

Context and the commons

Thomas Dietz*[†] and Adam Douglas Henry*^{‡§}

**Environmental Science and Policy Program, 273 Giltner Hall, Michigan State University, East Lansing, MI 48864*; **Sustainability Science Program, John F. Kennedy School of Government, Harvard University, Cambridge, MA 02138*; and [§]*Institute of Transportation Studies, University of California, Davis, CA 95616*

Despite the grim view of resource overexploitation and the collapse famously described in Hardin's (1) much-cited "Tragedy of the Commons," we now know that local governance institutions have the potential to overcome common pool resource dilemmas. A growing literature (2, 3), including Chhatre and Agrawal's analysis of forest commons (4) in this issue of PNAS, demonstrates the conditions of successful commons governance. This body of research augurs well for our ability to design decision-making processes that facilitate both environmental and economic sustainability and thus is of immense practical importance.

Why Commons Matter

The issue of forest commons is an excellent illustration of the practical importance of commons research. Managing forest commons poses a major challenge for sustainability in the twenty-first century. In addition to the ecosystem services provided directly by forest products, forests contain $\approx 50\%$ of terrestrial organic carbon stocks and 80% of terrestrial biomass, as well as perhaps half of terrestrial plant and animal species (5). However, the Millennium Ecosystem Assessment estimates that global forest area has declined by 40% over the past three centuries, with the pace of decline accelerating. Forests have disappeared entirely in 25 countries and have declined by 90% or more in another 29 countries. As Chhatre and Agrawal (4) note, forests managed as common property constitute 18% of global forest area and so are important in themselves. Further, what we learn about forest commons can provide insights into how we can govern other commons, including the atmosphere and the oceans.

Chhatre and Agrawal's article (4) makes an important contribution to our understanding of forest commons governance. It deploys innovative data and methods to address one of the most important questions in the commons literature: What facilitates the sustainable governance of resources? The International Forest Resources and Institutions Program (IFRI) data that underpin their analysis has been painstakingly collected by dozens of cooperating investigators for > 15 years. It is one of the few datasets that allow robust inferences regarding commons. Case studies and historical ob-

servations have yielded insights into the importance of local enforcement mechanisms, but Chhatre and Agrawal provide the strongest quantitative evidence we have on the critical role of enforcement in commons governance systems.

The study of commons is not only of practical importance; it also engages deep scientific questions. The tragedy of

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the commons assumes that human action is best explained by narrow self-interest, what has come to be called the "rational actor paradigm." This assumption drives the overexploitation and resource collapse that constitute the tragedy. Thus, commons researchers must wrestle with central theoretical questions in the social sciences: "What drives human decision making and behavior? What role do self-interest and altruism play?" The argument that self-interest dominates decision making has been challenged by important advances in modeling, experimentation, and conceptual analysis (6–9). The emerging approach emphasizes how context shapes decision making and thus allows for situations in which altruism plays a significant role as well as those in which narrow self-interest dominates.

How Context Matters

The contributions of studies like that of Chhatre and Agrawal (4) to both commons governance and to basic social science come, in large part, from helping us to understand the contexts that yield actions that sustain the commons. However, context has at least three meanings, each important to understanding the dynamics of decision making about commons. Chhatre and Agrawal emphasize how the effect of one variable depends on the state or value of other variables. So, for example, they find that the commercial value of a forest increases the chances of regeneration when there is strong local enforcement

of rules, but commercial value decreases the chances of regeneration in the absence of local rule enforcement. It follows, as they note, that enforcement matters, as do markets. How each factor matters depends on the other factors. So our first sense of context is what is often called an "interaction" in statistical analysis—the effect of one variable, such as enforcement, depends on other factors, such as whether the forest is used commercially or primarily for subsistence.

Context also means the larger landscapes of local and national government and the local, regional, and global political economies that shape actions and responses to actions (10). For example, the ability to use legal mechanisms of enforcement depends on the power of government, and the ability to derive commercial value from forest products depends on regional, national, and even global markets. So our second sense of context is the extra-local arrangements that impinge on the local places where many key decisions about commons use are made. This is context as a hierarchy of interactions (11). Examining these extra-local influences is a high priority for future research because it is often the extra-local factors that can be most efficiently influenced by policy. But doing so will require investment in more extensive data sets, a point to which we will return below.

Social networks are another key aspect of context. All human activity is embedded within social relationships, where interactions continually reshape beliefs, norms and values, and ultimately actions. We know that certain types of governance arrangements, such as collaborative policy-making institutions, may lead to the formation of networks that in turn promote the development of social capital and grease the wheels of altruistic collective action (12, 13). Although it is widely accepted that networks matter for effective regulation and governance (14), we are just beginning to understand the precise mecha-

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[†]To whom correspondence should be addressed. E-mail: tdietz@msu.edu.

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nisms that relate network structure to cooperation (15) and even less is known about how networks influence enforcement. The Chhatre and Agrawal (4) analysis suggests at least two pathways through which social networks impact governance outcomes: by their direct influence on altruism and collective action, and indirectly, through the interactions between collective action and enforcement. In thinking about the relationships between network structure, collective action, and enforcement mechanisms, it is also important to note that network structures are themselves influenced by policy outcomes (including enforcement actions) and the attributes of individual network actors. Thus, an understanding of how social networks impact commons governance requires a perspective that emphasizes the coevolution of networks and the individuals embedded within them (16).

So our third sense of context refers to the structure of the social networks in which the use of the commons will play out. This third kind of context has been the least explored of the three. But we can imagine, for example, that network structures in a local community will influence both how sanctions are applied and how the applications of sanctions are perceived. For example, hierarchical or centralized networks may support more efficient enforcement mechanisms, but these types of networks may also reduce the efficacy of rule enforcement because they damage perceptions of legitimacy and trust in the governance process. Chhatre and Agrawal (4) present evidence that local enforcement matters but depends on context in our first sense of that term. But context in

the sense of the structure of local networks and the hierarchical relationships of the local to the regional and global also requires assessment. We note that the emerging field of “conservation criminology” provides an important link between the large social science literature on enforcement of laws and the literature on commons management and may prove helpful in this regard (17).

Context and Learning

The extra-local context that shapes decision making will always change, new technologies will emerge, and local social networks will evolve over time. As a result, effective commons governance must be honed through policy learning. Learning is widely identified as a key hinge for sustainability and is often mentioned in discussions of integrated assessment, policy experimentation, and adaptive management. Presumably, learning emerges from a combination of policy experimentation, scientific research, personal observation, and social influence processes occurring at both the local level and elsewhere. However, most discussions of policy learning are disappointing in that they underemphasize explicit models of information processing and belief change, and are often vague about questions of “who learns” and “what is learned” (18). In some cases, the important learning will be on the part of those making use of the common pool resource. In other cases, the important learning will take place on the part of those shaping the policies that are the context for decisions about using the commons.

Overall, Chhatre and Agrawal’s contribution (4) moves us forward by em-

phasizing the importance of context in the sense of interaction and arguing, in particular, for the importance of implementation. But valuable as their work is, it also makes clear the need for a more integrative theoretical framework, one that takes account of interaction effects, hierarchies, and social networks. Important moves in this direction are underway (19), but no single theory or framework successfully deals with all of these contextual factors (20).

Finally, Chhatre and Agrawal’s analysis (4) demonstrates the vital importance of long-term investments in developing datasets. The IFRI data that power their work required collaboration by 11 research centers for more than a decade. These data will continue to yield key insights into commons governance. But despite the heroic effort required to construct it, the sample is modest in size (152 cases), covers only 9 countries, and does not include much information on many key contextual factors such as the extra-local context or the structure and dynamics of local networks. This is not to criticize what has been accomplished—Chhatre and Agrawal’s analysis is testimony to the kinds of insights this sort of data can yield. But, we must insist that greater resources be devoted to developing more extensive data on commons. Learning to govern commons is one of the major challenges for sustainability. A strong community of researchers is available to deploy the full repertoire of social science theory and methods to provide a scientific basis for commons governance, but their efforts remain hampered by a lack of sustained funding commensurate with the scientific and practical importance of the problem.

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