**The Tragedy of the Diffusion of the Commons Metaphor:**

**Bringing the Environment Back in to Environmental Studies**

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“*Policies based on metaphors can be harmful*,” Elinor Ostrom (1990: 6)

“The issue in this case - and many others - is how best to limit the use of natural resources so as to ensure their *long-term* ***economic*** *viability*” (Ostrom 1990: 1) [italics and bold added].

1. **Introduction**

Elinor Ostrom’s path breaking work on understanding and overcoming local, and globally relevant, resource depletion challenges has profoundly shaped scholarship, policy practices and the training of students in professional graduate environmental programs since the 1980s. Most comprehensively articulated in *Governing the Commons: The Evolution of Institutions for Collective Action* (1990), Ostrom’s work was innovative for two reasons.

First, in contrast to contemporaneous institutional scholarship, she treated the emergence, design, and implementation of institutional development *inductively* by working backwards from a particular type of resource problem commonly known as the ‘tragedy of the commons’ (Hardin 1968).[[2]](#endnote-2) Now familiar to generations of students, practitioners and scholars, the tragedy refers to the phenomenon in which perfectly rational utility maximizing individuals will, in the absence of ‘collectively optimal’ institutions that constrain behavior, overuse a resource at levels higher than the sustainable yield rate, resulting in complete loss of the (economic) resource in question, such as fish, timber or grasslands.

Second, Ostrom discovered that many resource problems exhibit ‘non-excludability,” not only ‘subtractibility’. In other words, not only does the act of using a resource reduce the ability of others to use it (subtractibility), but in many cases some beneficiaries of the resource cannot be excluded from using it. Notably, she made this discovery inductively, through careful observation and conceptual unpacking of the nature of (economic) resource depletion tragedies. Prior to Ostrom, institutional analyses often assumed that excludability was always possible.

Significant theoretical and empirical breakthroughs followed. For example, Ostrom’s initial discovery of the feature of non-excludability came from empirical investigation of cases of fisheries depletion where communities depended on the resource for their livelihoods. She observed that many communities developed alternative effective governance mechanisms to the standard ‘solutions’ developed deductively in the institutionalist literature: coercive government authority or privatization Ostrom (1990: 22). This led her to identify a third potential institutional form for overcoming commons tragedies: locally-based “self-organized and self-governing” institutional regimes, developed by participants themselves that would incorporate locally relevant features. She argued that local institutional approaches might be a better ‘means-oriented’ approach for this class of resource problem than private or public (top-down regulatory agency) models that dominated the applied scholarship before her. She subsequently devoted significant attention to these approaches through what became known as the “Institutional Analysis and Development” (IAD) framework (Ostrom 2007, 1999).

In sum, Ostrom inductively built her models from empirical research on how a wide range of communities at different scales managed common pool resources (CPRs). This strategy enabled her to identify innovative means to address specific and very clear ‘ends,’ i.e., “governing and managing diverse CPRs for which at least some potential beneficiaries cannot be excluded” (Ostrom 1990: 22). It also distinguished her work from other institutionalists, many of whom at the time were criticized for, pathologically (Shapiro and Green 2007, Shapiro 2007, 1994), emphasizing rational choice as a universalistic, ahistorical approach to explain and address *any class* of problems and any type of human behavior.

The purpose of this article is to develop two distinct, but related, arguments about the direct and subtle effects, positive and negative, of Ostrom’s approach and legacy on environmental governance, policy research and professional training. First, we argue that her careful attention to the *problems at hand* – which requires engagement with knowledge and data generated by natural, biological and physical scientists who generally sit outside of political science, policy and governance communities – is critically important for resource and environmental problem focused scholarship. On the one hand, recognition of this need in theory has extended to the fields of Political Science and International Relations and resulted in calls for much greater attention to *unpacking the type of problem* in question when developing, designing and applying, institutional approaches.[[3]](#endnote-3) On the other hand, this lesson has largely been lost in contemporary scholarship and training in practice on environmental and resource problems for reasons we discuss below. Yet, the relevance of requiring that ‘means-based’ approaches be justified based on the ‘ends’ (i.e., the resource or environmental issue) in question, remains as critically important today for problem-oriented policy scientists, economists, and political and other social scientists as it was in 1990.

Second, a countervailing dynamic has worked to the detriment of the problem focused research approach Ostrom nurtured: her means-oriented approach to overcome Nash equilibrium tragedies has been cast adrift from the problem features themselves, such that it is now used to anchor analyses and justify similar solutions to all types of problem boats. Specifically, research and practitioner training over the last 20 years have extended Ostrom’s utility-oriented, Nash-equilibrium/sub-optimal that characterized common pool resource (CPR) tragedies – meant to address a subset of resource management problems – to universalizing metaphors such as ‘collective action dilemmas.’ These metaphors now inform the underlying framing and analytic lens for research programs and training on almost every type of resource and environmental problem, including climate change, **whether or not they share the relevant features Ostrom identified**.[[4]](#endnote-4) Ironically, Ostrom herself worried about the power of metaphors to limit policy options for the CPR problems on which she focused.[[5]](#endnote-5) She saw the tendency of existing analysis to gravitate towards centralization or privatization as oversimplifying metaphors that lead to “idealized” institutional solutions to managing CPRs when observed effective institutional arrangements in particular situations contained complicated mixes as well as alternative arrangements that didn’t fit either metaphor very well (Ostrom 1990: 21-23). Yet, she didn’t anticipate the limiting power of the metaphor of the problem definition itself. Instead, she opened herself up to overextension by suggesting that CPRs describe a wide range of problems that they only loosely – and sometimes very poorly – fit (Ostrom 1998).

Consequently, application of the commons metaphor, which characterizes commons tragedies as *economic* problems, has undergone concept stretching so that it is now deemed to address *environmental* problems. This stretching had the effect of conflating actual environmental problems, such as species extinctions and ecological effects associated with catastrophic climate change, with social welfare or Pareto optimal economic problems. While there are good philosophical and practical reasons to examine environmental, social and economic aspects of many problems, the reduction of all problems to Pareto optimality is a problematic aspect of Ostrom’s entire analysis when applied to the environment. In the very first paragraph in *Governing the Commons*, Ostrom could not be more clear that she was *not* discussing *environmental* challenges: “The issue in this case – and many others – is how best to limit the use of natural resources so as to ensure *their long-term economic viability*” (emphasis added, Ostrom 1990: 1). Such an orientation not only reduces environmental issues to economic goals, it also makes it *impossible to address the environmental issue in question, since utility enhancing behavior is frequently the cause of environmental problems in the first place****.***

Efforts by Ostrom and others to overcome these challenges focused on the impossible task, as we detail below, of drawing on Ostrom’s original ontological assumptions to address global environmental problems through the concept of ‘polycentric’ governance (Ostrom 2010, Jordan et al. 2018) and/or socio-economic systems (Brondizio, Ostrom, and Young 2009) that tend to underplay exogenous shocks such as norm changes, or unpredictable ‘critical junctures’ that are key for addressing some types or classes of environmental problems we identify below. We consider the diffusion and reproduction of this reductionism a tragedy that demands an opening of analytic space for research and training and, following Ostrom, a careful delineation of research strategies and epistemological approaches appropriate to the type of problem at hand.

To overcome the tragedy of the diffusion of the commons metaphor we identify two core dimensions along which resource and environmental problems are generally conceived: 1) whether the focus is on one or multiple *problems*; 2) whether the means-oriented *solutions’* epistemological project aims for universal design principles or historically contingent approaches. These two dimensions allow us to distinguish four overarching approaches to applied resource and environmental problem solving that, taken together, help us unpack and critically assess shifting research and pedagogical attention, the role of powerful interests in shaping these trends, and implications for problems solving: Type 1 (‘win/win’) and Type 4 (‘win/lose’ priority) both lead to the identification and development of applied policy analysis inductively while Type 2 (‘win/lose’ optimization) and Type 3 (‘win/lose’ compromise) are applied deductively.

We proceed in the following steps. After summarizing our core argument, we elaborate the four conceptualizations of environment and resource problems identified above. Third, we show that Type 4 conceptualizations previously dominated understandings of environmental problems, including in the United States in the 1970s, thus challenging the view that for feasibility reasons, publics would never support such an orientation. Fourth, we describe the key dynamics among the four Types to illustrate the importance of making explicit the implications of the largely uncontested prioritizations of Type 1, 2 and 3 conceptualizations at the expense of Type 4. Fifth we show how institutional scholarship on environmental effectiveness and the Paris Agreement reveal biases towards means-oriented solutions Ostrom offered to Type 1 problems, and to similar tendencies toward universalistic analyses and solutions generated by Type 2 and 3 conceptualizations of these problems. Such an orientation means little or no attention is paid to the “super wicked” (Levin et al. 2012) features of a subset of Type 4 problems, which we argue characterize climate change. We conclude by suggesting ways in which problem focused institutional theorists, and professional environmental management schools, might work to overcome these challenges.

***The Core Argument***

We argue that the Type 4 problem conception (win/lose prioritization) is the most appropriate metaphor for a range of environmental problems, especially those that risk irreversibility such as species extinctions and climate change – a problem that Levin et al. (2012) have labelled “super wicked”. (It is also the most appropriate for social problems that are fundamentally not subject to compromise, such as efforts to eliminate modern-day slavery). While Type 4 is similar to Ostrom’s Type 1 in that it is justified on the basis of a particular targeted problems, it is dissimilar in that it requires attention to ‘critical junctures’ in which norms change, rather than are given, and through which the interaction of mobilization and institutional responses can produce durable, path dependent effects. As critical junctures can, and do, unleash historical transformations but are, by definition, unpredictable in a Popperian sense (Pierson 1993b), any effort to develop universal design principles, rather than diagnostic questions, will be unable to foster Type 4 problem solving.

Type 4 problem conceptions were actually common during the 1970s when scholars and practitioners focused considerable attention on species extinction. Their preferred approach was binding hard law, such as the US Endangered Species Act and related legislation that required federal managers ‘list’ threatened and endangered species according to scientific evidence *without regard to economic considerations***,** and development of management plans consistent with scientific knowledge for maintaining species viability. These policies have proven highly durable over time, gaining ‘institutional status’ and triggering processes that worked, through a series of historical steps, to *change* public manager opinionsabout the primacy of managing for ecosystems rather than timber (Yaffee 1994). Research on addressing climate change suggests the appropriateness of a similar approach today. For example, working inductively, Levin et al. (2007) (Cashore et al. 2016, Levin et al. 2012, Levin et al. 2009, Levin et al. 2007) identified Type 4 challenges that they label “super wicked” characterized by the following: time is running out, those seeking to solve the problem are also causing it, no central authority exists, and policies are discounting environmental futures irrationally, i.e., they are not being developed in ways consistent with the climate science and short term economic priorities trump long term environmental concerns, even when collective interests desire long-term problem solving. While the conceptualization of climate change as this type of problem has been picked up by other scholars, practitioners, and the media,[[6]](#endnote-6) environmental institutionalist scholars are giving them significantly less attention than mainstream climate analyses that treat the issue is largely an economic commons challenge. Meanwhile, US-based professional environmental management programs seem to largely ignore Type 4 conceptions altogether, a trend reinforced as they hire an increasing number of neo-classical and behavioral economists while downplaying the political science, sociology, history and ecological economics training necessary for ameliorating this class of problems (Cashore 2018).

We argue that failure to explicitly make these distinctions, and to develop research and training ‘backwards’ from the conception of the type of challenge in question, has resulted in the subtle ways in which Type 1 methods and epistemological approaches diffuse into global environmental politics and professional training. Consequently, they influence the methods to analyze, and the deliberative approach to address, Type 2 and 3 problems. More insidiously, the dominance of a Type 1 orientation and accompanying metaphors of environmental and resource problems limit research space for, or marginalize, efforts to conceptualize, research, or train practitioners to address Type 4 environmental problems. The diffusion of Type 1 approaches and sidelining of alternatives helps explain, for example, widespread paradoxical accounts by institutional scholars of the Paris Agreement as at once ‘transformative’ alongside acknowledgments that it is highly unlikely to meet its problem-focused emissions reduction targets or sufficiently catalyze decarbonization to prevent dangerous climate change.

These effects also permeate political science research on international environmental governance, comparative politics, and local resource management. For example, it has led to a leading school of environmental effectiveness (Hovi, Sprinz, and Underdal 2003) that, drawing on Pareto optimal social welfare notions of ‘collective optimal’ solutions, are disconnected from the nature of the problem at hand (Kutting 2000b, Young 2003). It also affects teaching and training on the part of leading environmental schools, with knock-on effects on the practice of thousands of environmental professionals.

1. **Four Types of Resource and Environmental Problem Conceptions**

Distinguishing resource and environmental problem conceptions according to their problem orientation (single or multiple), and policy analysis solution (generalizable or contingent), leads to four classes of problem conceptions that carry with them profound biases regarding whether they emphasize economic or environmental challenges, human needs versus humans as cause, the applied solutions that are offered, and disciplinary or methodological approaches (Table 1). We also show that each problem conception is reinforced by different metaphors with their own inherent biases and dangers.

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| **Table 1: Four Environmental & Resource Policy Problem Conceptions** | | | |
|  |  | **Epistemological Orientation to Policy Analysis** | |
|  |  | **Generalizable**  (Rational/utility) | **Historically contingent**  (path dependency/critical juncture, change in normative obligations) |
| **Addressing a single, dominant, targeted problem is the goal** | **Yes**  (Ends determines the means) | **Type 1: ‘win/win’**   * **Economically valuable resource depletion tragedies**   + includes private goods and common pool resources[[7]](#endnote-7) * **Problem orientation**: *human needs* * **Solution method**: build locally durable collective optimal institutions from general design principles or polycentric arrangements, as appropriate, for efficiency and effectiveness at larger scales * **Problem metaphors**: tragedy of the commons, collective action dilemma, utility maximization, collective optimum, Nash equilibrium * **Methodological emphasis**: quantitative data for generalizing design principles, reinforced by qualitative ­­ethnographic case studies, methodological individualism but open to non-consequentialist logics of action (e.g., influence of community norms) | **Type 4: ‘win/lose’ priority**   * **Environmental tragedies such as species extinctions or catastrophic ecological effects of climate change**   + includes ‘super wicked’ problems * **Problem orientation**: *humans as cause of the problem, difficult or impossible to reverse consequences* * **Solution method**: find, trigger, and nurture, ‘critical juncture’ pathways capable of withstanding Type 3, 2 and 1 conceptions, i.e., transform system trajectory * **Problem metaphors***:* irreversibility, ‘planetary boundaries’, ‘dangerous” global change, ‘just transition’ * **Methodological emphasis**: qualitative (historical institutionalism, historical sociology, process tracing, forward reasoning, discursive policy analysis), reinforced by quantitative indicators |
| **No**  (Means determines the ends) | **Type 2: ‘win/lose’ optimization**   * Any and all problem-solving subject to whether solutions improve, or reduce, **social welfare maximization**[[8]](#endnote-8) * **Problem orientation**: *Human needs* * **Solution method:** conduct (pareto optimal) cost-benefit analysis * **Problem metaphors**: utility maximization, collective action, collective optimum * **Methodological emphasis**: quantitative through econometrics modeling | **Type 3: ‘win/lose’ compromise**   * ‘Neutral’ **balancing of environmental, social, and economic goals** * **Problem orientation**: *human needs & humans as cause* * **Solution method**: multi-goal policy analysis alongside multi-stakeholder dialogues/dispute resolution[[9]](#endnote-9) * **Problem metaphors**: pluralism; sustainable development, sustainability science, environmental justice * **Methodological emphasis**: mixed quantitative and qualitative through |

**Type 1: Commons Tragedies (Win/Win)**

The first type of conceptualization directs attention to specific problems where failures to address them make everyone worse off in the long run. Following Ostrom,[[10]](#endnote-10) the most common example is resource depletion “tragedies of the commons” [[11]](#endnote-11) in general, and her specific subset of CPR problems as described in our Introduction. Hence, Type 1 problems derive their conception from the nature of the problem itself: without collectively optimal institutions (means) a non-Pareto optimal “Nash equilibrium”[[12]](#endnote-12) will prevail that leads, through rational behavior, to the depletion of the economic resource in question. Largely inspired by rational choice and ahistorical ontologies, scholars such as Ostrom focused on designing the ‘right’ types of internal rules and procedures for developing collectively optimal solutions for ending such tragedies, including fisheries loss, deforestation, and overgrazing. In these cases, natural science evidence is important for providing information about species loss that has economic value, such as Canadian scientists warning policy makers that the cod fishery was being overharvested (Chase 2003, McKenna 1992). Meanwhile, social science is important for devising rules capable of avoiding the loss.

Ostrom’s and her students’ work in fisheries and forestry have made significant contributions in this regard. They have both developed theory about, and extensive empirical evidence on, what appear to be the most effective design principles for promoting management of CPR resources through her rationalist and ahistorical “IAD” framework (Ostrom 2007, 1999). In pursuing their research goal of identifying optimal interventions or institutional designs, they focused on an important but narrow problem conception (tragedy of resource depletion), and developed and prescribed design principles with very clearly elucidated “causal logics.” Hence in Type 1 efforts, means-oriented solutions are adjudicated on their ability to causally address a specified (economic) problem to the betterment of an entire community or society (Andersson 2004).

However, characterizing these problems as resource depletion tragedies, while paying less attention to how they might be situated within a broader web of ecosystems that cannot be reduced to CPRs, means that the CPR conception also generated some negative consequences. For example, it has arguably resulted in policies that address complex forest governance challenges while reinforcing neo-liberal problem orientations in which sustainability is reduced to “timber” rather more complex ecosystems in which that timber grows and people and other species live (Wright 1995) (Cashore, Vertinsky, and Raizada 2001). In fact, Ostrom (1990) herself recognized that her approach addressed only a narrow class of resource challenges and provided a focus largely on economic incentives (Bartley, Andersson, and Jagger 2008). She specifically limited the scope of her 1990 study to small scale, renewable resource problems and excluded situations of asymmetries of power of individuals or groups to cause harm to other participants (Ostrom 1990: 26).

Yet, there and in other writings she also suggests that the findings about self-organization at small scales might provide general insights into collective action: “All efforts to organize collective action. whether by an external ruler, an entrepreneur. or a set of principals who wish to gain collective benefits, must address a common set of problems. These have to do with coping with free-riding, solving commitment problems, arranging for the supply of new institutions, and monitoring individual compliance with sets of rules” (Ostrom 1990: 27). In her presidential address to the American Political Science Association, she goes a step further, arguing that: “ … the theory of collective action is *the* central subject of political science” (Ostrom 1998: 1). Others argue that CPR is the most appropriate way to characterize international environmental conflict generally (Barkin and Shambaugh 1999, Dietz, Ostrom, and Stern 2003). Not surprisingly, then, others see CPR problems everywhere in environmental studies and political science.[[13]](#endnote-13) What is important about Type 1 solutions is that whereas the scholarly work in this vein focused on a diverse set of examples and approaches, it is united in a search for a ‘generalizable’ theoretical framework to inform institutional design and policy interventions at multiple scales.

Hence, Type 1 conceptualizations, especially the application of means-end reasoning, is now being applied far beyond the specific set of problems Ostrom originally envisioned, including to non-depletion environmental challenges such as climate change. Its dominance in policy and political sciences of the environment may explain, for example, why Sabatier (1999) included Ostrom’s IAD framework (Ostrom 1999) in his edited collection, *Theories of the Policy Process*, but excluded historical institutionalists, such as Hall (1993) or Skocpol (Skocpol 1995). Sabatier limited his book to those bodies of scholarship on the policy process that emphasized developing generalizable theories and frameworks which, by definition, would not include identifying causal mechanisms with which to explore and understand a range of historically contingent factors. The latter, while highly useful for addressing Type 4 problems as we discuss below, Sabatier deemed less “rigorous” than efforts to develop universally applicable hypotheses. While generalizability might be a virtue for Type 1 challenges, we argue that to understand and address Type 4 problems requires attention to methods and approaches offered by historical institutionalists. Hence, in the name of “rigor” and a misguided allegiance to a Popperian view of social science, the academy has become disconnected from the means to address some of the most important and pressing challenges facing our planet (Kutting 2000a).

This shift from a focus on inductively designed institutions to deductively applied prescriptions is also evident in some of the work of Ostrom’s students. For example, Prakash, who has made a major contribution to conceiving of voluntary standards as “club goods” (excludable, non-rivalrous), has inverted Ostrom’s approach by making such goods both an independent variable and a prescribed institutional solution (Prakash and Potoski 2007, Prakash and Potoski 2006, Kolln and Prakash 2002). Whereas Ostrom intended this category to be about an actual ‘on the ground’ resource (and the ‘dependent variable’), that like a CPR problem would require some institutional arrangement to maintain, Prakash treats them as the institutional arrangement (i.e., the independent variable or prescription itself).

This inversion has had the effect of studying club goods to address a great many problems outside of Ostrom’s conceptualization of club goods, including ecosystem protection, sustainable yields, and sustainable forest management. It also reinforced a metaphorical social science, “data-driven” orientation to assessing support for these ‘club goods’ that gave much less attention to understanding how a particular environmental problem might be addressed by such an approach.[[14]](#endnote-14) Indeed, this led to a labeling of some “brown” type club goods (i.e., developed by industry to limit both government regulation and higher standard environmental certification systems) as “green” (Prakash and Potoski 2007, Prakash and Potoski 2006, Kolln and Prakash 2002). This misplaced labelling led to incorrect conclusions that club good were examples of environmental initiatives, when they were arguably better classified as industry ‘greenwashing’, as they were often initiated by firms to fend off pressure by environmental groups to modify their ‘on the ground’ environmental practices (Oliver 1997). Hence, the precedent for the anchorless metaphor approach that shows up so clearly in Type 2 and 3 problem conceptions, seems to have originated, in part, in Ostrom’s own lab.

This is just one example of how Ostrom’s means-oriented framework has also influenced, and reinforced, means-oriented Type 2 and 3 universalist conceptions which are applied to all types of resource and environmental challenges, regardless of their features. This shift from inductively derived institutional designs to deductively derived prescriptions typical of Type 2 and 3 problem conceptions represent, as we discuss below, their own type of tragedy.

**Type 2: ‘win/lose’ optimization**

Type 2 problems are consistent with Ostrom’s utility enhancing rationale but are developed deductively as universalist approaches for helping society deliberate on how to address trade-offs between different problems. The challenge Type 2 problems orientations address is social welfare or Pareto optimality inspired by neo-classical economics and cost-benefit analysis (Adler and Posner 2009). In such analyses, economic values are assigned to different outcomes, and, following modelling and the application of discount rates, analysis identifies the most efficient and effective trade-offs for enhancing welfare. Hence, this problem conception accepts that there will be winners and losers (or, in the Pareto optimal scenario winners and no losers) but based on a transparent model in which social welfare is advanced. These approaches underpin the core approach of many agriculture, resource, and forestry schools. An iconic example is Yale’s Forestry School, founded by Gifford Pinchot to advance a utilitarian conception of forestry as promoting “the greatest number for the greatest good in the long run” (USDA Forest Service 2006). Drawing on utilitarian philosophical norms for its conceptual justification (Sinden, Kysar, and Driesen 2009, Kelman 1981), Type 2 is universalistic in the sense of seeking generalizable institutional models that respond optimally to the problem structure. This in turns, requires training in large-N statistical techniques, modelling, and other type of data analysis such as “willingness to pay” (Turner et al. 2003, Ozanne and Vlosky 1997), that explicitly treat environmental challenges as actionable if they can be converted into economic, utility enhancing, benefits.

The challenges with the means-oriented nature of Type 2 approaches is that utility maximizing frameworks are set up to provide the **‘**rigorous’ ‘data driven’ scientific *answer* (Carpenter et al. 2009) about *whether*, rather than *how*, society is able to address environmental problems. For example Type 2 approaches seems to explain the emergence of ‘*ecosystem services*’ (Sell et al. 2007) approaches even when doing so is *inconsistent with basic scientific research* and *evidence* (Turner et al. 2003) about a particular environmental challenge (Kosoy and Corbera 2010) (Cashore 2018). In addition, as the focus on optimality usually involves some type of discount rate application, Type 2 conceptions, when applied through a neo-classical lens, not only undermine environmental problems by treating them as economic, they also, by definition, value the future less (Winkler 2006, Yang 2003), serving to implicitly undermine institutional analysis for long-term problem solving (Sprinz 2009). Somewhat ironically, debates about where to set the discount rate (Hepburn and Stern 2008), have reinforced the legitimacy of Type 2 solutions, which has served to undermine, however well intended, long-term environmental problems solving (Barkin 2006).

A contemporary example of this type of problem orientation is at play in many policy discussions of pricing carbon. Economists tend to favour pricing carbon as a policy solution to climate change because it is economically efficient and, if priced at the “social cost of carbon”, should be Pareto optimal. However, the logic of carbon pricing is not to decarbonize, it is to internalize costs and allocate them efficiently, whether that means a decarbonized world that prevents dangerous climate change or one in which the choice to live in such a world is “paid for”. Even leaving aside the practical and political problems with sufficiently pricing carbon at a level to internalize the “social cost” and debates about discount rates, the very logic, as many economists readily admit, is that it makes no difference whether the result is a reduction in emissions or other forms of decarbonization. To quote one policy brief on the importance of carbon pricing in Ontario, Canada, “Price [is] the primary goal” (Tombe 2018: 12).

**Type 3: ‘win/lose compromise’**

Type 3 conceptions, like type 2, are derived top down or deductively, rather than inductively, on the belief that ‘balance’ and ‘compromise’ can be guided by science and rationality. Inspired by the discourse of sustainable development popularized by the Brundtland Commission Report (WCED 1987), this conceptualization suggests hard trade-offs between environmental, economic and social values can be avoided if science can develop integrative solutions (Saez and Requena 2007). Type 3 problem conceptualization certainly fits a ‘distributional’ orientation to politics (Aklin and Mildenberger 2017) that has long been the focus of political science (Lowi 1964). It may also help focus efforts on understanding domestic political struggles that are key to address climate change and other large-scale societal problems. However, the danger of staying within a Type 3 paradigm is that researchers often undertake their questions in ways that are disconnected from the problem at hand. In other words, most political studies say very little about whether distributional politics that favour a green agenda will have any chance of limiting warming to below two degrees Centigrade (above pre-industrial levels). This is important since scientist argue that warming above two degrees risks catastrophic ecological effects. In addition, the compromise approach inherent in these efforts seems reinforced by sustainability science and norms associated with sustainable development that have ascended again in the international community, most notably with the adoption of the 2015 Sustainable Development Goals (United Nations 2015; Kanie and Biermann 2017).

Arguably Type 3 conceptions apply to many resource challenges. Type 3 conceptions occur when stakeholders decide that winning and losing should be shared among different interests. The classic example in environment and resource studies are those governing “land use” in which the landscape is divided up according to different functions, from biodiversity to forestry management to mining to community forestry to agriculture. In fact, Type 3 land use processes were often advanced by forest industry and logger interests (Kelly and Alper 1995, Coglianese 1996, Beyers 2001, Brach et al. 2002, Halbert and Lee 1990) following the effects of Type 4 endangered species laws in the United States, especially in the Pacific Northwest (Yaffee 1994).

During processes that deliberate on how to accomplish these multiple goals, each interest explains why they feel they should have so much land designated as such, and, in the end, some type of government body or agency makes a policy decision (usually a state/province or national government). In practice, these processes pose many implementation challenges but have also generated desirable outcomes for stakeholders. For example, they are often incremental in nature and the institutional arrangements that result can reflect dominant discourses and institutional path dependencies that favour some interests and values over others (Bernstein and Ven 2017). However, research on land use planning in British Columbia and Ontario, Canada, and New Zealand has found that proactive efforts that integrate key stakeholders, especially marginalized indigenous peoples, industrial interests and environmental groups, in ways that a range of stakeholders support, can yield surprisingly durable and legitimate policy decisions (Cashore et al. 2001). In these cases, policy learning can be expected to foster transformative processes when it marries a focus on substance with knowledge on policy instruments and legitimatization processes including those that consider justice and inequality (Banner 2015) (discussed below).

As Cashore (2018) argues, the challenge for Type 3 problem solving, given it derives from mean rather than ends, is that it often occurs alongside increasing “engagement with powerful ‘stakeholders’ – often with those whose businesses practices caused the environmental degradation in question – and whose motivations for engaging, and providing resources for teaching, internship opportunities, and training, is to promote compromise that undermines” Type 4 environmental priorities (Cashore 2018). The result can be a subtle but powerful shift away from the championing of ‘science’ a source of knowledge for understanding and addressing Type 4 environmental tragedies to *subjective belief system* in which “science-based” efforts have become synonymous with the balancing of environmental, social and economic goals, reinforced by the twin concepts of ‘sustainable development’ and ‘sustainability science’ (Glaser and Bates 2011). As Kates (2011) notes, the *Proceedings of the National Academy of Sciences*, “defines ‘sustainability s*cience*’ as a **balancing** act among problem definitions as well as current and future needs of human beings: “...an emerging field of research dealing with the interactions between natural and social systems, and with how those interactions affect the challenge of sustainability: meeting the needs of present and future generations while substantially reducing poverty and conserving the planet’s life support systems.”

The treatment by the National Academy of Sciences as needing to balance among these three goals as “scientific” has led to an ironic situation in which professional environment programs now treat ‘conflict resolution’ ‘neutrality’ and ‘balance’ as scientifically objective for addressing a host of societal, economic and environmental challenges consistent with Type 3 approaches. The irony is all the greater as even political debates on climate change and the Sustainable Development Goals have been unable to resolve whether the three dimensions of sustainable development are meant to be “balanced” or “integrated” – both words appear in the UN resolution on the 2030 Sustainable Development Goals – with the latter implying, perhaps, greater attention to one or the other depending on the problem type (Bernstein 2017). The characterization of problems as Type 3 truncates that debate. Instead, it proposes. by design a mode for adjudicating balance among problems, regardless of a specific problem’s targeted features.

**Type 4: ‘Win/lose, Prioritization’**

Type 4 problems, adjudication of which will result from societal and stakeholders learning processes – either formal or informal – are conceptualized as “win/lose” but in which there is a clear prioritization of the problem in question. In these cases, society or learning processes finds that some problems simply should not be contrasted, or traded off, with others. Laurence Tribe made this observation back in 1972 when he argued that since species extinction was final, it made little intuitive logic to ‘rationally’ permit the loss of species because it led to higher social welfare. They simply were not contrastable. This type of conceptualization informed the 1973 US Endangered Species Act, which formally prohibits economic issues from affecting whether to list a species as threatened or endangered.

Arguably most relevant for this analysis is the case of global climate change, where, owing to learning about the nature of the problem, there is a general consensus among most social and natural scientists that failure to limit climate change below two degrees Celsius will lead to catastrophic environmental, economic, and social impacts. In these cases, multi-stakeholder learning processes are important to assess, and understand, strategies for addressing the problem at hand, but are not useful if they end up shifting conceptions to Type 3 compromise away from the targeted problem in question. In other words, well intended dialogues that “compromise away” the two degrees, in the name of respecting different interests to say, “six degrees”, will be, by definition, unable to address the problem for which the dialogue was created.

The failure to engage in such an explicit distinction among problems has led, we argue, to Type 1, 2 and 3 solutions being applied to Type 4 problems. The result is that innovations that might exist for addressing Type 4 solutions are not being given sufficient attention or resources – reinforcing the tragedy of “super wicked” problems (Levin et al. 2012). More generally, an approach to addressing Type 4 problems requires attention to historical institutionalist approaches, process tracing methods, and deep reflections on the nature of power, structure, and the interactions of state and society (Kutting 2000c).

1. **The Analytical Framework: Types 1, 2 and 3 conceptions undermine Type 4**

These problem type distinctions provide an analytical framework for assessing the diffusion of Type 1, and to a lesser degree Types 2 and 3, thinking into political science, international relations, and environmental scholarship; national and global policies; and, curiously, dramatic shifts in the composition, and training of, especially US, environmental management professionals. First, Type 1 is ‘long-term’ oriented in the sense that its purpose is to overcome a sub Pareto optimal Nash equilibrium tragedy, which can be achieved by developing design principles that would, if maintained, end this tragedy. In other words, the goal is to develop a generalizable theory and design principles with which to adjudicate locally relevant ways to build institutions capable of overcoming depletion tragedies. However, the challenge is that this orientation risks being applied to other problems such as ecosystems, such that scholars either fail to see the Type 4 challenges (such as endangered species) or they work hard to fit the species (or other environmental challenge) into Type 1 conceptions by converting them to economic, utility enhancing objects. This orientation almost always leads to ‘sub-optimal’ results for irreversible environmental tragedies (Tribe 1972, Kysar 2010, Ackerman and Heinzerling 2004). Hence, Type 1 problem orientations are decidedly not future oriented for a whole host of issues that reflect broader normative concerns about the environment that cannot be reduced to our own anthropogenic utility, or even biophilic (Kellert and Farnham 2001) needs. A classic example is that society now accepts that slavery is not appropriate and must be avoided regardless of economic rationality (Type 1) or social welfare optimization (Type 2), or be the subject of ‘compromise’ since it would be abhorrent to ‘balance’ it against other interests (Type 3).

These distinctions also lead us to reflect on the role of Ostrom’s Type 1 emphasis on ‘feasible best’ solutions and ‘better than otherwise would have been’ definitions of effectiveness that permeate scholarly and practitioner assumptions about what is possible or useful. Type 1’s emphasis on utility has diffused to Type 2 directly, and Type 3 indirectly, such that students are being trained to believe that the only possible answers, for feasibility reasons, can emerge from Type 1, 2 or 3 methods. The result is that Ostrom’s metaphor has locked future-oriented policy analysis into present day feasibility calculations.

1. **Application: US and Global Environmental Politics[[15]](#endnote-15)**

*US Environmental Politics*

During the 1970s Type 1 conceptions of environmental problems, especially regarding species loss, had reached mainstream status in the United States and globally. In particular, the Endangered Species Act required not only listing of threatened and endangered species, but for federal agencies to develop management plans on public lands designed to ensure species viability. Similar themes emerged during the 1972 Stockholm conference (UN Conference on the Human Environment), which coincided with the creation of domestic environment agencies to act as an alternative, and often counter, voice to economic and extractive agencies at the highest levels of policy making.

However, the priority of economic goals, and subjugation of environmental and social concerns to those consistent with economic development associated with Type 1, 2 and, to a lesser degree 3, conceptions occurred alongside a shift in the 1990s from ‘environmental management’ among US resource agencies in general, and the US forest service in particular, to today’s ‘ecosystem services’ metaphor that dominates the teaching in most environment schools. This shift is telling, and consistent with broader global trends towards what Bernstein (2001) has called the compromise of liberal environmentalism. Ecosystem management emerged in the 1990s following Type 4 court-mandated rulings in the United States that forest dependent endangered species – in particular the Northern Spotted Owl – required for their survival massive biodiversity conservation. In direct contrast, industry and community interests, reinforced by professional forest scientist communities, responded in several ways to champion Type 1, 2 and 3 conceptions under the rubric of ‘Sustainable Development’ (Type 3), sustained yields (Type 1) and ecosystem services (Type 2). The purpose was to downgrade the prioritization of ecological concerns to those largely consistent with utilitarian social welfare maximizing benefits.[[16]](#endnote-16)

This shift was accomplished through political action on many fronts. First came the reaction of the US forest products industry, whose image was tarnished by successful protests in the 1980s by social and environmental groups in the US Pacific Northwest to preserve old growth forests (Yaffee 1994). Frustrated by their limited influence and poor public image, they drew on Brundtland Type 3 norms to offer their “Sustainable Forestry Initiative” (SFI) and the ‘sustainable forest management’ (SFM) concept as an alternative to Type 4 ecosystem management which prioritized environmental science. The American Forest and Paper Association’s SFI approach promoted Type 3 compromise and balance among economic, social and environmental goals rather than prioritizing environmental crises such as species extinctions that explained old growth forest preservation policies in the early1990s.

The creation of the SFI helped the US forest products industry ‘fend off’ US EPA efforts to increase environmental regulations on Type 1 oriented private forests (Northwest Management 2001, National Woodland Owners Association 2000), and to offer a ‘business friendly’ alternative to the environmental social movement initiated Forest Stewardship Council (FSC) certification system. Many US company officials reasoned that their own institutions were a way to avoid what they perceived at the time to be burdensome standards (Cashore, Auld, and Newsom 2004) inconsistent with their preference for Type 3 balanced approaches. In this case we should note that the competition between the FSC and SFI worked to reinforced Type 3 conceptions, by simply debating the distributional and regulatory dynamics within such an orientation.

These debates also coincided with government granting agencies shift their attention to market mechanisms and sustainability that prioritized human development over the environment, and voluntary standards over mandatory regulations. During this time, even the EPA shifted towards Type 2 voluntary and market mechanism. For example, it promoted consumer-oriented eco-labeling program to identify energy use of electrical products, rather than regulating mandatory energy efficiency for appliances. This policy direction contrasted with other institutional models that had some success under a Type 4 conceptualization, such as Canada-US regulatory agreements to combat acid rain that had affected the great lakes region.

*Global Environmental Politics*

***At the global level***, and in contrast to the regulatory approach offered at the 1972 Stockholm conference, these shifts had taken hold by the 1992 Rio-Earth Summit. Whereas the agreements reached there ostensibly drew on Brundtland’s ‘three legged stool’ (World Commission on Environment and Development 1987) that promoted a balance among environmental, social and economic goals, in practice the agreements incorporated a normative framework that prioritizes markets and economic goals over social and environmental ones (Bernstein 2001).

The jury is still out on whether the SDGs, agreed on in 2015, offer a corrective or simply reinforce these understandings, but fit squarely within the Type 3 framing. The preamble to the SDGs claims to both “integrate” and “balance” economic, social and environmental purposes, which raises questions about whether a coherent agenda will result or how sustainability science – which has emphasized integrative ideas such as the “nexus” approach (e.g., water, food, energy) – will fare in practice in providing “solutions” when incoherence remains in the political framing. Similarly, the SDGs call for both “sustained” and “sustainable” economic growth and employment in goal 8, but avoid any mention of planetary boundaries, despite attempts to include the concept in negotiations over the “growth” goal (ENB 2014)(Bernstein 2017).

*The Paris Agreement*

The prevalence of Type 1, 2, and 3 conceptions helps explain the emergence of, and support and criticism, of the Paris Climate Agreement. For instance, those who support the Paris Agreement tend to approach climate change as a Type 2 or 3 problem (Stavins 1995). For example, Victor (2016: 1)argues that Paris “worked” “when almost everything before it failed” owing to Paris’ nonbinding “pledge-and-review system” that “transformed climate diplomacy from past gridlock by creating flexibility”. Meanwhile, and for the same reasons, Type 4 focused climate scientist Hansen (2016) calls the talks a “…a fraud really, a fake… It’s just worthless words.” What is important is that both agree Paris will not be able to achieve its science-based target of 1.5 degrees (aspirational in the agreement) nor even agreed target of 2 degrees. As Victor (2016: 4) acknowledges, “…the *world has dithered for too long* [on climate] and must now brace for the consequences...[A] realistic crash program to cut emissions will blow through 2 degrees; *1.5 degrees is ridiculous. New goals are needed.*” Hansen, a scientist who can fairly be said to view climate change through a a Type 4 lens, concerned with the ecological effects of climate change itself, evaluates the call for new goals that are *inconsistent with the climate science* as a failure; Victor, a political scientist who conceptualizes climate change as a Type 2 or 3 problem, focuses on the agreement itself as an institutional breakthrough and evaluates the same agreement as *successful*. In other words, he is less focused on the end emphasis on climate change, and more on the means-oriented agreement.

To be sure Paris is more complicated than its articulated targets and could yield potentially successful efforts to address Type 4 super wicked problems over the longer run if viewed as catalytic rather than problem solving (Cashore et al. 2016). Our point is that those trained in a social welfare utility model are more likely to see Paris as transformative even if they also view the problem for which it was created as being insufficiently addressed because they are primarily motivated by a means-oriented Type 3 problem conceptions rather than an ends-oriented Type 4 problem conception.

In the same vein, future scholarship might examine whether a range of environmental groups, development agencies, business associations and even government agencies are also inadvertently reinforcing Type 1, 2 and 3 conceptions over Type 4 owing to prevailing discourse and norms that prioritize market friendly solutions. These norms could also help explain why so much of the work on the plight of local peoples and biodiversity conservations champions Type 1, 2 or 3 problem conceptions to foster ‘rights to resources.’

This orientation has also, it seems, fostered research aimed at identifying a positive correlation between biodiversity conservation and local resource use. These assumptions stand in contrast to the large-scale Type 4 biodiversity conservation efforts promoted in the 1970s and 1980s in the heyday of bioenvironmentalist world views (Clapp and Dauvergne DATE). We are not arguing that these approaches aren’t useful, but these norms may help explain the shift in orientation and problem definition away from Type 4.

1. **Conclusion: Towards a Type 4 Future**

How might a problem conceptions be nurtured in ways that integrate, rather than eschews, Type 4 problem? Given the propensity of Types 1, 2 and 3 to undermine 4, we suggest that highly proactive efforts on the part of governments and stakeholders to consciously identify those problems they conceive of as Type 4, and, subsequently, to developing policy and institutional responses capable of doing so. Some ideas are discussed below.

1. ***Engage Historical Institutionalism***

Just as Ostrom compellingly developed, and offered, her IAD institutional framework to help overcome CPR depletion tragedies, we suggest institutional analysis for type 4 problems ought to undertake the same type of inductive exercise. This requires two related efforts. First, like Ostrom, it requires unpacking specific subsets of problems under general problem types. Such an orientation to research is precisely what led Ostrom to emphasize that while privatization and public ownership or control could indeed provide adequate institutional responses to resource depletion tragedies denoted by substractibility and excludability, CPR problems could often be more optimally managed through a different type of institutional response.

Hence, we envision a number of distinct institutional projects that might help ameliorate different subsets of Type 4 problems. For example, Cashore and Howlett (2007) have found that highly durable “thermostatic institutions” emerged to govern endangered species protection in the United States. The initial trigger came through policy punctuations in the early 1970s that created a thermostatic system in which species endangerment was the equivalent to a home’s thermostat maintaining an inside temperature. As a result, when logging practices resulted in key species becoming endangered, the thermostat kicked in, requiring reductions in logging in order to maintain species viability (Cashore and Howlett 2007). The lesson from this type of institutionalized system is that there is one set of explanations for its emergence (public opinion around concerns about environmental degradation human activity was causing), and another for its reproduction (policy lock-in owing to high consensus needed among executive, senate and congress to consider changes).

At the same time, not all Type 4 problems can be addressed through thermostatic institutions. For example, the four features of super wicked problems like climate change, Levin et al. (2012) argue, make it more amenable to an “applying forward” path dependency analysis than deductive reasoning. They reason such an approach is more appropriate because historical work had shown that if done well, such analysis can identify mechanisms that lock in particular policy options, entrenching policies over time and, most importantly, diffusing them to initially uncovered populations even in the absence of any central authority. To guide their work they draw especially on scholarly work on path dependency (Page 2006) as well as practitioner attention to uncovering, and unleashing, four types of causal processes: policy lock-in; increasing returns, self-reinforcing and positive feedbacks. Levin et al. argue, however, that unlike Ostrom’s approach, designed to develop generalized responses for all CPR problems through her IAD framework, path dependency analysis focuses on uncovering potentially 1000s of innovative and creative solutions that might be capable of triggering path dependency processes around type 4 super wicked problems.

For these reasons they eschew universal design principles that would constrain creativity, to instead focus on three diagnostic questions: 1) What can be done to create immediate stickiness; 2) what can be done to entrench support over time; 3) and what can be done to cover populations not previously covered? These questions in turn focus not only on unique policy mixes that can, and do, emerge, but also on the multiple steps through which such timing and sequence might occur.

This approach points applied policy analysis to think about unique coalitions, such as Vogel’s ‘California effect” in which, over time, a particular type of ‘Bootleggers and Baptists” coalition emerged first in the United States, and then globally, in which relatively highly regulated businesses sought alliances with environmental groups to help champion increased regulations on less regulated competitions. These processes fostered a step by step ‘ratcheting up’ of environmental regulations – triggering a process in which public goods emerge from private interests. This approach also incorporates broad thinking about the causes of high carbon economy, such as inequality in K-12 education that leads many Americans to drive to suburbs with good public schools, locking in high carbon transportation. In these cases, it may be that focusing on ultimate causes, such as reducing K-12 inequality, may have triggering effects in reducing high carbon transportation as more and more Americans would be expected to, over time, live near cities in which they work. Likewise reducing K-12 inequality could be reasonably projected to change, over time, societal preferences in ways that backward looking, or even short live experimentation efforts, would not be able to uncover.

These examples reinforce the need to expand institutional thinking that Ostrom engaged largely incorporating some type of rational choice/utility maximization institutional environment, to including historical institutionalism as well. While HI does not allow for the same kind of predictability since it begins, and ends, with the importance of ‘critical junctures’ in shaping ideas, policies and politics, (Skocpol 1995, Hall 2003, Hall 2009, Pierson 2004, 1993a) it also allow policy makers and society to think much more creatively about how to trigger potentially meaningful path dependent processes.

1. ***Design Multi-stakeholder Deliberations for Type 4 problems***

Given type 4 pathways almost always require a number of governmental and non-governmental stakeholders to undertake strategic decisions in which they are aware of distinct, but related steps through which the problem in question might be ameliorated, it follows, that collective learning processes about these pathways must precede their unleashing (Cashore and Lupberger 2016). To nurture the necessary multi-stakeholder policy learning consistent with a Type 4 conceptualization, Cashore et al. (2016, 2015) argue that policy learning protocols can be designed to assist those seeking to co-generate collective strategic insights for ameliorating specified problems (Humphreys et al. 2017). This literature tells us that without a clear problem-oriented design, multi-stakeholder dialogues on the issue of the day will either be doomed to fail and/or narrow problems to those powerful interests prefer, serving to reinforce traditional power dynamics, undermining both necessary societal change and environmental justice, under the pretense of problem solving.

Two seminal contributions to policy learning are helpful in this regard. Sabatier (1988) has emphasized how those coalitions whose individuals hold deep-seated core beliefs, such as the need to address environmental degradation (with a tendency toward characterizing problems as type 4) or promote economic development (with a tendency to characterize problems as type 2 or 3), can, through learning about the casual impacts of instrument choice, forge cross coalition engagement that can change and shift, the feasibility calculations governing policy decisions. Like Ostrom, Sabatier (1988) devoted considerable time to developing a generalized theory about the conditions under which different types of policy learning might occur based on individual and “advocacy coalition” belief systems. In contrast, Hall (1993) offered a more contingent approach that emphasized historical processes through which different types of societal and subsystem learning might influence policy change, arguing that large-scale change can only come about owing to some type of external subsystem perturbation, such as an economic crisis. In contrast, incremental change can occur through subsystem learning about whether policy mechanisms and settings need adjustment based on empirical evidence. As Cashore and Howlett (Cashore and Howlett 2007) pointed out, while Hall was useful, he incorrectly assumed that large scale change in settings could only occur through endogenous learning processes when the evidence from the thermostatic institution affecting Pacific Northwest forestry was that massive change could also occur endogenously. Hence, while Sabatier and Hall are key for assessing learning processes, applying them forward must be done in a way that encourages insights and creative thinking open to multiple endogenous and exogenous triggers, and subsequent pathways, that might be uncovered.

1. ***Foster integration***

Drawing on Clapp and Dauvergne (Clapp and Dauvergne 2005), we note that some of the greatest innovations in conducting problem focused research, teaching and outreach, lie in the integration of insights from a range of disciplines that permeate Type 1, 2, 3 and 4 conceptions. Integration for Type 4 would require avoiding implicit and explicit hegemonic scholarly battles and instead focus the integration by ‘anchoring’ knowledge and strategic insights around a clear and identified targeted problems. Such efforts must avoid subtle ways in which research strategies reinforce compromise and consensus biases over scientific queries and knowledge generation. This could result in sophisticated approaches for ameliorating problems that lie in the integration of prescriptions, while acting in ways consistent with the core knowledge of the environmental problems in question. (For example, neo-classical economists such as pioneers like John Harkness Dales’ or policy-oriented researches like Robert Hahn, Robert Stavins and Michael Grubb played, through their development of the idea of tradable pollution permits, a key role in championing ideas that would form the basis of ‘cap and trade’ systems aimed to reduce the costs of Type 4 regulation in the acid rain issue in the Great Lakes in the 1980s and, later, climate change (Paterson et al. 2010). At the same time, the importance of problem type orientation must remain central to avoid policy solutions being mistaken for ends in themselves, as in the example of the policy prescription on carbon pricing cited above (Tombe 2018).

This is also important because, as a range of scholars and practitioners are finding, there does indeed appear to be great promise in integrating technical knowledge around climate emission reductions with broader social science scholarship on class, inequality and economic globalization (Newell 2009). This outreach focused research is showing great promise. However, continuing along this path requires moving beyond the comfort of our own particular world views. And doing so requires constant vigilance about the way in which powerful interests, vested in the status quo, will work to shift problem conceptions at multiple levels, from domestic politics, international environmental governance deliberations, funding of dialogues, and, arguably, the curriculum of environmental professional schools who were created, and designed, in the 1970s to address a perceived gap within university settings: how to generate knowledge about, and ameliorate, Type 4 problems.

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**Endnotes**

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2. As Araral (2014: 12) notes, “One of Ostrom’s main contributions in the literature is to bring these disparate case studies together, carefully select them to test her hypotheses about the evolution of institutions for collective action overtime, point to the similarities of the institutional dilemmas plaguing the commons, *extrapolate the design principles of long lived commons* and show why Hardin’s conclusion is flawed.” [↑](#endnote-ref-2)
3. We acknowledge that this argument applies to the impacts of her earlier work, which Ostrom grappled with in subsequent analyses. [↑](#endnote-ref-3)
4. Ostrom strongly argued against this potential trend: “It is my responsibility as a scientist to ascertain what problems individuals are trying to solve and what factors help or hinder them in these efforts. When the problems that I observe involve lack of predictability, information, and trust, as well as high levels of complexity and transactional difficulties, then my efforts to explain must take these problems overtly into account rather than assuming them away. In developing an explanation for observed behavior, I draw on a rich literature written by other scholars interested in institutions and their effects on individual incentives and behaviors in field settings.”

   Ostrom made it very clear that her approach was only meant for human focused resource depletion CPR problems in two ways. First, she made the point that other scientists will focus on other problems and also ‘work backwards’ form a specific focus to identify solutions: “Biologists also face the problem of studying complex processes that are poorly understood. Their scientific strategy frequently has involved identifying, from empirical observation, the simplest possible organism in which process occurs in a clarified, or even exaggerated, form. The organism is not chosen because it is representative of all organisms. Rather, the organism is chosen because particular processes can be studied more effectively using this organism than using another.” Second, and as a result, she made it clear that “My ‘organism’ is a type of human situation. I call this situation a CPR situation and define exactly what I mean by this and other key terms.” (Ostrom 1990: 25-26). [↑](#endnote-ref-4)
5. “What makes these models so interesting and so powerful is that they capture important aspects of many different problems that occur in diverse settings in all parts of the world. What makes the models so dangerous – when they are used metaphorically as the foundation for policy – is that the constraints that are assumed to be fixed for the purpose of analysis are taken on faith as being fixed in empirical settings” (1990: 22). [↑](#endnote-ref-5)
6. For example, Lazarus 2009 [list a few more of the over 500 cites?]; Andrew C. Revkin, December 12, 2015, “The Climate Path Ahead”

   <http://www.nytimes.com/2015/12/13/opinion/sunday/the-climate-path-ahead.html>; and Andrew C. Revkin, November 30th, 2015, “In Paris, Managing Humanity’s Relationship with Earth’s Climate Becomes Normal” <http://dotearth.blogs.nytimes.com/2015/11/30/in-paris-managing-humanitys-relationship-with-earths-climate-becomes-normal/?partner=rss&emc=rss/>; [http://www.bbc.com/news/science-environment-33782943](https://urldefense.proofpoint.com/v2/url?u=http-3A__www.bbc.com_news_science-2Denvironment-2D33782943&d=AwMGaQ&c=-dg2m7zWuuDZ0MUcV7Sdqw&r=V9-xEEdZOyAhD9Lm2JgurKHeVb3lZC8mycr6B1_CCRk&m=arHimUYfEUXAMrfIhxUWg7ioanba4mErRhtAijM5GRk&s=XKEMygE1iTmOuz0LiI2Ty19xAmijF5hiUvNG63wWUto&e=) and [http://www.theguardian.com/environment/2015/nov/14/un-climate-change-summit-paris-planet-future-balance-science](https://urldefense.proofpoint.com/v2/url?u=http-3A__www.theguardian.com_environment_2015_nov_14_un-2Dclimate-2Dchange-2Dsummit-2Dparis-2Dplanet-2Dfuture-2Dbalance-2Dscience&d=AwMGaQ&c=-dg2m7zWuuDZ0MUcV7Sdqw&r=V9-xEEdZOyAhD9Lm2JgurKHeVb3lZC8mycr6B1_CCRk&m=bpsWGS80mdyV1Pl3JXFGX-Qqm2v6esP_7DpeKCzLVtY&s=f6VWD8gqjG3rWsnKg0f8py5u1ED_Pj9pGZX0bMT8liA&e=) [http://www.theguardian.com/news/2015/nov/22/for-the-record](https://urldefense.proofpoint.com/v2/url?u=http-3A__www.theguardian.com_news_2015_nov_22_for-2Dthe-2Drecord&d=AwMFAg&c=-dg2m7zWuuDZ0MUcV7Sdqw&r=V9-xEEdZOyAhD9Lm2JgurKHeVb3lZC8mycr6B1_CCRk&m=NrF4odZuvKCXJw2pGauJtCcPEKogwNq5nuZNGW_v-AA&s=D3Vsb9ZVJNtKRnseHSNiWzSsY97WwNohgjFzo_gLfFM&e=) [↑](#endnote-ref-6)
7. Public goods and club goods are not tragedies since they are not subtractible (using one does not reduce the ability of others to use them) [↑](#endnote-ref-7)
8. The term “social welfare” is itself somewhat confusing to those who promote balancing of social, economic and environmental values since it is, decidedly, an economic, not social, term. [↑](#endnote-ref-8)
9. Who gets how much of the pie is always historically *contingent* upon the constellation of dynamic factors at any one time (e.g., resources of different groups, norms, ideas, role of science, the process itself, and concerns over justice). [↑](#endnote-ref-9)
10. To be sure, Ostrom’s approach was consistent with, and reinforced broader Olsonian collective action metaphors of human behavior (Olson 1965) in which individuals, unless in small organizations, will not always act to develop collective responses, even if there are clear and rationale benefits for individuals in the organization to do so (Ostrom: 6). [↑](#endnote-ref-10)
11. The designation of a problem as a “tragedy of the commons” can also bring covert and latent power into play by limiting how the problem is conceived. For example, what appear to be “commons problems” actually are more complex – with those who can “move on” or live off accumulated gains having much to lose if the problem is addressed? This illustrates our point below that “Type 1” problems are quite rare, and potentially over diagnosed by those who are lured by the elegance of the tragedy of the commons metaphor. [↑](#endnote-ref-11)
12. I refer to the Nash equilibrium since this is the metaphorical starting point for utility-oriented Hardin, Ostrom, and international environmental effectiveness scholars when describing a resource problem that is not subject to any rules or institutions, all of whom draw on the ‘prisoner’s dilemma’ to anchor their analysis. And this, of course, is a decidedly anthropocentric problem. [↑](#endnote-ref-12)
13. E.g., many of Ostrom’s students and followers argue that the IAD framework is helpful for addressing biodiversity loss and other environmental problems (Andersson and Ostrom 2008, Andersson, Evans, and Richards 2009). [↑](#endnote-ref-13)
14. In general, scholars have given much less attention to studying the substantive regulatory content of these systems, arguably because it is so difficult and challenging to do so – owing to constantly changing, and wide ranging, standards. While the paucity of research on these questions is someone understandable, failure to undertake this type of analysis means that it is almost impossible to ‘process trace’ support by firms to ‘on the ground problems’ if it isn’t clear just what the firm is supposed to be doing, and what that ‘supposed to’ requirement might meant for environmental problem solving. The poor proxy, has been to undertake rather static correlational analysis, and/or applying “better than otherwise would have been” approaches in which the ‘collective optimum’, rather than the environmental problem, is treated as the actual goal. [↑](#endnote-ref-14)
15. Please note that this empirical review has been applied by Cashore (2018) using Clapp and Dauvergne’s Four World Views framework. This paper reviews some of the same data, through the lens of the four problem Types instead. [↑](#endnote-ref-15)
16. These values are voiced in Pinchot’s classic book on US forest management that emphasized the ‘greatest good’ for the greatest number (Brown and Harris 1991, Miller 1992). [↑](#endnote-ref-16)