

10 A Century of Institutions and Ecology in East Africa's Rangelands: Linking Institutional Robustness with the Ecological Resilience of Kenya's Maasailand

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Abstract. In analyzing the interactions between institutions and ecology, it is useful to evaluate the robustness of the designed governance system and the resilience of the ecological system that together comprise a Social-Ecological System (SES). In this chapter, we will examine the patterns of interaction between ever-changing governance institutions related to the highly variable ecology of Eastern Africa extending in time from prior to the British colonial rule until early in this century. That will enable us to examine three questions: (1) Which of the institutions that have existed during this time are more robust and why? (2) How does institutional robustness influence ecosystem resilience? and (3) What assumptions can be made about human behavior and incentives in light of this sweep of human history? We find that the indigenous institutions of the Maasai people were the most robust of the set of institutions studied over time since pre-colonial days until contemporary times. And, these robust institutions were associated with a more resilient ecology.

Keywords: Ecological resilience, Institutional robustness, Kenya, Maasai, Pastoral systems, Social-ecological systems

10.1 Introduction

Working with Konrad Hagedorn on various projects involved in understanding how institutional arrangements facilitate or deter investments by resource users in maintaining complex ecosystems of high value has been a wonderful experience. A central purpose of this chapter is to examine questions related to the linkage

between institutions and ecology, which we hope will be of interest to Konrad as well as a contribution to a further understanding of these complex connections. We will explore the dynamic interactions between institutions and ecology by trying to draw out characteristic features of institutions that are more likely to enhance the robustness of social systems and the resilience of ecological systems when these are brought together as Social-Ecological Systems (SESs). We share a deep concern with Vatn (this volume) concerning the sustainability of resource systems given contemporary uses. The term “social-ecological system” underscores the integrated concept of humans-in-nature and that any boundaries between social and natural systems are artificial (Berkes & Folke, 1998).

Since the publication of “The Tragedy of the Commons” by Garrett Hardin in 1968, many scholars have presumed that those who rely heavily on ecological systems to support their livelihoods, such as pastoralists, are trapped in social dilemma situations and cannot engage in self-governance. Social dilemmas characterize an extremely large number of settings in which individuals make independent choices that affect themselves and others. If each individual in such situations selects actions based strictly on individual, short-term maximization of individual returns, together they generate worse outcomes for the group as a whole. Hardin predicted that each pastoralist would place as many animals as they could on a shared pasture, leading to substantial overharvesting. Further, he presumed that the pastoralists themselves could not establish their own rules and norms to extract themselves from the tragedy of overuse. In other words, they could not govern themselves.

Governance is a process of devising rules for a variety of operational or day-to-day situations, such as where to pasture animals for today, the next week, and then the week thereafter, and so on. Governance processes are undertaken by governments (which are one type of organization) as well as by organizations of all types and at all scales (for further elaboration of this, see Blomquist, this volume). Contrary to the presumption made by Hardin, and many others following his general theory, many groups of harvesters from ecological systems do engage in self-governance (McCay & Acheson, 1987; NRC, 1986, 2002; Dietz, Ostrom, & Stern, 2003). A self-governed ecological system is one where actors, who in this case are major harvesters of the resource, are involved over time in making and adapting rules within collective-choice arenas regarding such matters as the inclusion or exclusion of participants, what are agreed-upon harvesting strategies, the obligations of participants, how rules will be monitored and sanctioned, and how conflicts will be resolved.

Some isolated ecological systems are governed entirely by harvesters and are not governed at all by external authorities. In most modern political economies, however, it is rare to find any resource systems, including the treasuries of private for-profit corporations, that are governed *entirely* by participants without rules made by local, regional, national, and international authorities also affecting key decisions (V. Ostrom, 1997, 2008). Thus, in a self-governed system, participants

make many, but usually not all, of the rules that affect the sustainability of the resource system and its use.

When we speak of the governance of ecological systems, basically we mean the regimes that regulate one or more of the following:

- who is allowed to harvest resource units (trees, grasses, animals);
- the timing, quantity, location, and technology of harvesting;
- who is obligated to contribute resources to provide or maintain the ecological system itself;
- how harvesting and obligation activities are to be monitored and enforced;
- how conflicts over appropriation and obligation activities are to be resolved; and
- how the rules affecting the above will be changed over time along with changes in the performance of the resource system and the strategies of participants.

Diverse forms of self-governance are found in most societies, some of which are amazingly robust even though others are fragile and still others fail (E. Ostrom, 1990). Robustness is a concept developed in engineering to characterize designed systems that are able to continue to perform their core functions when subjected to external, unpredictable perturbations or disturbances (Carlson & Doyle, 2002). A robust bridge, for example, is one that continues to provide safe passage across a chasm when challenged by earthquakes or traffic jams. In ecology, a somewhat similar term – resilience – is used to evaluate the amount of a disturbance that will transform the maintenance of an ecological system from one group of mutually reinforcing structures and processes to a different set (Holling, 1973). A resilient ecosystem is one that has the capacity to withstand perturbations, such as fires, floods, or migration of new species, and to rebuild or renew itself afterwards. In analyzing the interactions between institutions and ecology in any particular region, it is useful to evaluate the robustness of the designed governance system and the resilience of the ecological system that together comprise an SES (see Anderies, Janssen, & Ostrom, 2004; Janssen, Anderies, & Ostrom, 2007).

In this chapter, we examine the patterns of interaction between ever-changing governance institutions related to the highly variable ecology of Eastern Africa, extending in time from prior to British colonial rule until early in the present century. That will enable us to examine three questions: (1) Which of the institutions that have existed during this time have been the most robust and why? (2) How does institutional robustness influence ecosystem resilience? and (3) What assumptions can be made about human behavior and incentives in light of this sweep of human history? In order to answer these questions, we use archival records, literature reviews, including published material that draws heavily from empirical work conducted by the authors.

Since we are analyzing human decisions as they impact on ecological systems, let us lay out our basic assumptions immediately, so that we can later assess whether they are reasonable in light of evidence. We assume that:

1. Human decisions occur within tiers of decision-making units that extend from an individual to higher tiers.
2. Within all tiers of decision making, fallible individuals make decisions that are intended to increase net benefits to themselves and, potentially, to others.
3. Individuals learn from their experiences and from culturally transmitted experiences.
4. Human decisions at all tiers are affected by the cultural values of the individuals involved, the resources they possess, the information they obtain, the incentives and disincentives they face, the internal learning and choice processes used, and the time horizon invoked.
5. Decisions at any one tier affect the conditions, information, incentives, and time horizon (and, perhaps the cultural values, resources, internal choice processes) of others at that tier, at present and future time periods, and sometimes at other tiers.
6. Thus, human choice is interdependent within tiers, at times between tiers, and across time and space. Impacts may be horizontal, upward, and downward.
7. Physical and biological processes also affect the information, incentives, and time horizon that are used in human choice as well as being affected by human choice.

In the conclusion, we will briefly assess whether we need to change any of these assumptions in light of the evidence we review in this chapter.

Following a brief description of the ecological dimension of an SES, the second section of this chapter provides the backdrop for later sections, outlining the pre-colonial environmental and institutional conditions among pastoral Maasai. This as well as the third and fourth sections consider the interplay between institutions and environment during colonial rule (1890–1963) and after 1963. The final (fifth and sixth) sections discuss the factors that influence institutional robustness and ecological resilience, connecting back to the assumptions that were posed in the introduction. Overall, this chapter presents a series of institutional changes over time and attempts to tie these together with their implications for the ecological system.

10.2 The Ecological Side of an SES

Dryland ecosystems are interchangeably referred to as savannahs, rangelands, bushlands, and the like. They cover about 40 percent of Africa's landmass (Scholes & Walker, 1993) and support close to 50 percent of its population (Thomas, Twyman, & Harris, 2002; Anderson et al., 2004). At a global level, pastoral areas represent some 25 percent of the global land area (FAO, 2001) and are home to about 103 million rural poor (IFAD, 2000). Many dryland environments are confronted with persistent drought shocks. Pastoralists, the dominant groups that

inhabit these areas, are among the poorest peoples in the world (Lybbert, Barrett, Desta, & Coppock, 2004). In Kenya, for example, the highest incidence of poverty is found in the arid and semi-arid lands, where more than 65 percent live below the poverty line (GoK/ILRI, 2003).

Rainfall over much of Maasailand, which forms the context of this analysis, is low and variable (see Fig. 10.1), distributed in a bimodal pattern, with short rains from October to December and long rains from March to May. Annual rainfall in Kajiado District, for example, is strongly influenced by altitude. Loitokitok, on the foothills of Mount Kilimanjaro in the south, has the highest average rainfall of about 1,250 mm (49 inches). Lakes Magadi and Amboseli, the lowest points in the district, have the lowest average rainfall of less than 500 mm (20 inches) per annum. Heavy rains also occur around Ngong Hills, Chyulu Hills, the Nguruman escarpment, and the slopes of Mount Kilimanjaro. Apart from being low, the rainfall is highly variable from year to year.

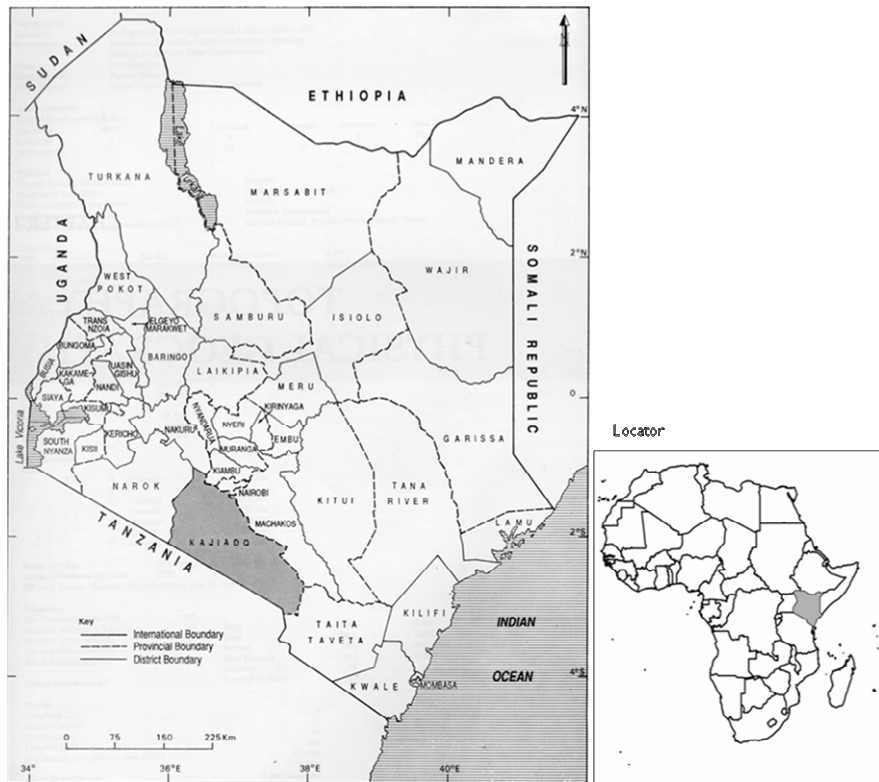


Fig. 10.1: Location of Kajiado District in Kenya
Source: Kenya Republic, 1990

Temperatures in the district also vary with altitude and season. The highest temperatures of about 34°C (93°F) are recorded around Lake Magadi, while the lowest minimum of about 10°C (50°F) is experienced at Loitokitok, on the eastern slopes of Mount Kilimanjaro. The mean maximum of Loitokitok is about 22°C (71°F). The coolest period is between July and August and the hottest is from November to April.

Based on these rainfall and temperature regimes, the Kajiado district has been divided into five agro-climatic zones with varying ecological potentials. Most (55 percent) of the district falls under agro-climatic zone V and 37 percent under agro-climatic zone VI: classified as semi-arid and arid, largely suited to livestock ranching. Rain-fed agriculture is possible only in a very small part (8 percent) of the district, mainly on the slopes of major hills and mountains and on the floodplains of the Ewaso Ng'iro River, one of the three major rivers in the area.

In general, the Maasai live in a highly constrained and risky ecological setting, where livelihood options are limited and access to patchy resources are ever more critical. They are pastoralists, and livestock are central to their livelihoods and social relations. While some Maasai may periodically fall out of pastoralism because of drought or disease, or become cultivators or hunter-gatherers, they have been known to switch back to the pastoral mode as soon as they have rebuilt their herds (Waller, 1993).

The trajectory of change within SESs in Kenya's Maasailand is instructive for other parts of Africa and the developing world more broadly. Institutional reforms that address property rights are at the center of development policy in Kenya, with a push away from exclusive state claims towards decentralization and marketization. This push has tended to support one form of property structure, that is, individual ownership, regardless of the social and ecological setting. An analysis of the links between institutional robustness and ecological resilience over a defined time period shaped by major, externally-driven changes in property rights, in a defined ecological and cultural setting, can provide insights into how local institutions function to mitigate and/or absorb these changes and the effects of these functions on ecology. Such knowledge will help to generate a deeper understanding of how SESs are linked in order to improve governance and policy at a time when humans and nature are faced with many uncertainties and challenges.

10.3 Governance of the SES Prior to 1890: A Probable Balance

The Maasai in Kenya are comprised of twelve sections that occupy a specified territory, broadly governed by an autonomous political structure based on an age-grade system.¹ During the period prior to colonial rule, the boundaries of each

¹ The territorial organization of the Maasai has been extensively documented by prior scholars, from whose descriptions the following account is drawn: Spencer (1997), Mol

section were well recognized, and defended against unauthorized intrusion by a warrior age-set. Ecologically, most sections represented a mosaic of different ecosystem types and could include high-potential forest, low-potential semi-arid scrubland, and wetlands. Access and use were coordinated, and highland pastures often reserved for dry-season grazing, while areas closest to settlements were set aside for young, old, and sick stock. Elders' councils and the warrior groups enforced access and use rights. In times of environmental stress, herds were moved within the section and across sectional boundaries, depending on pasture availability (Galaty, 1994a, 1994b). Sectional alliances allowed access outside the territory of each section. Under extreme environmental stress, intersectional conflict over resources would often escalate into war.

Each section was further divided into localities and localities into neighborhoods. Each locality had a council of elders for coordinating resource access and management, settling disputes, and enforcing customary law. The locality was the basis of the Maasai transhumant herding system and involved herd and family movements between dry- and wet-season pastures. Local organization through the elders ensured that Maasai stock had access to both types of pasture and that various traditional management techniques were employed, such as the regular burning of portions of grassland to help regenerate new grass growth and the judicious grazing of goats to prevent destruction of grass roots. Rights to resources were secured by families through continued residence in the locality and by participation in rites and rituals.

Each locality was divided further into common residential areas, or settlements, that comprised several households. Different neighborhoods would grant grazing access to herders who were temporarily passing through the area. There were also neighborhood controls on grazing. Each neighborhood had, for example, two types of dry-season grazing areas, one to be used in the early to middle of the dry season, and the other in the late dry season. Elders enforced these rules and also forbade the construction of permanent settlements in these areas. Despite cooperation at the settlement level, where households pooled labor for herding and security as well as for enforcement of use and management rights, herd ownership was individualized. Each household was autonomous and regulated its own affairs independently.

Maasai pastoralism allowed for a variety of accommodations with cultivating communities living in the region, such as the Kikuyu. Through marital exchange, the Maasai solidified friendship bonds that facilitated complementarities. The Maasai could seek agricultural produce in exchange for livestock, obtaining for instance superior steers from Borana pastoralists of northern Kenya and southern Ethiopia. Maasai dependence on trade increased during times of crisis, such as drought or epidemics.

(1996), Galaty (1989), Ingule (1980), Berntsen (1979), Baxter and Almagor (1978), Jacobs (1965), and Bernardi (1952).

Knowledge on the ecological status of Maasailand in the precolonial era is based on anecdotal information from early travelers and colonial administrators. Maasailand comprised a diversity of landscape and vegetation conditions (Thomson, 1885). The southern part of Maasailand comprised what Thomson called the “Nyika dry savannah,” which was sparsely vegetated with grass. Here, water was scarce and rainfall so little that there was “hardly a blade of grass to be seen.” These areas included the regions surrounding the Maparasha Hills, Oldonyo Orok, and the Amboseli plains. To the north of this area, in the Kaputiei plains (i.e., present-day northeastern Kajiado District), Thomson found a grand expanse of undulating country, the hollows of which were “knee-deep in rich and succulent pasture . . . and ridges covered in trees of moderate size” (1885, p. 170).

Similar observations were made by Governor Charles Eliot a decade later when commenting on the pasturage potential of the East African Protectorate. According to Eliot (1905, p. 170), Maasailand would “afford excellent grass to cattle owned by both natives and Europeans.” He further suggested that the quality of the pasturage may have been due to long periods of continuous grazing by native cattle, which involved regular burning to improve the quality of grass, to clear pests, and to remove woody vegetation. On the other hand, Talbot (1972) suggested that, ranging over broad territories, the Maasai may never actually have achieved a balance with their environment. Their emphasis on large herds, close herding in tight groups, and use of few watering points by large concentrations of livestock resulted in overgrazing, which was typical of Maasai pastoralism, as it comprised an adaptation to a difficult environment. Movement to new pastures allowed the recovery of overgrazed and/or degraded areas. Jacobs (1980) points out that past traditional localities seemed to have been stable, with adequate quantities of both wet- and dry-season pastures and considerable mobility between the two. Nevertheless, the absence of surface water, periodic droughts, and livestock disease limited livestock production and maintained the balance of the SES.

The influence of traditional pastoralism on the historical development of ecological regimes in Maasailand is inconclusive, yet these early accounts suggest that Maasai pastoralism may have been attuned to resource productivity. Under traditional herd management practices and other self-regulatory mechanisms, exhaustion of pasture was temporary and probably not serious, since the pastoralists had sufficient opportunities to move their herds elsewhere. Herd mobility may well have enabled the achievement of a dynamic balance between pasture resources and livestock holdings.

The preceding account reveals two major features of an interactive SES that may permit, and possibly enhance, the resilience of the ecological system against periodic disturbances such as drought and disease: (1) a multilevel governance structure at multiple and nested spatial scales and (2) rules (and norms) for resource access and conflict resolution that were legitimate and broadly accepted. During this era, households were nested within neighborhoods and settlements, nested within localities, nested within sections. Each level corresponded to a spatial scale and was interlinked. Yet, failures at any one level did not necessarily

devastate decisions at another level, because each level had a fair amount of autonomy to make and enforce rules for resource appropriation and provision that were recognized and accepted at other levels.

These features of polycentric and multiple governance (concepts that are also developed by Blomquist, this volume) provided pastoralists with the flexibility to adapt and respond to disturbances, including drought. Mobility was a key component of resource use, management, and sustainability. Rules and norms served to coordinate access, to prevent or manage conflicts among multiple users, and to provide degraded areas with sufficient time to recover. Importantly, if one level did not function well for whatever reason, the whole system was not necessarily compromised, as other levels would continue to function.

10.4 Governance of the SES During the Colonial Era: Institutions and Ecology in Jeopardy

British interests in East Africa in the late nineteenth century encouraged the settlement of European farmers in Maasailand. The agricultural and commercial activities of the incoming settlers were expected to contribute towards making the New British Protectorate self-financing and less reliant on budgetary support from the London office. The Maasai, whose use of land was seasonal, were relocated from the northern, better-watered areas of their territory to land further south, where most of them resided at the time. Close to two million hectares of land used by the Maasai was converted to private, individually owned farms and commercial ranches.

The land areas where the Maasai were relocated were either too small or too arid to support transhumant pastoralism. The most valuable water supplies were included in the land allocated to the Europeans (James, 1939). Land in the south was also tick-infested and already populated by other Maasai sections (Tignor, 1976; Sandford, 1919). Of the 10 million acres of the Maasai reserve, 2 million acres were arid or semi-arid; 800,000 infested with tsetse fly; and 300,000 subject to East Coast fever (Lewis, 1934, cited in Kipury, 1989).

More land was later taken for the creation of protected areas. Between 1946 and 1965, a total of 25,792 km² of present-day Kajiado District was converted into national parks, reserves, or conservation areas (Kituyi, 1990). Most of this land constituted dry season highlands or swamplands and salt licks – strategic resources for the Maasai.

The Maasai were eventually confined to the southern reserve (Halderman, 1989; Kipuri, 1989; Sandford, 1919), their herds restricted from regular, traditional movement to prevent mixing with new breeds from England. This restriction also blocked traditional trade and exchange between the Maasai and the northern Borana pastoralists.

Lack of market offtake and the introduction of veterinary services within the Maasai reserve led to herd proliferation. Herd growth was also aided by “authorized” raiding against non-Maasai communities, as British officers employed the Maasai as mercenaries who were paid with captured cattle (Bridges, 1991; Halderman, 1989). By 1932, colonial administrators were expressing concern about the large herds, which they presumed were responsible for soil erosion and land degradation. In 1904, cattle were estimated at only 50,000 and shoats at 600,000.² By 1914, Maasai cattle were 600,000 and shoats over 1 million. In later years, even after the droughts of 1933 and 1934, cattle had increased to 700,000 and sheep and goats to 800,000.

Administrators attributed soil degradation in the Maasai reserve to Maasai “irrationality.”³ The Maasai’s “cattle complex,” a psychological attachment to the beast, led to an emphasis on quantity over quality, resulting in overgrazing and environmental degradation (Herskovits, 1926). This destruction was viewed as a threat to the large herds of wildlife in the Maasai reserves. Maasai perceptions of the origins of the problem were, however, different (Campbell, 1993). For them, degradation was a consequence of constrained grazing following large-scale appropriations for European settlement. It was also a consequence of losing the remaining good-quality grazing to cultivation.

The official solutions to the problem of degradation undertaken by the British involved appointing a series of commissions to divine ways of controlling stock levels in tune with carrying capacities and to explore land tenure options. The first was the Kenya Land Commission (Carter Commission) of 1932, which recognized customary tenure in the Maasai reserve, but recommended gradual privatization and eventual individualization of land. The commissioners were opposed to returning appropriated land back to the Maasai, since they thought the Maasai were tying up prime land and not exploiting it efficiently. The commission suggested that the Maasai be forced to lease out land, particularly to cultivating communities.

The Carter Commission ended the theoretical security over land rights that the Treaty of 1911 had given to the Maasai. It also introduced a new structure for land and livestock management: the grazing schemes, which turned on the reduction of livestock numbers, the provision of water supplies, disease control and the creation of livestock markets through British financing. Each scheme was administered by a livestock officer, with the assistance of a grazing committee comprising twelve elders, who were responsible for the enforcement of regulations. Livestock officers acted under special ordinances and bylaws that conferred broad powers upon them. They determined who could graze livestock in the scheme, the number of animals each could graze, and where they could graze, while also enforcing

² This unnamed and undated citation, titled “Section VII: The Masai Extra Provincial District,” was retrieved from Box File A in the library of the Catholic Church in Kajiado town.

³ The notion of Maasai irrationality has since been forcefully refuted (Livingstone, 1977, 1986; Helland, 1980).

fines on violators. The bylaws did not provide for appeal against a livestock officer's decisions.

Grazing schemes were introduced at the level of the Maasai section. But first, in 1946, a model ranch unit was set up in Konza in order "to demonstrate to the Maasai how a permanent water supply can be most beneficially used and the advantages of control grazing, that is relating the number of cattle to the carrying capacity of the land."⁴ The Konza scheme was also aimed at demonstrating the improved stock breeding practices and at conducting experiments in pasture improvement. The first Maasai families to participate in this scheme, chosen by elders, took up residence in January 1949. Each agreed to weekly livestock dipping, giving prophylactic injections, following rotational grazing plans, and restricting livestock to prescribed numbers. A manager was resident from the start of the ranch until 1958.

One commentator characterized the scheme as a drastic failure (Fallon, 1962). Many things went wrong: fencing fell into disrepair and did not keep out game animals; residents did not restrict livestock numbers; and the drought of 1959 forced residents out. Cattle population increased substantially. By 1954, the number had grown from 1,400 to 2,300, and by 1958 it had grown to 2,441, far exceeding the stated maximum of 1,700. In 1958, a new limit of 2,000 was set. Then came the drought; by mid-1961, the ground was bare and all residents had left. By this time, most of Kajiado District was severely overgrazed and range resources badly degraded. Watering points, grazing schemes, and demonstration ranches were the sites of severe degradation. The destruction was so severe that, where the "model range" was located, a jagged, bare, red-earth scar in the savanna landscape was now visible from a high-flying airliner through the blowing dust. Residents of the Konza scheme failed to honor their commitment to reduce livestock. All other grazing schemes (in the Ilkisonko and Loodokilani sections) were eventually abandoned.

Overall, grazing schemes did not function during droughts, and water development contributed to significant resource depletion (Fallon, 1962). Destocking proved difficult (Jahnke, 1978): many Maasai were already living at submarginal levels. Stock reduction further reduced the supply of meat and milk for the household; culling programs did not fit into the traditional social patterns that were built on an intricate system of human bonds established by lending, renting, exchanging, and sharing livestock for different reasons in different situations.

A second commission, the East Africa Royal Commission (also known as the Dow Commission) of 1952, was initiated to provide solutions for land tenure. This commission viewed Maasai communal ownership of land combined with individual livestock ownership as the root cause of land degradation. The commissioners recommended that land be individualized and customary rights eliminated as they were inefficient. However, the commission also recommended that collective rights in pastoral areas be maintained, but only as an intermediate stage towards

⁴ See footnote 1.

individual ranching. It proposed ranches, access to markets, better breeding practices, and commercialization of stock farming as solutions to the “pastoral problem.”

The Swynnerton Plan of 1954, crafted during a time of great political crisis, superseded but drew heavily from both the Carter and Dow Commissions. It proposed a sweeping registration and individualization of land tenure in Kenya. Since the outcome of individualized tenure in the Kikuyu areas of central province had been landlessness and political unrest, however, the Swynnerton Plan promoted grazing schemes and group ranches. These were to be managed according to “scientific principles,” such as grazing rotation. Water and veterinary facilities were to be provided and small-scale irrigation encouraged. Soil conservation, afforestation, and rehabilitation were to be taken up to restore denuded areas. To ensure that these innovations were strictly followed, the government was to impose strict measures such as “grazing guards,” fines, and imprisonment for pastoralists who broke the rules. Livestock marketing, controlled grazing, water supply, and tsetse and livestock disease eradication were additional interventions. The objective was to exploit the potential of Maasai stock to contribute to the national economy.

What do we make of these changes in the SES during the colonial era (1890–1963)? How can institutional robustness be linked to ecological resilience? Clearly, the entry of officials from the British administration introduced a new set of powerful actors and institutions at the national and local levels. These new sets of institutions did not solve the long-standing problem of drought and land/soil degradation, but rather intensified it. The key features of the SES during the colonial era that are important to robustness and resilience include:

1. A new and powerful actor, the government and government officials, with clear objectives regarding land management, but with insufficient understanding of ecosystem processes. These objectives, which included limiting livestock numbers, and new rules and structures for land and livestock management, were at odds with the Maasai production system and institutions that supported it.
2. A decline in spatial scale for the operation of Maasai resource management institutions and production system. Mobility was constrained within grazing schemes and the Maasai Reserve. Elders were, in turn, required to enforce rules made by government officials (e.g., those for constraining livestock numbers), while their authority was undermined.
3. Removal or reduction of the risk of disease, water distribution, and a declining scale of the system (or a concentration of livestock with reduced mobility) reversed these supposed gains in risk reduction and increased the severity of disturbances.
4. New government institutions at nested administrative levels, competing with and/or replacing Maasai institutions. This competition and replacement also included the content of the institutions, which was not only at variance with Maasai institutions, but also poorly matched with the ecological situation.

In sum, a general decline occurred in the diversity of institutions, the autonomy of Maasai institutions, the spatial scale of livestock production, and the institutional levels of indigenous institutions. This resulted in the reduction of both the robustness of institutions as well as the resilience of the ecosystem, whose vulnerability to disturbances was amplified. In order to cope with the severity of the disturbances, the Maasai abandoned the new/imposed institutional structures and, instead, resorted to prior arrangements of mutual reciprocity, which allowed for mobility.

10.5 Governing the SES in the Post-Colonial Period: The Introduction of Group and Individual Ranches

The Dow Commission and the Swynnerton Plan resulted in the establishment of individual ranches⁵ and group ranches in Maasailand. Instead of attempting to directly control herders and their livestock management techniques, the government instead sought to formalize land rights. Land in the former reserves was demarcated, surveyed, and registered, with the expectation that the Maasai would adjust their herd management strategies, destock, and conserve the resource base.

Individual ranches were intended to serve as a model for the rest of the Maasai to emulate (Jahnke, Ruthenberg, & Thimm, 1972). Low-interest credit for purchasing superior breeds and for farm infrastructure, such as boreholes and water pans, was made available through the Agricultural Finance Corporation as part of World Bank financing to Kenya's livestock sector under the Kenya Livestock Development Program (KLDP). The individual ranchers also had support from livestock extension officers from the Ministry of Agriculture and Livestock Development.

The first individual ranch was established as early as 1954 (Campbell, 1993), but most of the approximately fifty-two ranches were established between 1963 and 1965 (Hedlund, 1971; Rutten, 1992). Individual ranches were first created in better-watered areas of Kajiado District. The first owners of individual ranches were all Maasai, most of whom, once having acquired their large ranches, sold off portions to Kikuyu cultivators (Simpson, 1973).

The progressive development of individual ranches, each averaging between 300–800 hectares (Grandin, 1987), raised concerns among administrators and ordinary Maasai alike, who feared a landgrab by influential Maasai and insecurity as land was easily transferred to non-Maasai. These concerns were captured in the Lawrance Report of 1965–1966 (Kenya Republic, 1966), which recommended the establishment of group ranches, which were seen as an alternative way of realizing the same goals of accelerating pastoral development, but with the added advantage

⁵ An individual ranch is a production enterprise in which an individual member of a "tribal" society may, with community consent and the authorization of the local country council, legally register communal land as private property.

of safeguarding against alienation to non-Maasai. They were expected to provide tenure security, creating incentives for the Maasai to invest in range improvement and, ultimately, to reduce overaccumulation of livestock.

A “group” meant a tribe, clan, section, family, or other group of persons whose land under recognized customary law belonged communally to its members. The exact grouping was determined by a committee that comprised officials of the Lands Department and elders from each section of the Maasai. Under this law, a Registrar of Group Ranches, whose job it was to oversee their functioning, was also created by the Lands Ministry. He or she would convene a meeting of the members of the group, encouraging them to adopt a constitution and elect representatives. Every registered member of the group ranch is a joint owner of group land and holds equal shares. Each member is entitled to reside on group land with family and dependents.

The group representatives are expected to ensure that the rights of any person under recognized customary law are safeguarded. In consultation with other group members, they are authorized to hold property on behalf of the group, acting on its behalf and for its collective benefit. Each group can craft its own rules regarding the running of its own affairs, but is required by law to hold a general meeting of its members every year. Decisions made at these meetings are binding if at least 60 percent of group members are present and a similar proportion of those present vote for them. In addition, members elect a management committee by open ballot, comprised of a chair, vice-chair, secretary, treasurer, and three other members elected from the group representatives. The committee encourages members to manage the land or graze their stock in accordance with sound principles of land use, range management, animal husbandry, and commercial practice. It can raise credit and is involved in development planning. Every member is required to accept and comply with decisions of the committee and, if aggrieved by a committee decision, has the formal right to appeal to the group representatives, the registrar of group representatives, or to a subordinate court having jurisdiction in the area. Group ranch dissolution can occur only after a written application signed by a majority of the group representatives is followed by a resolution passed by a 60 percent majority in a meeting specially convened for that purpose.

The Kenyan government, newly independent in 1963, received loans and grants from the World Bank, USAID, the Swedish Aid agency, Canadian Development Agency, and the United Kingdom. Loans were granted under the KLDP and implemented jointly by the Ministry of Lands and Settlement, the Range Management division of the Ministry of Agriculture, the Ministry of Water Development, and the Agricultural Finance Corporation. A total of fifty-two group ranches were created under two phases of the KLDP between 1968 and 1979.

Although the Maasai did not agree with, or even understand, some features of the group ranch, such as grazing quotas, boundary maintenance, and the management committee, they accepted the idea of group ranches primarily because it afforded them protection against further land appropriation from the government, against the incursion of non-Maasai, and from a landgrab by the elite Maasai

(Fratkin & Smith, 1994; Campbell, 1991; Goldschmidt, 1980; Hopcraft, 1980; Halderman, 1972; Hedlund, 1971). Group ranch development also promised water development in the form of dams and boreholes, and improved livestock husbandry through introduction of dipping facilities and regular vaccination against prevalent animal diseases (Davis, 1970). An evaluation conducted in the fourth year of the program found that the Maasai viewed the program as a means of increasing herds and assuring a larger and steadier supply of milk and blood to feed their families (Axinn, Birkhead, & Sudholt, 1979).

Group ranches are now generally thought to have failed to meet their intended objectives. An indicator of this failure is increasing demands for their dissolution and subsequent division into individual, titled units for distribution among their registered members. Disintegration began in the mid-1970s for the Kaputiei ranches. By 1985, twenty-two group ranches in different parts of Kajiado had resolved to subdivide; seven went ahead and subdivided (Munei, 1987). By 1996, all of these twenty-two group ranches had actually subdivided and individual land titles had begun to be issued (Kimani & Pickard, 1998). Eleven other group ranches were in various stages of subdivision. By 2000, thirty-one group ranches had subdivided and been issued titles (Mwangi, 2007a). Fourteen others resolved to subdivide and were being surveyed and demarcated. Only twelve had resisted subdivision. According to official records in 2006, out of a total of fifty-two group ranches, thirty-two are subdivided, and fifteen are in progress, seven of which are disputed and under court injunction, five have not subdivided (Mwangi, 2007b).

A variety of reasons have been offered to account for the failure of group ranches. Some scholars note that group ranches were undermined by a lack of ecological viability (Kipuri, 1989; Halderman, 1985, 1989; Hopcraft, 1980; Njoka, 1979). Ranches were not sufficiently extensive to allow pastoralists to exploit the discontinuity and heterogeneity of resources within their environment adequately. Group ranch boundaries were not respected in times of drought and Maasai continued to rely on movement across group ranches under traditional norms of reciprocity via kinship and friendship ties. Thus, the incentive to invest in pasture management and stinting is weakened, as those who did not invest effort would still benefit from the investments of others (Hopcraft, 1980). Munei (1987) argues that, while the enclosure of group ranches served to intensify droughts and increase movement, this would have been less severe if appropriate infrastructure had been developed within the ranch. Because the committee was not vested with sufficient authority to control livestock numbers (livestock are owned individually) and grazing patterns, group ranches experienced an overgrazing problem (Evangelou, 1984; Hopcraft, 1980).

Misappropriation of funds, difficulties in enforcing loan repayment, and low/delayed returns were additional problems that locked out group ranches from their principal source of development funds (Galaty, 1994b; Kipuri, 1989; Munei, 1987; Doherty, 1987; Migot-Adholla & Little, 1980). The above suite of reasons was provided by observers in the very early stages of group ranch disintegration. Later studies echo these problems. They also provide additional insights about the

increasing uncertainty regarding individual shares in group land, population increases, and governance failures, especially difficulties in enforcing livestock quotas and subsequent distributional problems (Mwangi, 2007a, 2007c; Davis, 2000; Simel, 1999; Galaty, 1992, 1994b).

What have been the effects of these institutional changes that have taken place during the post-colonial era (after 1963) on ranch ecology? A series of unrelated studies and evaluations using different methodologies and based on different group ranches provide insights on the implications of group ranches on local ecologies. One evaluation of group ranches observed that, four years after launching the program, committees had not yet implemented grazing quotas, save for a general rule that restricted grazing from a two-mile perimeter around water facilities (Jahnke et al., 1972). The same evaluation also noted that the notion of committee decision making on behalf of others was a new one for the Maasai, who traditionally rely on group consensus. In addition, livestock is owned by individuals, and the idea of the livestock quota tends to favor either an egalitarian distribution of herds or a freezing of a given distribution pattern, both of which were not valid for the Maasai production system, which has been fluid and motivated by risk reduction and cultural obligations. Talbot (1972) views group ranches and grazing schemes as “resource degrading development activities,” in which overgrazing and drought losses are proportional to the amount of development suffered. The projections of the early evaluations were confirmed by empirical studies in later years.

Ecological studies comparing a broad range of ecological indicators before the creation of group ranches in 1967 and during their operation in 1977 observed a deterioration in range condition, with an increase in the incidence and cover of undesired/less palatable species relative to desired/palatable ones (Njoka, 1979). Range management seemed to be a more important factor influencing the decline, including a roughly two-fold increase in cattle and water facilities, even as vaccination and other treatments decreased mortality. Despite ecological decline in group ranches, they seemed to fare better than their closely associated individual ranches (Rutten, 1992). Other studies using community perceptions – backed by aerial photography and topographical maps – revealed similar trends over a thirty-year period, comparing conditions before and after group ranches were subdivided (Macharia & Ekaya, 2005). Communities indicated that areas of bare ground were more prevalent and more extensive than they were before, while sustained overgrazing reduced cover, quality, and productivity; changed plant composition from perennial to annual species; and encouraged bush encroachment.

Group ranch subdivision and privatization is associated with a steady decline in the capacity of the land to support livestock populations (Thornton et al., 2007; Boone, Burnsilver, Thornton, Worden, & Galvin, 2005) and with a precipitous (72 percent) decline in wildlife populations in the subdivided areas adjacent to protected areas, due to habitat fragmentation (Reid et al., 2007). In spite of the subdivisions, herders are now adopting new institutional arrangements that increase opportunities for herd mobility and access to forage (Burnsilver & Mwangi, 2006;

Mwangi, 2007b; Rutten, 1992) and are also reconsolidating subdivided parcels and pursuing joint management, while continuing with large-scale movement during severe droughts and reciprocal arrangements of herd redistribution. These arrangements at local and broader scales are based on pre-existing social relationships, networks and norms among age-sets, clan members, friends, and stock associates. An evaluation of the ecological implications of these arrangements is instructive (Mwangi, 2007a, Chapter 7): Valuable perennial grass species show consistently higher cover values where groups reconsolidate parcels and jointly manage pastures, while weedy shrubs colonize unconsolidated parcels, where individuals enforce their boundaries and livestock concentrated over smaller areas.

Features of the SES after 1963 include:

1. The national government is an established actor that uses formal law to embed its objectives, which are intended to create incentives for better range management.
2. Government objectives do not change across time.
3. Creation of group and individual ranches side-by-side, both replace the council of elders as the organization that governs resource allocation and management. Individual owners now make decisions for individual ranches, while a new bureaucratic structure with new decision-making rules – the management committee – is the locus of decision making on land matters for the group ranch. The accountability of the management committee was primarily to the organization that had oversight over group ranch functions – the registrar of group ranches, a government official – rather than to the group members.
4. The evolution of an elaborate and ineffective system of financing and operation that involved multiple donors, with multiple expectations and mechanisms of financing group and individual ranches. This system did not work.
5. The spatial scale of pastoralism is further circumscribed with the creation of hard boundaries between group ranches.
6. The condition of the range declines further, and the group ranches eventually subdivide into individually titled parcels, the viability of which is questionable, even as herders adopt new arrangements.

10.6 Discussion

We began this chapter by asking three questions: which institutions are more likely to be robust over time, how robustness (or lack thereof) may influence ecological conditions, and what kinds of assumptions those exploring linked social-ecological systems can make in their inquiries.

Robust institutions are those that can weather repeated disturbance and reconstitute themselves to perform their functions. Our cross-time analysis demonstrates that, at prior to colonial rule Maasai institutions regulated resource use and access

within and among different subgroups of the Maasai. These councils of elders were organized locally, but they were also nested and replicated at higher spatial scales and governance levels. Thus, the neighborhood was nested within a settlement, the settlement was nested within a locality, and the locality was nested within a section.

At lower levels, the rules established by these governance arrangements regulated access and relationships between households and neighborhoods, at higher levels between Maasai sections or sub-tribes, and between them and non-Maasai (see Marshall, 2008 for development of the concept of nesting). These access relationships included seasonal herd movements between wet and dry season pastures, daily livestock movements in localities, and pasture management techniques such as burning. Mobility between different resource patches was possible. The effects of overgrazing and degradation, which were posited by colonial officials as typifying Maasai pastoralism, were tempered by the capacity to move to new pastures. The different spatial scales for resource appropriation were well matched with the multilevel structure of institutions, allowing sufficient control and flexibility over use, thus checking sustained damage/degradation of the ecological conditions. Institutions were well adapted to a risky ecological setting.

The colonial rule (ca. 1890–1963) represents the beginning of radical changes in the linked SES. The introduction of external, formal, governmental institutions and personnel was grafted onto preexisting traditional institutions and systems. Formal institutions competed with and/or replaced the functions of traditional institutions, reducing their autonomy and restricting their reach to very small spatial scales. Soil erosion, land degradation, and increased severity of droughts were the result. The new institutional rules, such as those requiring the reduction of stocking levels, were ineffective simply because they overlooked cultural, ecological, and nutritional imperatives that necessitated an accumulation of livestock among herders. Despite heavy capital and financial investments, these new institutions and organizations were unable to adapt to ecological exigencies. At best, the introduction of water points and veterinary services served to reduce risks faced by herders. At worst, these interventions were incomplete, and only served to increase the severity of environmental disturbance, such as drought, when it occurred.

The Maasai tended to abandon the imposed grazing schemes and their rigid rules. Instead, they resorted to prior and well-tested mobility to exploit heterogeneously distributed resources, while using familiar norms of reciprocity among kin and friends to facilitate movement. The elders councils – the primary governance arrangement controlling resource access and distribution – were undermined by the introduction of formal government rules and organization. They subsequently lost control. This was then reflected in declining ecological resilience. However, other traditional institutions, such as norms of reciprocity, were remarkably robust and allowed herders to adapt to the declining conditions and still be able to move their herds to some degree, despite their confinement in smaller spaces.

During the post-colonial era, after 1963, radical changes from the colonial rule (ca. 1890–1963) were further adopted and entrenched under an independent

Kenyan government. Full-scale privatization of the range was pursued with the creation of individual and group ranches. Again, the official objective was to stabilize a degrading environment and to change Maasai herds from being a subsistence asset to a marketable commodity. The strategy was different in that it involved a formal change in the rules of resource access for the Maasai by creating and formalizing boundaries between Maasai subgroups by way of formal land ownership. In the group ranches in particular, a management committee was constituted that served to replace the council of elders in land and resource allocation. Committees were, by law, granted additional powers, including the regulation of livestock numbers in the group ranches by enforcing livestock quotas. Finally, group consensus in decision making was replaced by a majority voting rule in an open ballot. Quantitative and qualitative studies demonstrate that ecological condition in the group ranches steadily declined (even though they performed better than adjacent individual ranches). Scarcely fifteen years after their inception, the owners of group ranches started to subdivide their land into individual parcels to be distributed among their constituent members.

Much of the ecological decline over this long time period is associated with this process of individuation of land ownership. Individuals tend to increase livestock herds, wildlife populations are seen to decline, while forage options needed to sustain livestock and human nutrition are severely constrained. Land allocation and management decisions now fully reside with the individual parcel owner. During the post-colonial time, as in the times of the colonial rule (ca. 1890–1963), the robustness of traditional institutions of resource access were further undermined and eventually snuffed out. Statutory institutions gained prominence after 1963, but they were poorly adapted to the risk inherent in this ecological setting. Despite reducing livestock mortality through veterinary innovations and water provision, drought and rainfall continue to be limiting factors, severely impacting group ranches, and ecological degradation continues. Group ranch members continued to move their livestock outside the group ranch, exploiting mutual reciprocal arrangements across clan and age sets.

The newly introduced formal rules for resource access and decision making in the group ranch structure were not robust. Group ranches disintegrated. The new formal rules were unenforceable, as they contradicted cultural norms that underpin Maasai society. Livestock management is the preserve of each individual owner, who is under great pressure to maintain large herds for subsistence, to ensure against risk, and to meet cultural obligations.

In short, the earlier indigenous institutions prior to colonial rule appear to have been more robust, even though officials did not consider them to have formal status. Again, the indigenous institutions of the earlier times were nested at the group and higher levels and covered large spatial scales. Other indigenous institutions such as age-grades and clans are also cross-cutting institutions, found in all group ranch areas. In a post-subdivision setting, these norms of reciprocity and bonds of kinship and friendship now assume even greater importance. Most individual parcel owners continue to move their herds out of their parcels to other

areas, even to Tanzania, during dry and drought spells. Other parcel owners do move their livestock, but also reconsolidate parcels for joint herding and pasturing at a very local level, often sharing with friends, neighbors, and family. Reconsolidated parcels have somewhat better ecological conditions than non-reconsolidated ones.

10.7 Conclusion

An important lesson to be learned from studying the relationships between institutions and ecology in the drylands of Kenya is that the “real” tragedy of the commons has been the lack of understanding shown by colonial and contemporary Kenyan government officials of the importance of a nested governance system for sustaining this Social-Ecological System over time. Many scholars and public officials presume that effective governance is possible only when a single, monocentric government makes all of the rules related to all policy issues within a national domain (see, for example, Miller, 1992). Garrett Hardin (1968) presumed that pastoralists involved in a tragedy of the commons dilemma could not extract themselves from it. He proposed that government should control access and use of a commons or that private property rights should be assigned. These are the two “solutions” that have been imposed on the Masaai over time. Neither of them have worked better than the nested system that the Masaai had themselves evolved over long periods of time, using trial-and-error methods to learn how to make better decisions. Neither of Hardin’s preferred solutions were more effective in the short term, or more robust in the long term, than the nested layers of institutional rules that the Masaai had developed.

In our introduction to this chapter, we promised to examine three questions: (1) Which of the institutions that have existed during these time periods are more robust and why? (2) How does institutional robustness influence ecosystem resilience? and (3) What assumptions can be made about human behavior and incentives in light of this sweep of human history? Given the substantial evidence summarized above, we must conclude that the answer to the first question is quite clear. The traditional rules and norms evolved before colonial times were more robust than the formal, imposed rules made by officials who applied simplified panaceas regarding how to manage land. The officials are delinked from, and poorly adapted to, the risk inherent in the existing environmental setting and have largely served to create conditions that are associated with land degradation. The Masaai themselves continuously face risk. The traditional norms of herd redistribution and reciprocity assume more importance for them than for government officials, since the exposure to risk is not only more severe for the Masaai, but is also felt among a broader segment of society.

The evidence also provides some insight into our second question: How does institutional robustness influence ecosystem resilience? The robust institutional ar-

rangements exhibited in this history were the set of nested arrangements ranging in size from a family, to localities, to the sections, and finally to alliances among the twelve sections. Each of these levels was able to make rules and norms related to terrains about which the participants in decision making at each level knew well. Thus, decisions could be and were tailored to the specific conditions of a particular locality. When drought hit one location, Maasai decision makers could search out other regions where rainfall was adequate and negotiate movement of the herds from the dry patch to wetter patches. Moving the cattle off of the range suffering from overly dry weather protected that patch and enabled it to regenerate when the next rains came. This rotation over a very large space was conducive to sustaining these drylands over time.

Unfortunately, the traditional nested governance system of the Maasai was not recognized by outsiders and officials who repeatedly tried to impose a centralized governance system to correct presumed management errors. A broad range of studies has demonstrated similar outcomes, yet very few have adopted frameworks that explicitly link robustness and resilience. Sporrang (1998), for example, demonstrates a degree of social and ecological resilience in Central Sweden prior to the enclosures of the 1820s, while Niamir-Fuller (1998), Alcorn and Toledo (1998), and Jodha (1998) all speak to the importance of nested institutions in enhancing the resilience of local resource management in pastoral, forest, and mountain ecosystems in Sahelian West Africa, Mexico, and the Hindukush-Himalaya, respectively.

Currently, however, the capabilities of a nested governance system for more effective management of natural resources and for mitigating risk are being recognized in other parts of the world, because of the promise that nested systems hold of perhaps being more effective and robust than centralized systems. Marshall (2008), for example, is exploring what can be learned from nested community-based governance systems for Australian ecologies that are very large but composed of meaningful units at multiple spatial scales. As more and more ecologists are recognizing that ecological systems exist at multiple scales, policy analysts need to recognize this fact and learn how to think about and encourage nested systems that facilitate decision making at multiple scales (Cash et al., 2006; Gibson, Ostrom, & Ahn, 2000). Problem solving related to complex SESs is best done under diverse institutions at multiple scales with sufficient autonomy and flexibility to make and change rules, depending on the nature of the ecology and the human organization at that scale.

Our third question relates to the appropriate assumptions that could be made about human behavior and incentives in light of this sweep of human history. In our introduction, we laid out our basic assumptions related to fallible humans who make decisions at multiple tiers of action intended to increase net benefits to themselves and potentially to others. We found that, when the Maasai made decisions within their evolved norms and rules, their decisions benefited not only themselves and their immediate families, but also generated benefits for a larger group. When government officials tried to replace the indigenous system, many of

these norms of reciprocity and trust were destroyed in the process. Individual decisions became more self-centered on family survival rather than the survival of a larger group. We did find that human choice has been interdependent within tiers of decision making and across time and space, with the impacts of decisions being horizontal, upward, and downward. The change in governance shortened the time horizon of individual Maasai, because government officials no longer recognized the Maasai system for taking long-term effects into account.

Thus, from this effort to understand more than a century of the interrelationships among the components of an SES, we urge scholars and practitioners to recognize the advantage of nested governance systems organized at diverse levels. And, in particular, to be conscious that top-down changes may disrupt institutional adaptations that enable resource users to utilize the spatial and temporal distribution of resources to avoid excessive pressure on particular locations within larger ecosystems (Janssen et al., 2007). In our modern era of communications and market exchanges, relying strictly on small-scale common-property institutions for effective and robust management of ecosystems is not sufficient. Nor, is it sufficient to try to impose uniform rules on large, patchy environments when officials have little information about variations in rainfall, regrowth of key plants, soil nutrition, and water availability and suffer little harm from making decisions that can bring major damage to the citizens on the ground, trying to find ways of surviving over the long run. We continue to need nested governance systems that range from the very small to the global in scale.

Acknowledgments

Esther Mwangi gratefully acknowledges support from the Giorgio Ruffalo and Zif fellowship programs at Harvard University. Elinor Ostrom gratefully acknowledges support from the National Science Foundation (subaward No. 06-653) for the project "Dynamics of Rules in Commons Dilemmas". We appreciate the suggestions of Pauline Peters, Martina Padmanabhan, and Volker Beckmann, and the excellent editing of Patty Lezotte and Christopher Hank.

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