970s. Thus, the Kyoto-mandated reductions in greenhouse gas emissions are far from meaningless. The second argument is also questionable. While it is difficult to know governments' "intentions," this may be beside the point. The history of international environmental regime building indicates that once states have committed themselves to specific targets, they will face enormous pressure from environmental NGOs to live up to those commitments. Moreover, most environmental regimes have proceeded from relatively weak framework conventions, such as the FCCC, to increasingly stringent regulatory protocols, which are amended in light of new scientific information. If history is any guide, then governments, in signing the Kyoto Protocol, have started down a slippery slope towards greater reductions of greenhouse gas emissions. Thus, the argument that climate science poses no challenge to consent-based political authority because the agreed-

upon reductions of greenhouse gas emissions are meaningless does not hold up to scrutiny.

A fourth plausible reading is that, in agreeing to the Kyoto mandate, governments have not necessarily accepted the authority of climate science, but rather have acted out of economic self-interest. The argument has been made that EU countries, which have taken the lead in pushing for sharp reductions of GHG emissions, have an interest in doing so because of their extreme dependence upon foreign energy sources. This claim is dubious. If EU action on climate change were driven purely by narrow economic interests, then we would expect EU countries to take a more activist stance when oil prices are high rather than at an all-time low as they have been in recent years. Moreover, given Europe's greater efficiency as a result of measures taken after the oil crises of the 1970s, further reductions in GHG emissions will be comparatively more demanding for the EU countries than for more energy-intensive economies. This does not mean that interests play no role in states' positions on the climate change issue. A strong regulatory protocol, for instance, might help France to expand its exports of nuclear technology. Both Germany and Britain are weaning themselves from their coal dependency, thereby reducing their GHG emissions anyway. Yet, the steep reductions (20 percent and beyond) promoted by these countries will likely require some economic sacrifice. Given the close correlation between wealth production and fossil fuel consumption, explanations based upon traditional economic interests cannot account for the general willingness of industrialized countries to commit themselves to reducing GHG emissions. That willingness can only be explained on the basis of scientific authority.

A fifth interpretation, and one that offers the greatest challenge to the argument presented in this paper, is that governments have agreed to reduce greenhouse gas emissions because they believe that wealth production can be decoupled from the use of fossil fuels. If this belief is true, then perhaps we are seeing a significant shift in the material foundations of economic productivity, but not any challenge to consent-based political authority. The fact that global emissions of carbon dioxide fell in 1998—for the first time during a year in which economic growth was strong—offers some support for this belief (Kirby 1999). But whether governments actually subscribe to such a belief is dubious. The persistence of many tax and spending policies that encourage fossil fuel consumption calls this interpretation into question. More to the point, there is little historical support for the belief that economic prosperity can be decoupled from fossil fuel emissions, at least in the near term. While it is true that the economies of most OECD countries have moved towards the services sector in the past two decades, greenhouse gas emissions in all of those countries have continued to rise. This can be explained by various developments, most importantly the phenomenal growth of emissions in the transportation sector, espe-

cially energy-intensive air travel. Moreover, there is no evidence that citizens in the "postindustrial" wealthy countries are consuming fewer manufactured goods. Rather, industrial production is being shifted to the developing world, so that the affluent lifestyles of the so-called "industrial" countries are increasingly accompanied by emissions in the developing countries. While the link between greenhouse gas emissions and jobs may be weakening, the link between emissions and prosperity would be much harder to break. Thus, if they do subscribe to a belief that prosperity can be decoupled from greenhouse gas emissions, then governments' willingness to reduce their emissions represents a kind of leap of faith. The only apparent reason for taking that leap is a strong scientific consensus that burning fossil fuels will cause global climate change sometime in the next century, bringing us back to the central argument of this paper.

Finally, we should be clear about the fact that the state does not *lose* legitimacy if it accepts the authority of science. Indeed, the rational legal state has a long history of using scientific evidence to solve problems. In a more fundamental vein, the epistemological basis of leadership in Western political thought since Plato has linked political authority to knowledge about what is good for society (Jones 1993:122). Rather, the *basis* of its authority shifts from liberal notions of consent to a different sort of authority, one based upon scientific expertise. The fact that such a shift can be perceived with respect to international responses to climate change does not mean that a wholesale reconfiguration of political authority is under way.

Perhaps more important in the long run will be the normative commitments to intergenerational responsibility entailed in the climate change regime. Prevailing accounts of political authority rooted in liberal notions of consent do not take into account the "consent" of future generations, but only the sanction of contemporary self-interested citizens who evaluate their government's performance in terms of enhancing security and prosperity. Yet efforts to address climate change, the real impact of which will not be felt until well into the next century, hinge upon the notion of intergenerational responsibility. Indeed, the normative implications of the precautionary principle suggest that states are moving in this direction, albeit haltingly.

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