

Connecting Commons and the IAD Framework

Michael D. McGinnis

Associate Dean for Social & Historical Sciences and Graduate Education, and Professor of
Political Science
College of Arts and Sciences
Indiana University
Owen Hall
790 E. Kirkwood Avenue
Bloomington, IN 47405-7101
Phone (812) 856-7207
Fax (812) 855-2060
email mcginnis@indiana.edu

The **Institutional Analysis and Development (IAD) framework** provided the analytical foundation upon which Elinor Ostrom built a research program on community-based management of natural resources. For that work she was named a co-recipient of the 2009 Nobel Memorial Prize in Economic Sciences. She was also the primary driving force behind the initial development and subsequent revisions of the IAD framework, which remains one of the most prominent theoretical perspectives in scholarly research on public policy (Wieble and Sabatier 2018, Cole and McGinnis 2017). Although she makes no explicit use of IAD in her highly influential 1990 book, *Governing the Commons*, she does use an informal discussion of its basic components to frame her mode of analysis (Ostrom 1990, 45-57). In later work Ostrom (2005, 2010) more fully articulates the broad scope of this analytical framework, which she envisioned as a means whereby scholars from multiple disciplines could more effectively communicate with each other, as they used diverse perspectives to better understand complex policy settings.

In this chapter I investigate this deep connection between the conceptual framework of IAD and the empirical subject of the commons, and suggest ways in which a deeper realization of this connection might inspire promising directions for future research. Section I introduces the concept of a commons as a configuration of resources, rules, and the people whose access to those resources is determined by those rules. Section II summarizes the IAD framework, and highlights a remarkable congruence between its key components and the nature of a commons, which helps explain why IAD proved to be such a solid foundation for commons research.

Section III uses the design principles from Ostrom (1990) to illustrate how the IAD framework helps contextualize the conditions necessary to insure the long-term sustainability of a commons.

Section IV locates both IAD and the commons within broader perspectives on social-ecological systems and systems of polycentric governance. Late in her career Ostrom (2007, 2009) introduced a Social-Ecological Systems (SES) framework that fine-tuned the IAD framework to be more directly applicable to the study of resource systems. Polycentric governance requires a multitude of decision centers, each with a limited range of authority which, to some extent, overlaps with the jurisdiction of other decision centers, thus requiring these authorities to interact with each other to achieve their own goals. Ostrom highlighted the centrality of polycentricity to her Nobel-winning research on the “study of governance, especially the commons” by selecting “The Polycentric Governance of Complex Economics Systems” as the title for her Nobel Memorial Lecture (Ostrom 2010). This chapter concludes that a fuller appreciation of close connections among the IAD framework, commons, social-ecological systems, and polycentric governance can help lay a firmer foundation for future research in all of these areas.

I. Commons as a Configuration of Resources, Rules, and People

Informally, the word **commons** refers to resources to which members of some group share access. Resource commons occur in many different forms, and are familiar to people from all cultures. Typical examples include common grazing land, fisheries, lakes, or forests. Other commons are humanly-constructed, ranging from irrigation systems to complex infrastructures for transportation, communication, and the generation and distribution of electric power.

More technically, a commons may include one or both of two kinds of goods: (1) **public goods**, for which one person’s enjoyment does not preclude others from also enjoying it, and (2) **common-pool resources**, for which consumption by one makes that particular resource unit unavailable to others, even while the broader resource pool remains available to all eligible users (Ostrom and Ostrom 1977). Difficulties grounded in the ubiquitous temptation to free-ride on the contributions of others towards the production of public goods are universally recognized, and

common pool resource is a technical term for something that happens every day, whenever fish are caught, firewood collected, or farmers draw upon an irrigation system to water their crops. Beneath this mundane façade, however, lie subtle connections between our understanding of private and public. When a particular resource unit (a fish caught in a lake) is extracted from a pool of commonly shared resources (the population of fish swimming in that lake), that fish becomes the private property of some individual or corporate entity, whereas the rest of those fish remain available for use by others.

Individuals extract resources for their own use, but if too many people extract too much in too short a period of time, the common pool may be degraded or destroyed. This “**tragedy of the commons**” (Hardin 1968) is especially likely in an “open access” commons, from which anyone can draw. This tragic outcome can be avoided only if someone takes responsibility for insuring the replenishment or maintenance of that resource. Hardin concluded that there were only two possible answers: either the commons should be (1) managed by some central authority assigned the task of acting as its steward, or (2) divided into parcels of private property, since owners can reasonably be expected to look after their own property.

In 2009 Elinor Ostrom was awarded a Nobel Prize for demonstrating the relevance of a third answer to this question (Ostrom 2010). A commons may be effectively managed as **common property**, an institutional arrangement through which a specific group of individuals shares responsibility for jointly producing, consuming and/or managing a common resource. In *Governing the Commons* (1990) and many other publications, Ostrom drew upon examples from countries throughout the world to demonstrate how local communities dependent on continued access to natural resources can, in some circumstances, work together to craft, monitor, enforce, and revise rules limiting their own behavior, and thereby manage to keep those resources available for long periods of time. These rules typically specify how many resource units can be extracted, and when, as well as requiring contributions towards maintaining any needed infrastructure. By transforming common resources into common property, a group of resource users acts as their own stewards.

Ostrom's research inspired others to carefully examine the concept of a commons. An especially useful insight is provided by Frishmann et al. (2014: 2): "Commons refers to a form of community management or governance. It applies to resources, and involves a group or community of people, but commons does not denote the resources, the community, a place, or a thing. Commons is the institutionalized arrangement of these elements." In their effort to extend Ostrom's mode of analysis to knowledge commons, such as intellectual property rights systems, they identify the core analytical task as understanding "How people interact with rules, resources, and each other" (Frischmann et al. 2014: 19).

This conceptualization of a commons as a mutually sustaining configuration of resources, rules, and people provides an especially rich foundation for analysis. A commons consists not just of resources or the people with access to those resources, or even to the rules that restrict how these people may use those resources; rather, a commons should be understood as a holistic configuration of resources, rules, and people.

II. A Framework for Understanding Institutional Processes

Resources, rules, and people are all located within broader biophysical, political-legal, and social-cultural contexts. This brings into play the IAD framework, which was designed to be applicable to all kinds of policy settings (Ostrom 1986, 2005, 2010, 2011). In her words,

If a wide diversity of institutional forms exist not only side by side but nested within one another, behavior cannot be explained, nor guided, controlled and evaluated, through reliance on any limited sets of pure theories. We need to ask whether similar conceptual characteristics underlie all hierarchies, markets, courts, electoral contests, collegial fora, and solidaristically organized communities. Is there a common set of variables that can be used to analyze all types of institutional arrangements? (Ostrom 1986: 459-460)

The IAD framework posits a few key categories of potentially explanatory variables from which common sets of variables could be constructed and used to explain all kinds of policy situations. As shown in Figure 1, the IAD framework represents institutional processes by a series of boxes within which different causal determinants or processes are located. At the heart of the IAD framework is an **action situation**, in which individuals (acting on their own or as agents of formal organizations) observe information, select actions, engage in patterns of interaction, and evaluate outcomes. Choices and outcomes are influenced by the beliefs and incentives of individual actors, as shaped by the responsibilities and social expectations attached to any official position they may hold, and by the information available to them.

Each action situation is shaped by preexisting **contextual conditions**, grouped for analytical purposes into three categories: (1) “nature of the good” under consideration, including all relevant biophysical conditions; (2) “rules-in-use,” which includes the entire body of laws, regulations, rules, norms, and shared understandings held by the participants to be relevant to deliberations on that policy area, and (3) “attributes of the community,” that is, the social ties and cultural attributes that characterize the individuals directly affected by that policy problem.

Each action situation denotes a nexus where a group of decision makers jointly confront important decisions related to some particular policy concern. As is typical in strategic interactions, potential outcomes are differentially valued by actors with only partial control over the final determination of results. Ostrom (1986) frames an action situation as a generalization of standard game models. To define a game, modelers must specify the actors involved, the actions available to them and how these actions jointly generate alternative outcomes that are differentially valued by the actors, who may have access to different sources of information as well as different types or levels of resources they can use to influence the actions of other players.

In the IAD framework, each action situation is configured by interlocking “working components,” which are related in the following manner:

Participants, who can either be individuals or any of a wide diversity of organized entities, are assigned to *positions*. In these positions, they choose among *actions* in light of their *information*, the *control* they have over *action-outcome linkages*, and the *benefits and costs* assigned to actions and outcomes. (Ostrom 2005, 188; italics added)

Implicitly, the values taken by each of these italicized components is determined through processes occurring in other settings for strategic interaction, that is, in other action situations.

The IAD framework differentiates among three arenas of choice, or conceptual levels of analysis: (1) **operational-choice** settings in which the choices of the relevant actors directly impact tangible outcomes, (2) policymaking or **collective-choice** settings in which the actors shape the rules that constrain actors in operational-choice arenas, and (3) settings for **constitutional-choice** in which decisions are made concerning which actors have standing in different choice situations as well as which kinds of alternative institutional mechanisms are available to them as they make their collective deliberations and operational-level choices (Ostrom 2005, 58–62).

Individuals and collective actors generate patterns of **interaction** from which specific **outcomes** emerge, which they (or other actors) compare against **evaluative criteria** that seem pertinent to the actors doing the evaluations. All these evaluations (and the outcomes that triggered them) feed back into the entire set of preexisting conditions, thereby setting the stage for the next round of action situations. Although evaluative criteria are placed in a box off to the side of Figure 1, a more complete representation would show how these criteria were determined by processes of collective or constitutional choice occurring in other action situations.

Concurrent action situations operating at the same or different levels of analysis interact in subtle ways. In particular, the contextual factors which define any given action situation will themselves have been determined by outcomes generated by other action situations. Ostrom and Ostrom (2004, 134) illustrate how processes of constitutional choice can shape the general context under which collective policy decisions are made, and the outcomes generated by action

situations at the collective choice level can determine the specific conditions under which operational choices are implemented. McGinnis (2011b, 54) provides an alternative graphical representation in which different kinds of collective or constitutional choice processes can influence the working components that constitute an action situation at the operational level.

Strictly speaking, this determination of the working components of a focal action situation may be no different from a complete specification of a game model, but in practice this concern with simultaneous consideration of multiple choice arenas that endogenously generate conditions for choice in other arenas inspires IAD scholars toward a more inductive mode of analysis (Mitchell 1988). Formal mathematical analyses are rendered problematic because of the complexity of the full network of inter-connected action situations. However, in some settings the same actors may participate in the most critical action situations (McGinnis 2011b). In a self-organized community of resource users who live in a remote area and only rarely experience interference from outside actors, a complex network of adjacent action situations could distill down to a small number of tightly interwoven action situations. This is one reason why this mode of analysis has proven so useful for analysts studying community management of common resources and other forms of self-governance.

The details of IAD have undergone changes over the three decades of its use (Kiser and Ostrom 1982; Ostrom 1986, 1989, 2010, 2011; Oakerson 1992; Ostrom, Gardner, and Walker 1994; Ostrom and Ostrom 2004; Clement 2010; Schlager and Cox 2018). For example, the action situation was initially divided into actors and the action arena, which included all the rest of the working components. These changes are discussed in detail in Ostrom (2011), which was her last solo-authored evaluation of its impact on policy studies in general.

Despite minor changes in terminology, the same basic structure has remained in place from the beginning: diverse kinds of choice processes that are operating concurrently or sequentially at different conceptual levels of analysis and that interact to shape the contexts under which all action situations are conducted. This enduring vision permeates *Understanding Institutional Diversity* (Ostrom 2005), the most comprehensive and authoritative explication of the full analytical repertoire of the IAD framework.

III. IAD and the Design Principles for Sustainable Commons

Although Elinor Ostrom intended IAD to be generally applicable, in practice it tends to be most frequently used for certain kinds of policy settings (Heikkila and Cainey 2018). IAD explicitly presumes that human choice matters, and that the contexts within which those choices occur can be shaped by individual choice and collective action. It is not difficult to imagine policy settings in which the choices of ordinary citizens have very little direct impact on ultimate outcomes.

For example, the IAD framework may not be well-suited for understanding decision situations within complex hierarchical organizations in which ultimate authority is concentrated at the top levels of that hierarchy. Still, the IAD framework can be modified to improve its ability to answer a broader array of questions. For example, analysts working within this tradition tend to focus on the problem-solving aspect of policy problems and downplay the extent to which policy outcomes are driven by whoever has the most power to shape policy. Clement (2010) expanded the IAD framework in a natural manner by adding two additional categories of contextual variables to highlight the potential consequences of the social-economic foundations for political power and the ways in which public discourse can be shaped to favor the interests of influential actors.

The IAD framework is widely-recognized as one of the most influential perspectives in the research literature on public policy, and Heikkila and Cainey (2018) systematically compare IAD to others on that list. Briefly, the multiple streams approach highlights the tendency of Presidents and other national authorities to react sequentially to newly emerging crisis situations, with their decisions being driven to a great extent by the chance concurrence of specific problems and policy solutions that are the most politically expedient at that time, given the partisan configuration of the three branches of government or the electoral calendar. The advocacy coalition and narrative policy frameworks emphasize political disputes between coalitions of actors with similar beliefs towards a given issue or in which the terms of discourse can be instrumentally shaped by clever slogans or framing contexts. Models of policy diffusion can help

explain how policy ideas or experiments are transmitted from one state or nation to another, based on the communication networks among different jurisdictions.

Although the IAD framework cannot provide a universal language to study all of the political landscape, there are some circumstances for which it is ideally suited. Individuals who find themselves in situations in which they have the capacity to work together to meaningfully shape the conditions under which they interact are likely to find it easier to move from operational decisions to reconsideration of collective choices or to renegotiation of fundamental questions concerning the constitution of their own societies, and back again. The primary value to researchers of the IAD framework is the guidance it provides concerning the kinds of factors that need to be examined in situations of such pervasive endogeneity, by structuring the types of questions researchers should ask as they work their way through the complexities of those policy settings (Cole and McGinnis 2017).

The IAD framework requires analysts to realize that bio-physical, legal-institutional, and socio-cultural factors interact in complex ways to shape patterns of interactions among relevant actors as well as policy outcomes. By highlighting the fundamentally configural nature of causal relationships in social settings, this framework implies that the effects of any policy intervention will necessarily ramify throughout complex institutional systems in manners that are unlikely to be immediately apparent. In that way, IAD forces policy analysts to dig deeper into the underlying nature of the problem, and sensitizes them to follow through the likely consequences of any policy intervention on the subsequent incentives facing relevant actors, as well as the institutional processes which may shape the ways in which they act upon those new incentives.

It was this persistent inclination to dig deeper that helped Elinor Ostrom see more clearly into the fundamental nature of a commons, and to help the rest of us see these issues in a new light. Where other analysts saw only general questions of policy or legal context, Ostrom kept pushing to understand the ultimate linkages among the resources, rules, and people that constitute the configurations we have come to call a commons.

The IAD framework directs analysts to focus their attention on a small number of key action situations in which resources, rules, and peoples mutually influence each other (McGinnis 2017). Each of these focal processes can then be subjected to the forms of analysis prompted by the IAD framework. Despite Ostrom's early intentions as quoted above, it is more appropriate to say that the IAD is directed towards identifying a common set of **processes**, rather than variables. Ostrom (2005) frames all kinds of institutional arrangements as processes, and the IAD framework detailed there has helped many analysts to focus their attention on identifying certain key processes. Only secondarily does attention shift to identifying particular sets of variables for operationalization.

The way in which IAD nudges analysts to focus their attention on a small number of core processes can be illustrated by considering Ostrom's analysis of common property as a means of sustainable management of a resource commons (Ostrom 1990; McGinnis 2017). She begins by distinguishing two fundamental processes found in any common pool resource setting: **appropriation** (extraction of a resource unit from a common pool) and **provision** (the process of arranging for the production of public goods, the replenishment of a common resource, or the construction and maintenance of infrastructure used in either setting). In many kinds of resource commons, different groups of individuals or corporate entities are primarily responsible for appropriation and provision. But in most cases studied by Ostrom, the same individuals were directly engaged in both appropriation and provision.

Ostrom also directed attention to other related processes, especially rule-making, monitoring, and sanctioning. Her appreciation of their importance was reflected in her experimental research on common-pool resources. Ostrom, Gardner, and Walker (1994) use the term provision to encompass all replenishment and maintenance activities because this part of the CPR situation corresponds to a public good, at least for members of the user group. When they set up experimental versions of this generic model, they determined the rules that the participants had to follow, as well as any rules concerning how those participants may select different types of monitoring and sanctioning regimes. These experimental studies explore how the same subjects behave differently when given different options for monitoring and sanctioning. Even in this

highly abstracted version of a CPR, processes of appropriation, provision, rule-making, and monitoring and sanctioning are deeply interconnected.

It is my contention that a similar intertwining of focal action situations provides a key to understanding how Elinor Ostrom developed the “design principles,” the single most important take-away from *Governing the Commons*. Ostrom posited a list of eight conditions that were satisfied, in one way or another, in every one of the cases she examined in which local communities successfully managed, in a sustainable fashion, resources needed for their own survival. Although few if any of these communities explicitly set out to satisfy these conditions, in combination they provide a solid foundation for long-term sustainability of a commons.

My claim is that these design principles emerged from Ostrom’s intense engagement with her case studies, because her thought processes were shaped, in a fundamental sense, by the categories and relationships expressed in the form of the IAD framework on which she had been working for years (McGinnis 2017). I am not trying to reproduce the exact thought processes through which she reasoned her way to these conclusions, but am only interested in using the design principles to show how the IAD framework and the concept of a commons line up in a more fundamental way than is generally recognized.

I find it useful to rearrange and rephrase these design principles in the form of a single, but multiply compounded sentence, as follows:

A community of resource users dependent on an identifiable body of resources located in well-defined region (**clear social and resource boundaries**), which has sufficient formal authority or effective de facto opportunity to manage these resources (**local autonomy**), can do so in a sustainable manner by collectively crafting rules and procedures regarding levels and modes of resource extraction and the construction and maintenance of necessary infrastructure (**wide participation in rule-making**), sharing information generated through routine monitoring of user actions and resource outcomes, either by themselves or by monitors whom they hold responsible for honest oversight (**responsible monitoring**), imposing sanctions on rule-breakers in a way that imposes significant costs

for repeated offenses while still enabling them to return to the good graces of the community (**graduated sanctions**), resolving the disputes that will inevitably arise either directly or with the help of trusted intermediaries (**conflict resolution procedures**), and by soliciting assistance from outsiders or delegating important tasks to sub-groups when that is needed to find solutions to specific problems (**nested enterprises**), as long as the rules and procedures that emerge from ongoing interactions among the relevant parties turn out to be appropriate for local circumstances and have consequences that distribute the costs and benefits of their collective action in a manner considered equitable by most members of that community (**rule congruence with changing social and environmental conditions**).

This sentence highlights the many critical interactions among all items in that list (as modified by Cox et al. 2010) and illustrates how these principles operate in conjunction to generate and sustain a mutually reinforcing configuration of specific properties of the resources themselves, the actions of the people within that community, and the rules, norms, and procedures that shape those actions. In sum, the design principles define conditions for a mutually-reinforcing configuration of resources, rules, and communities, that is, for a sustainable commons.

Elsewhere (McGinnis 2017) I argue that Ostrom concentrated her analysis on four critical (or focal) action situations in her case studies: appropriation, provision, rule-making, and monitoring and sanctioning. A few related action situations that also contributed to her formulation of the design principles include constitutive processes (the construction of collective actors capable of making a common decision), dispute resolution, evaluations, and the slow accumulation of indigenous knowledge. The framing established by her IAD mind-set worked so well in this analysis because in most of the cases she examined essentially the same set of actors was directly involved in all four focal action situations as well as these supplementary (or adjacent) action situations.

Each of the design principles can be interpreted as an outcome generated by one or more of these core and supplemental action situations. As an overall configuration, these outcomes will be mutually reinforcing in some empirical settings, and not in others. More specifically,

- 1) **Clear social and resource boundaries** may emerge from constitutive processes and the accumulation of local knowledge in some circumstances, but in other cases deep fissures between competing groups may have prevented them from arriving at a consensus, or regular patterns of resource growth and decline may have been too frequently disrupted by unpredictable shocks.
- 2) A minimal level of **local autonomy** may have been effectively guaranteed in remote areas of little interest to central authorities, but any area which has attracted the attention of national leaders or global corporations may lose their ability to maintain traditional practices.
- 3) Groups systematically excluded from **participation in rule-making** would have been much less likely to comply with those rules or contribute towards their enforcement, compared to those groups which helped craft rules that served their own interests.
- 4) Many rule violations would have been easily observed within the dense social networks in these communities, but in those circumstances when explicit **monitoring** was required, the people most directly affected by the continued availability of these critical resources would have been better able resist bribes to overlook certain violations.
- 5) **Sanctions** that failed to be applied in a consistent manner would have undermined the legitimacy of the rules, and a lack of any opportunities for second or third chances would, eventually, have generated poisonous levels of resentment.
- 6) If processes for the **resolution of disputes** were not available, or if existing processes did not take into account the long-term effects of settlements on the community as a whole, then fewer members of the community would have been willing to continue to comply with or monitor the rules;
- 7) If the formation or operation of **nested teams** (each assigned a limited task) has long been hampered by deep social fissures, or the lack of trusted intermediaries, some important functions could not have been accomplished in any consistent manner; and
- 8) Appropriation and maintenance rules that failed to be **congruent** with local biophysical conditions would, eventually, lead to resource degradation, and it is

unlikely that rules which generated unacceptable levels of inequities would have continued to be widely observed or enforced by members of disadvantaged groups.

Each design principle explicitly connects to factors from one or more of the three categories of contextual variables: biophysical conditions of the resources, rules-in-use, and attributes of the relevant community. As a whole, these design principles emerged as the outcomes of multiple arenas of choice at the operational, collective, and constitutional levels. Continued operation of all of these design principles would have the effect of generating patterns of dynamic changes that exhibit a strong tendency towards co-evolution of the resources, rules, and communities that constitute a commons. In this way, factors within each category influence factors in all of the other categories to maintain a dynamic sustainability of the entire configuration. The IAD framework helps draw the attention of analysts to the full range of factors and dynamic processes that are necessarily involved in the operation and sustainable management of a resource commons.

IV. Extensions to Social-Ecological Systems and Polycentric Governance

As argued above, no one commons exists in isolation, since its constituent resources, rules, and people each connect outwards to broader contexts. The IAD framework directs analysts to focus attention on a small number of key action situations which serve as the nexus where resources, rules, and communities mutually influence each other. No action situation occurs in isolation; instead each action situation points outward to other action situations in which the defining components of that focal action situation have been determined.

Since there is no such thing as an institution-free context (Cole, Epstein, and McGinnis 2014), no policy reform can be applied to a completely blank slate. Policy advocates necessarily introduce purposeful interventions into an already complex ecosystem of institutional arrangements. Unfortunately, the dynamism embedded in this line of argument is not clearly represented in the canonical depiction of Figure 1, which might convey the mistaken impression that any one

policy situation can be understood in isolation from the many other policy situations with which it is, in the real world, complexly interrelated.

Later in her career, Elinor Ostrom (2007, 2009) developed a more complex framework intended to provide a more comprehensive approach to the study of closely-coupled systems of complex human-environment interactions, or social-ecological systems. This **SES Framework** was designed to give equal weight to both the social and ecological sides, whereas the IAD framework focused most of its attention on the social-institutional side of policy problems.

The SES framework was optimized for application to a relatively well-defined domain of common-pool resource management situations in which *resource users* extract *resource units* from a *resource system*. The resource users also provide for the maintenance of the resource system according to rules and procedures determined by an overarching *governance system* and in the context of *related ecological systems* and *broader social-political-economic settings*. Processes of resource extraction and maintenance were identified as the most important forms of the *interactions and outcomes* located in the very center of this framework (Ostrom 2007, 2009), but consideration was also given to rule-making, monitoring, sanctioning, dispute resolution, and the formation of organizations.

In practice, subsequent researchers have tended to focus on identifying lists of variables included in the first-tier categories of resource users, resource units, resource systems, and governance systems. The action-situation based category of interactions and outcomes has received considerably less attention, despite its location at the center of all SES-based diagrams. Unfortunately, the IAD's characteristic emphasis on identifying a few key action situations for particular attention was somehow lost in the transition from IAD to SES.

In hopes of re-integrating these related approaches to the study of resource commons, Cole, Epstein, and McGinnis (2014) draw upon both the IAD and SES frameworks to demonstrate that there was a lot more going on in Hardin's story of the tragedy of the commons than the overgrazing of an open-access commons. "If the grass on the pasture was not subject to appropriation, the cattle were not privately owned, or property- and contract-enforcement

institutions supporting market exchange were absent, then the ‘tragedy of the commons’ would not have arisen regardless of the open-access pasture.” (Cole et al., 2014: 353) In other words, the tragedy that Hardin considered inevitable would only be logically possible for settings characterized by a particular arrangement of ownership rights over different but inter-related types of resources.

Nor was Hardin’s prediction of an inevitably tragic outcome the result of a lack of consideration of the possibly remedial effects of institutions, as argued by Ostrom (2007). Cole et al. (2014: 365-6) conclude that Hardin’s conclusion required an unfortunate combination of “maladapted institutions that support incentives for overexploitation. ... The open-access pasture does not exist in splendid isolation but operates within a larger universe of interacting resources and institutions. Hardin’s ‘tragedy of the commons’ is not just about the pasture; it is equally about the grass, the cows, the herders, and the human society.”

The governance and resource utilization parts of the SES are generated by dynamic iterations of the complex network of inter-related action situations that should be examined in any analysis based on the IAD framework. No action situation stands alone, because its contextual conditions have to have been determined by the outcomes of other, related action situations. Similarly, no commons exists in splendid isolation; each is embedded within broader contexts of social, political, economic, legal, and other forms of institutions which, in combination, assign different configurations or responsibility for governance functions to actors with different kinds of property rights to different resources. When seen as an interrelated network of action situations, attention shifts to the range of authority that is being enacted by the actors-in-position within each action situation.

To analyze the ways in which action situations, as partially autonomous decision centers, are inter-connected, it is necessary to step up to a higher level of aggregation, and to consider the nature of **governance**. Governance is concerned primarily with the processes of provision, production, financing, and evaluation of public goods, as well as the management of common resources and public infrastructures. Governance necessarily requires tough decisions involving tradeoffs among alternative goods, many of which are high priority items for different parts of

society. Since the benefits of enjoying public goods or shared resources cannot be easily appropriated exclusively by the individuals who invest their time and resources in producing or procuring those goods, some kind of authority is critical for solving the problems of free riding. Typically, authorities need to be able to enforce at least a minimal level of legitimate coercion to gather the resources needed to support public purposes, by requiring individuals to pay taxes or changing fees to individuals who seek access to restricted commons.

Elsewhere (McGinnis 2011a: 171), I defined governance as a “process by which the repertoire of rules, norms, and strategies that guide behavior within a given realm of policy interactions are formed, applied, interpreted, and reformed.” The basic point is that governance must be understood as a **process**, and that both government officials and non-governmental actors play critical roles in that process.

The IAD framework is naturally congruent with a particular understanding of governance as being driven by a multitude of decision centers, each with a limited range of authority which typically overlaps with the jurisdictions of other decision centers, thus requiring these authorities to interact with each other to realize shared aspirations, or even to achieve their own goals. Each decision center typically has jurisdiction over only a few action situations, and the conditions under which one decision center operates have been shaped by the operation of inter-related decision centers.

In an ideal-typical system of **polycentric governance**, a diverse array of public and private authorities with overlapping domains of responsibility interact in complex and ever-changing ways, and out of these seemingly uncoordinated processes of mutual adjustment emerges a resilient system of social ordering that can support and sustain capacities for self-governance (Cole and McGinnis 2015). Originally introduced by Ostrom, Tiebout and Warren (1961) as a vision of governance that embraced the potentially positive consequences of governmental fragmentation in U.S. metropolitan areas, this conceptualization inspired empirical analyses of police services and other aspects of metropolitan governance (McGinnis 1999, Oakerson 1999, Oakerson and Parks 2011). The most widely-known application of polycentricity to real-world settings remains the work of Elinor Ostrom (1990, 2010), who concluded that community-based

commons management was likely to be sustainable only if its rules were nested within a broader system of polycentric governance that allowed for alternative mechanisms of collective decision-making and conflict resolution at all levels of aggregation.

Ostrom's analysis of southern California groundwater management in chapter 4 of *Governing the Commons*, based in part on her Ph.D. dissertation (1965), demonstrates that conditions similar to the design principles summarized above can be observed in less isolated and more intensely politicized settings. In this case critical contributions were made by a diverse array of organizational actors operating in constitutive, judicial, and scientific arenas – experts from the U.S. Geological Society, state laws granting special water districts and other inter-local entities with the authority to impose taxes on their members, equity court proceedings directed towards fact-finding rather than blame-setting, and the establishment of the role of watermaster as a reliable source of information and dispute resolution, but not regulation or enforcement. New institutions were built incrementally in a sequential and self-transforming process of learning and joint discussions, within a supportive regime of state law. Finding the right balance of small- and large-scale operations was critical to success.

A key puzzle in the literature on polycentric governance remains how well polycentric systems can generate effective matches between the functional scope of the jurisdictions of specific governance entities and the geographical and temporal extent of the ecological processes that need to be monitored and governed (Cole and McGinnis 2015, DeCaro et al. 2017). Following the line of argument developed here, policy reformers should strive to identify the kinds of decision centers that can realistically be established and operated in a manner conducive to the effective governance of the inter-connected webs of resource systems that constitute the context within which specific resources deemed critical to human survival are generated, utilized, replenished, and governed.

This chapter has revealed deep connections between the IAD framework and the commons. Ostrom's design principles define conditions under which co-evolutionary processes operating at all levels of analysis generate sustainable matches among the IAD's three categories of contextual variables corresponding to the resources, rules, and communities that jointly define a

commons. A complex network of action situations forms the ever-changing context within which exogenous and endogenous drivers push towards the emergence of polycentric governance in social-ecological systems. The rich vein of concepts and analytical tools associated with the IAD framework and the commons remains ripe for further exploration and exploitation by future researchers.

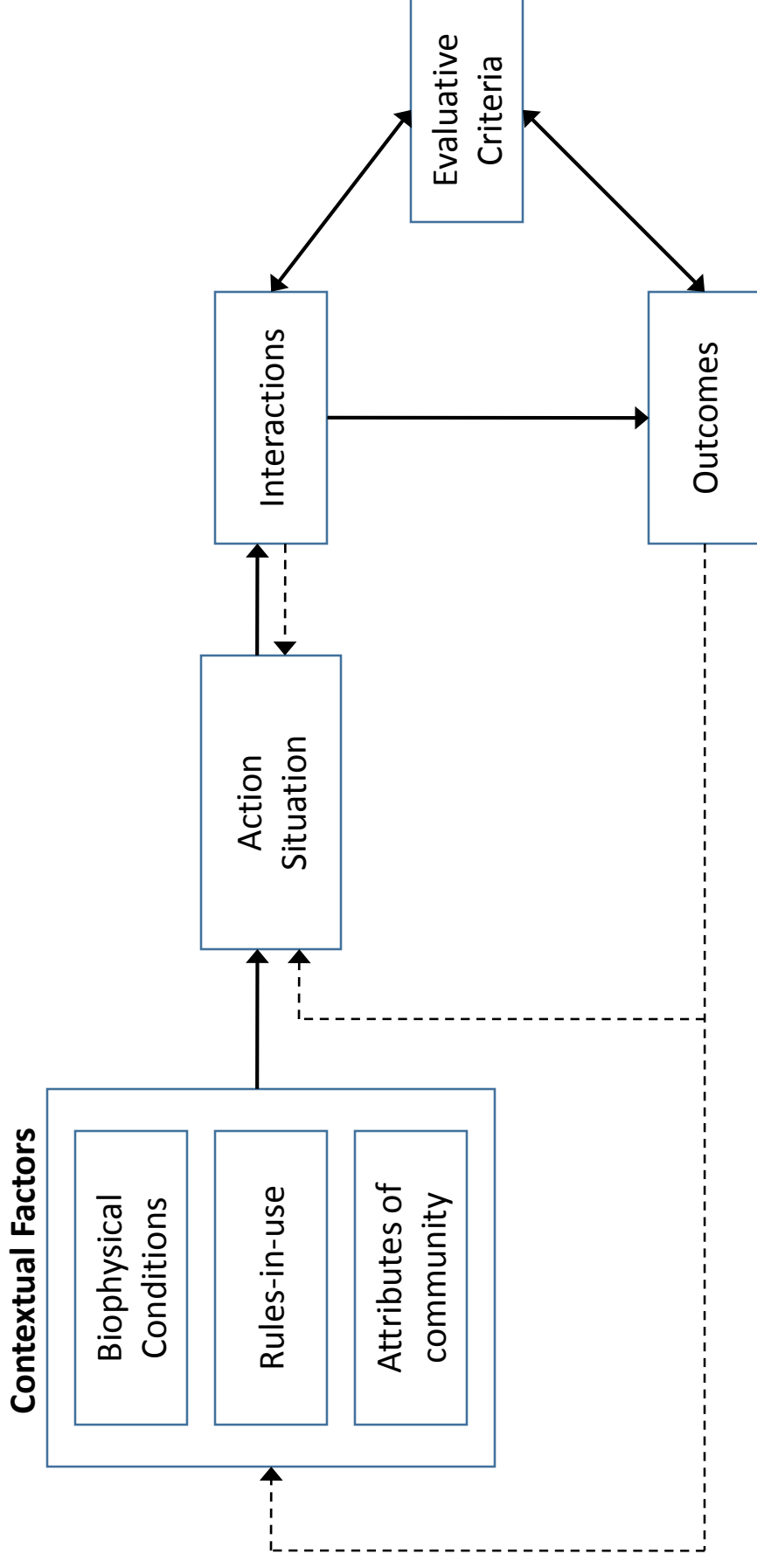
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Figure 1. Institutional Analysis and Development (IAD) Framework



Source: Adapted from Ostrom (2011, 10).