Introduction

Long-Term Environmental Policy: Definition, Knowledge, Future Research

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In the year 9595
I'm kinda wondering if man's gonna be alive
He's taken everything this old earth can give
And he ain't put back nothing

Zager and Evans ("In The Year 2525")

Considering the long-term is not necessarily new, yet we seem to be overwhelmed by long-term environmental policy problems: Climate change, increasing soil degradation, loss in biodiversity, transboundary air pollution, and the decline in coastal and high seas fisheries are only some of the examples which spring to mind. While dedicated research has been undertaken on each of these issues, it was mostly done with a view to a specific topic or to do a comparison among them. Of course not all environmental issues are long-term. For example, water can be purified to make it potable within minutes, and wolves can be reintroduced to areas where they have become extinct. But the political aspects of coping with long-term environmental problems have, hitherto, received comparatively little attention in scholarly research. This special issue of *Global Environmental Politics* is geared towards taking stock of what we know about the class of long-term environmental challenges, how we can study them, and which institutional response options are particularly suitable to ameliorating such challenges. It is the beginning of a journey, and I hope readers will give us feedback and constructive criticism, as well as contribute new research on this theme.

In order to clearly separate long-term from shorter-term environmental problems, I provide a three-part definition of long-term policy challenges in the next section. Subsequently, I briefly introduce the six contributions to this special issue before turning to a set of strategic challenges for further research on long-term environmental policy.

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Definition[1]

Long-term policy challenges shall be defined as public policy issues that last at least one human generation, exhibit deep uncertainty exacerbated by the depth of time, and engender public goods aspects both at the stage of problem generation as well as at the response stage.

First, a long-term problem exists only if the mechanism creating it leads to substantial adverse effects for at least a human generation of 25 years or if the remedy would take an equally substantial amount of time. Global biodiversity may offer us a potent example: If a species of flora or fauna becomes extinct and have no functional proxies, both the species and the function they fulfill for ecosystems could be lost forever. Even ambitious research and development efforts may find it difficult to create functional proxies, for instance by genetically modifying still existent organisms.

Second, deep uncertainty, "a situation where the system model and the input parameters to the system model are not known or widely agreed on by the stakeholders to the decision,"[2] refers to the breadth of parameter values which we may contemplate. For example, there is considerable uncertainty regarding the price of carbon offsets under various choices of policy instruments, and we have no experience with accurately predicting the price of carbon offsets for a 50 percent emission reduction over the next half century or the value of any natural resource or ecosystem.

Third, public goods aspects of long-term policy problems relate both to the generation of long-term policy challenges as well as ways to respond to them. Quite often, long-term policy challenges are generated by externalizing some cost to the public, both contemporaneously as well as intertemporally. For example, if historical carbon emissions already lead to uncompensated climate-related impacts now, then some past decision-makers will have benefitted, knowingly or unknowingly, from carbon releases at the expense of present generations. In addition, curbing future emissions is a public goods problem by itself in a mostly decentralized world. Those countries serving as leaders in international climate policy may not witness immediate benefits for themselves, and future benefits may be quite uncertain, thereby tempting only a small range of countries to venture into global public goods production—and others to free-ride.

Overall, long-term policy problems pose a rather difficult class of challenges that are beyond the scope of single parliaments and political and bureaucratic tenures in office and yet many have escaped comparative research so far. This special issue is designed to shed light on the knowledge we can assemble within the confines of a journal issue on long-term environmental challenges.

1. This definitional section draws, in part verbatim, on Sprinz 2008, forthcoming.
2. Lempert 2002, 7309.

Institutional Design, Methods, and Human Agency

The articles that follow respond to a range of challenges. They open a forum debate on the psychological and biological origins of humans' dual capacity for short-term and long-term reasoning, ask why long-term policy challenges exist, offer institutional design options, and review a broad set of methodologies for the analysis of long-term problems.

Can Humans Cope with the Long-Term?

It is often assumed that humans are myopic in their decision-making. While research on common pool resources provides evidence of the conditions for long-term resource management in small, manageable groups, the contribution by Thomas Princen focuses on the biological and psychological foundations of humans' *dual* capacity for short-term and long-term thinking and decision-making. By focusing on biorhythms, child development, as well as evolutionary human behavior (such as way finding, fire setting, and the grandmother effect), Princen's forum article develops a "legacy politics." Such a politics is, in part, a normative project, one that may find political space with the current instability of the financial system and a shift from short-term political, economic, and social decision-making towards long-term decision-making. Whether and how this can be accomplished is an open question, a question we invite readers to engage.

Origin of Challenges and Institutional Design

Four articles illustrate why long-term policy problems exist, which strategic problems exist, and which institutional response options we have to cope with them.

First, Jon Hovi, Detlef F. Sprinz, and Arild Underdal use the example of climate change mitigation to illustrate three interrelated commitment problems: time inconsistency, i.e. the difficulty of pursuing optimal plans *over time* even for a world government; domestic politics; and international anarchy. Each of these challenges by itself makes us hesitate to expect that a global climate agreement with simultaneously broad participation, deep emission reductions, and a potent sanctioning system will be concluded in the near future. Regrettably, many of these problems are interrelated, thereby exacerbating hopes for easy problem-solving. The authors do, however, also point to potentially positive synergies among the three commitment problems that might enable us to become more optimistic about preventing dangerous climate change.

Second, Randall W. Stone asks why there is underinsurance against long-term policy problems. By developing a simple formal model and using plausible assumptions about the distribution of risks as well as about the pivotal

voter, he demonstrates that majoritarian political systems systematically underprovide insurance. This problem is exacerbated at the global level due to de facto supermajority or consensus requirements in many multilateral international regimes. Thus, standard democratic mechanisms provide an explanation for sub-optimal outcomes. These general points are illustrated with examples from international institutions coping with international financial instability and climate change.

The third contribution by Paul F. Steinberg focuses on irreversibility in the case of biodiversity. Once a species is lost or an ecosystem completely destroyed, it cannot recover its original state. How can decision-makers pursue the broad goal of preventing the loss of biodiversity over long periods of time? Steinberg's answer is to "bring politics back into the institutional design equation," pairing considerations of rules and governance with an explicit emphasis on advocacy and social mobilization. Specifically, he calls for the creation of conservations systems—place-based constellations of rules, organizations, and diverse social constituencies that can collectively provide a resilient social safety net for biodiversity.

Finally, Johannes Urpelainen examines the puzzling phenomenon of local climate policy. Emissions reductions by small actors, such as US states, have little effect on the rate of global warming, yet local climate policies have preceded centralized mitigation efforts in many countries, including the United States. Why can we be cautiously optimistic that decentralized responses to a global long-term policy problem can emerge for perfectly rational reasons? Urpelainen develops a formal model of climate policy at two levels and shows that a central government refrains from national emissions reductions if local policymakers possess more accurate information on the local political costs and benefits of climate policy than the central government. As the evolution of climate policies in the United States shows, local solutions to a global problem can pave the way for national mitigation efforts and international cooperation.

Methods for Long-Term Policy Challenges

Systematic methods of analysis of long-term policy issues are developing into a vibrant field of inquiry in support of pertinent substantive challenges (see above). Acknowledging the limitations of rational choice methods such as optimal control theory and non-cooperative game theory under conditions of deep uncertainty, Robert Lempert, Jürgen Scheffran, and Detlef F. Sprinz provide an overview of the range of methodologies available for studying long-term policy challenges. Subsequently, they illustrate the opportunities and limitations of three major methodologies, namely statistical methods, robust decision-making, and a range of adaptive approaches in the context of climate change. In addition, they provide guidance on the choice among methodologies to study long-term policy phenomena.

Research Agenda[3]

The contributions in this issue of the journal review and advance the state of knowledge in the study of long-term environmental problems. Given the early phase of this field of inquiry, more research and experimentation in the political realm is called for. In the following, I highlight three overarching challenges for research: (i) how to overcome the time inconsistency problem in practical political life, (ii) whether democracies and decentralized political systems can successfully pursue long-term environmental policies, and (iii) institutional design options to prevent and recover from undesirable long-term policy outcomes.

First, the *time inconsistency* problem relates to the choice of optimal rules at time t_0 to actual rule adherence at t_1—when political circumstances might have changed and rule adherence at t_1 might not be optimal for decision-makers at that point in time. The possibility of this happening creates incentives to doubt the rule's credibility at time t_0. For example, Europe wishes to halt biodiversity loss by 2010—although many of the biodiversity hotspots are located outside the EU. It is all too easy to criticize a political actor for holding ambitious goals, and yet it is also sometimes too easy to promulgate ambitious political goals whose impact can only be evaluated far in the future. While the work by Kydland and Prescott (see contribution by Hovi, Sprinz, and Underdal in this issue) provided the academic rationale for the creation of independent central banks, it is unlikely that a forceful World Environment Organization will materialize in the near future. Thus, we are left with multilateral governance. While the world has harnessed new insights from the solution to the domestic time inconsistency problem, the equivalent of Kydland and Prescott's solution at the decentralized international level remains an open challenge.

Second, it is often doubted that *democracies* can pursue long-term policies due to the structured length of terms of the legislative, executive, and judicial branches. Moreover, decentralization of authority—as is typical with global environmental issues—may pose additional challenges to governance. The former aspect refers to electoral terms in office. Political or legal careers in high office rarely last multiple decades. Winston Churchill's career as a democratic leader may be an exception, yet it perhaps provides some clues as to why he could survive *and* return to office. He often held principled policy positions, accepted to be out of office when such positions did not garner sufficient support, and was returned to office when such positions became attractive to the (s)electorate. Churchill opposed the Munich agreement of 1938 when many, such as Chamberlain, thought that "peace for our time" was secured. In turn, he was a credible choice of democratic leader to withstand the German onslaught on Britain during World War II. The same dual clocks of relatively short-term electoral

3. Some of the research questions posed here originate from a research roundtable with the contributors to this special issue at the 2008 Convention of the International Studies Association. I am grateful to the roundtable participants as well as the audience for a vibrant discussion.

cycles (Churchill was voted out of office during the Potsdam conference of 1945) and long-term policy goals (withstand Germany during World War II) should be simultaneously modeled to see under which conditions time-limited democratic governments can survive and which characteristics their leadership personnel would have to offer to successfully pursue long-term policies.

Furthermore, how can political systems with *decentralized political authority* pursue ambitious long-term environmental problems? The German federal constitution (Grundgesetz), for example, grants authority for protecting nature to the Länder (states which are members of the Federal Republic of Germany) such that the German federal government may face implementation hurdles at the level of EU directives on nature protection issues. Conversely, around 20 major countries including the EU are needed for any long-term international strategy on climate change to have an appreciable impact. It therefore remains an open question how grander political designs, if any, can reconcile decentralized political authority with the successful pursuit of long-term environmental challenges, given the time inconsistency challenge mentioned above and the domestic and international political challenges discussed elsewhere in this special issue.

Third, long-term environmental issues may engender a quest for *institutional response options* to prevent unwanted outcomes or to recover from such outcomes after prevention has failed. The term "prevention" refers to the avoidance of an unwanted outcome. By contrast, "recovery" refers to having already reached the unwanted outcome, followed by subsequent attempts to substantially improve the state of the environment. This may include aiming for a return to a more desirable status quo ante.

Preventing biodiversity loss is, in the extreme, an impossible goal to pursue. We simply have no complete inventory of all species. We may lose species even without knowing that they ever existed. Nevertheless, halting the loss of biodiversity espouses some conceptual clarity: prevent losing a good (material and immaterial). The suggestion for the creation of "conservation systems" (by Paul F. Steinberg in this issue) presents a forward-looking perspective. The required characteristics for conservations systems to be successful are demanding. Can we derive a finite, relatively small set of design principles that allow us to move a desirable state of a specific environmental object (landscape, rivershed, or species) through an infinite "time tunnel"? Do design principles vary by spatial or temporal resolution?

A range of coastal and high seas fishing grounds have been overfished during the second half of the 20th century, particularly in the North Atlantic, and serve as a good example of the recovery perspective which may take decades or longer. The focus of research ought to be directed towards how long-term sustainable yields and rich abundance in species can be substantially improved from an undesirably low level. Scholarly interest should be directed to institutional design options which might combine, for example, solutions to the time

inconsistency problem with solutions to the decentralization challenge in authority for open sea fisheries.

Climate change can be seen as a combination of prevention and recovery modes. Article 2 of the United Nations Framework Convention on Climate Change explicitly directs member countries to "prevent dangerous anthropogenic interference with the climate system" (UNFCCC, Article 2). No universally agreed upon interpretation of this prevention goal exists. Much research seems to suggest that it will be far from trivial to reach the normatively set 2 degrees Celsius goal of change in global mean temperature as compared to pre-industrial periods. Some overshoot relative to the 2 degrees Celsius goal is not unlikely, thus inducing us to also consider the recovery challenge. While there is plenty of research on both mitigation (prevention) and adaptation (akin to recovery) to climate change, the appropriate mix between both and the reciprocal strategic impact between them remains an open question for research.

The list of research challenges outlined above is suggestive, yet certainly not exhaustive. Finding convincing answers would undoubtedly advance our knowledge on how to manage long-term environmental challenges more wisely for present and future generations alike. X PRIZEs have been created to establish whether private business can create spacecrafts that fly 100 km above the earth (prize awarded) and whether extremely fuel-efficient cars can be built (competition ongoing). These large prizes intend to create entrepreneurship to pursue goals with potentially widespread benefits to the public. Perhaps some of the research questions outlined above on the management of long-term environmental issues are worth an X PRIZE?

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