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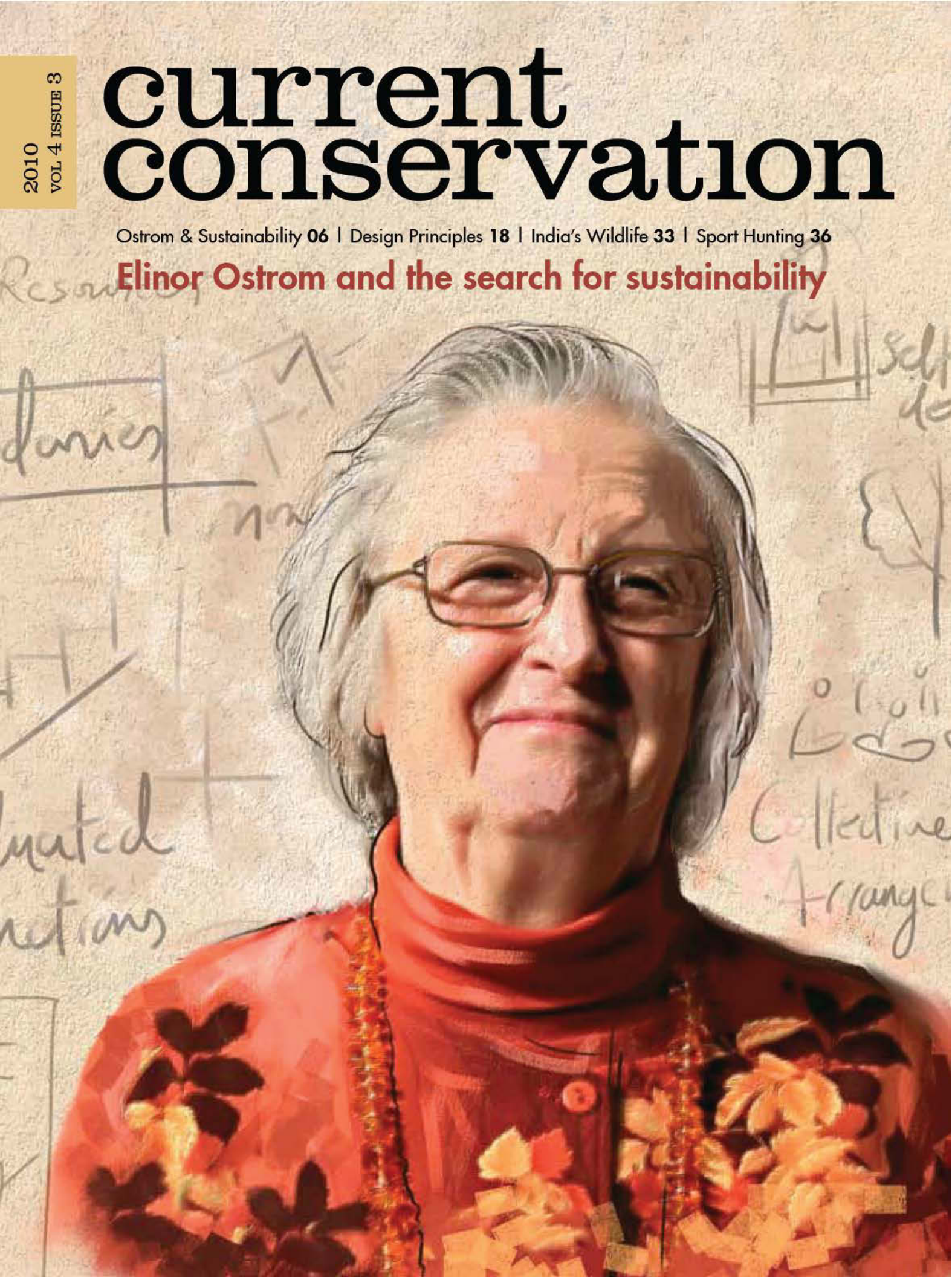
Elinor Ostrom and the search for sustainability



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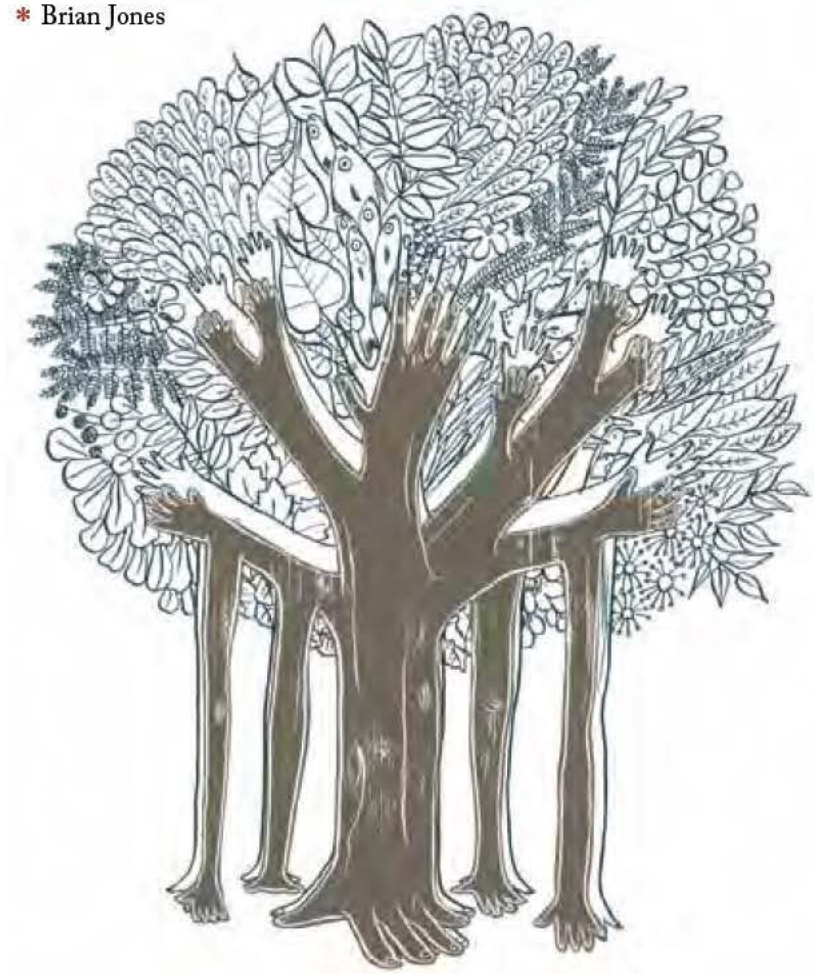

editor's note

Cover artwork: Suresh Kumar

Finding realistic solutions for the sustainable conservation of resources requires flexible and inclusive solutions. Elinor Ostrom, recipient of the 2009 Nobel Prize for Economics, has challenged orthodox views about management and use of resources, suggesting that cooperative systems might manage resources better than conventional systems (state-owned or private). She suggests that there might be more than one way to conserving common resources, and advocates greater tolerance and acceptance of diverse 'institutions' across the world that work to preserve and monitor use of such resources as forests, fisheries, etc. Her work urges us to think beyond the tragedy of the commons, and outlines principles that signify successful institutions (fisherfolk communities, pastoral systems, tribal communities harvesting forest resources, etc).

In this issue of Current Conservation, we feature a special section dedicated to the work and theory of Elinor Ostrom. This section, edited by Fred Nelson and Harini Nagendra, contains applications of Ostrom's design principles across various parts of the world ranging from South Asia and Africa to Latin America. In addition, we feature an interview of the first woman Nobel Laurate in Economics, where she answers questions about her work and experience.

Outside of the special section, we cover a project that encourages responsible use of land adjoining rainforests by private companies (Conservation Newsfeed), a recent book by Ghazala Shahabuddin that discusses current conservation paradigms in India (On Bookstands), and a research study that finds that cultural perceptions of wilderness factor into current conservation of these landscapes (Research in Translation).

Biodiversity-friendly beverages help protect wildlife & wild lands

Kalyan Varma

** Divya Karnad*

After several years of studying and working in the Valparai Plateau, Anamalai hills, Tamil Nadu, scientists T. R. Shankar Raman and Divya Mudappa of the Nature Conservation Foundation, Mysore, have joined hands with Rainforest Alliance (RA) to foster a novel approach to biodiversity conservation in plantation landscapes across India. They are working to provide market-linked incentives through credible certification of tea and coffee farms that adopt good land-use practices.

The Valparai Plateau situated in the Western Ghats biodiversity hotspot has great potential to support natural plant and animal diversity. Although the current land-use is dominated by tea and coffee plantations, they provide refuges for threatened species and act as corridors for animal movement. As these and several other plantations across the country have been carved out of or adjoin forests, the scientists realized the need to extend conservation efforts to these production landscapes. Although some plantation companies with a corporate conscience are already successfully involved in ecological restoration initiatives, Mudappa and Raman believe that introducing an economic incentive might attract others to join the effort.

Rainforest Alliance is an international non-profit organization that has established a system of certification for sustainable agriculture worldwide. While there are other certifications that producers might avail of, the RA certificate uniquely defines sustainability in agriculture from a perspective of biodiversity conservation in addition to regulated use of permitted agrochemicals, good social and farm management practices. Since 2007, Rainforest Alliance has certified estates in Tamil Nadu, Karnataka, Kerala, and Assam, who have been able to tap into growing markets for sustainable produce.

The certification process is simple, and a farm or group of farms can initiate the process with a voluntary application to the Rainforest Alliance Certified program. A farm visit by specialists is necessary to determine the changes needed to achieve certification, followed by an official audit. All farms or groups are inspected every year and they must demonstrate continual progress.

Farmers pay for the initial certification of their farms and the annual follow-up inspections. Currently, the Indian Coffee Board is enabling such market initiatives by providing a subsidy for planters who want to get this or other forms of certification. Nature Conservation Foundation recently joined the Sustainable Agriculture Network (SAN), an international consortium of non-profit conservation organisations that sets the standards underlying Rainforest Alliance certification.

Mudappa and Raman are helping to identify ecological and wildlife-friendly standards that are applicable in the Indian scenario and train and audit farms to achieve the certification. Ultimately the success of this venture lies in the hands of the consumer. While creating awareness among Indian consumers will take time, there is great potential in the domestic market. Tata Global Beverages, Unilever, and Kraft and many others have made a significant commitment to sourcing certified tea and coffee in the future.

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Elinor Ostrom and the Search for Sustainability

Over twenty years Elinor Ostrom and her design principles have transformed the way we relate to and manage common property resources. In this issue we pay tribute to her work by showcasing examples from around the world.

Conservation is largely about institutions, the 'rules of the game' that formally and informally mediate interactions between human beings, and between people and the natural resources that we live amidst. Institutions structure people's economic choices and behavior, and the incentives people in different places possess to use natural resources in different ways. Local institutions governing resources such as rangelands or forests are often the key in determining whether or not such commons are used sustainably or are subject to the 'tragedy' of open access depletion. Today, an enormous environmental challenge facing humanity is devising new formal institutions that will limit greenhouse gas emissions into the commons of the global atmosphere. The search for sustainable ways of living on the earth is inherently tied to our ability to devise and enforce such local and global governance institutions.

No individual has contributed more to our contemporary understanding of the role that institutions play in natural resource governance than Elinor Ostrom, the American political scientist who was awarded the 2009 Nobel Prize in Economics for her body of work on institutional evolution and collective action. During the past twenty years, Ostrom and her colleagues, many of whom were once among her numerous graduate students, have transformed our understanding of the ways people cooperate to manage resources such as forests, water, fisheries, wildlife and livestock pasture. Scholastically and analytically, this body of work represents perhaps the single most important contribution to the conservation field during the past two decades.

Ostrom's work came to the fore in a transformative way with the 1990 publication by Cambridge University Press of her landmark study, Governing the Commons: The Evolution of Institutions for Collective Action. Governing the Commons drew from studies that had been carried out in various parts of the world by other scholars of communal property regimes, where local groups of people cooperated together to collectively manage shared natural resources. The book's aim was to identify the key ingredients in such sustained collective governance regimes, to describe how they had evolved and how they had endured, and to situate this within a theoretical framework on cooperative human behavior that drew on game theory models such as the famous Prisoner's Dilemma.

Governing the Commons presented a fundamental challenge to core existing assumptions about natural resource governance and management paradigms of the times. Ostrom took explicit aim at Garret Hardin's 1968 article on 'The Tragedy of the Commons', which some surveys have ranked as the most influential scientific article ever published. Hardin's 'tragedy' was based on the premise that when resources are shared by a group of people, each individual possesses incentives to maximize their own consumption (of, say, a communal forest or livestock pasture). The result, as Hardin described it, is the inevitable tragedy of resource depletion, as each user of such commons competes to individually appropriate a greater share to themselves. The implication from Hardin's paradigm was that sustaining resources required measures that either individualized property rights over resources or that placed those resources squarely in the public realm, where the state could regulate local patterns of use so as to restrictively prevent over-exploitation.

The basis for Ostrom's challenge to Hardin's influential paradigm, as presented in Governing the Commons, was both empirical and theoretical. On a practical level, it was apparent that the 'tragedy' of over-exploiting shared resources was not in fact inevitable, as the work of various commons scholars was revealing. Local communities were, at least in certain contexts, able to sustainably manage common property resources through locally-devised institutions regulating use.

On a theoretical level, as game theory modeling by scholars such as Robert Axelrod showed, human cooperation is in fact instrumentally rational in an economic sense.

Governing the Commons laid out a set of basic principles for 'long-enduring common property regimes' drawing from a relatively small set of case studies. These factors in sustainable local governance regimes included the ability to make and enforce local rules governing use, the use of sanctions for violators, and linkages to institutions at higher scales. While to many anthropologists and, of course, local communities themselves, many of the arguments of Governing the Commons may seem obvious or intuitive, Ostrom's work provided legitimacy to local communal management as a sustainable form of resource governance, and an analytic framework to examine the conditions that enable local groups of people to cooperate together in managing natural resources.

Since this initial landmark study, Ostrom's work has continued to effectively ask this same question: what are the variables that enable people to form sustainable natural resource governance regimes? A range of large-scale research programs have sprung up from this basic line of enquiry, the most notable of which is the International Forestry Resources and Institutions (IFRI) program, which was initiated in 1992. IFRI now includes 14 countries and a database of more than 250 forests from these highly variable social, political, and ecological contexts, and as the research program accumulates more and more data, including repeat surveys of the same forests over time, it is producing critical insights on the links between forest condition, institutional arrangements across different scales, and local communities' abilities to capture economic benefits from forest products. These studies are transforming our understanding of foundational conservation questions such as the relative effectiveness of state protected areas and local management regimes, as well as synergies and trade-offs between local socioeconomic benefits and forests' ecological values. Recent studies analysing IFRI data also apply these lessons to efforts to combat climate change through payments designed to finance tropical forest conservation as envisioned under the new REDD regime (Reduced Emissions from Deforestation and Forest Degradation), highlighting the importance of local forest stewardship, tenure, monitoring, and rule-making if REDD is to work effectively.

Although Elinor Ostrom's work on institutional resource governance arrangements has contributed enormously to the integration of social science and biological sciences, as seen for instance in her contributions to the Resilience Alliance, and the influence that resilience thinking has had on, among other things, the Millennium Ecosystem Assessment, much of the body of common property scholarship has yet to fully penetrate the conservation field. For the 20th anniversary edition of the journal Conservation Biology, Ostrom and Arun Agrawal of the University of Michigan authored a piece lamenting the fact that political science's role within conservation biology remains largely a 'dialogue of the deaf'.

For conservationists and environmental professionals and activists, Ostrom's Nobel Prize in Economics is perhaps the scholastic equivalent of Wangari Maathai's 2004 Noble Peace Prize. Maathai's award, given for her leadership of Kenya's Greenbelt Movement in making forest conservation a major human rights and political issue in East Africa over the past twenty years, reaffirmed environmental conservation as being a mainstream contemporary security and justice issue of the highest global importance. In recognizing Ostrom's work, the Nobel committee has highlighted the growing importance of scholarship on the environment and natural resources in the wider context of humanity; it was perhaps not a coincidence that Ostrom's award occurred the year of the Copenhagen climate summit, including its prominent focus on the links between forest governance and climate change.

This edition of Current Conservation commemorates Ostrom's Nobel Prize, just over a year later, through several articles on the cutting edge research that has emerged from her work and efforts, and its application to natural resource management efforts around the world. Three of the articles discuss the application of Ostrom's work for forest conservation in different parts of the developing world, drawing on IFRI research and other studies. While the authors of these pieces are all drawn from Ostrom's wide network of colleagues and collaborators in the IFRI program and related research initiatives, Brian Jones provides an example from Namibia where Ostrom's 'design principles' were applied in the development of the country's heralded Communal Conserancies programme without Ostrom herself having any direct involvement with that process. The edition also features a brief interview with Elinor Ostrom herself and a concluding note by long-time colleague, and Current Conservation advisory board member, Harini Nagendra.

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Ostrom's 8

In 1990 Elinor Ostrom proposed 8 design principles that robust institutions for managing common-pool resources (CPR) such as forests or fisheries. Twenty years on, Michael Cox, Gwen Arnold and Sergio Villamayor Tomas examined 91 studies that evaluated the principles, and scored them according to whether they indicated success (s) or failure (f) of a particular principle, taking into account the evidence for these conclusions (evidence: yellow, no evidence: black). They also suggested reformulation of some of the principles. Here we present Ostrom's original eight, their success or failure and the new reformulations.

01

CLEARLY DEFINED BOUNDARIES

a *Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined.*

b *The boundaries of the CPR must be well defined.*

new 01a **USER BOUNDARIES**
Clear boundaries between legitimate users and non-users must be clearly defined.

new 01b **RESOURCE BOUNDARIES**
Clear boundaries are present that define a resource system and separate it from the larger biophysical environment.

02

CONGRUENCE BETWEEN APPROPRIATION & PROVISION RULES & LOCAL CONDITIONS

a *Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions.*

b *The benefits obtained by users from a CPR, as determined by appropriation rules, are proportional to the amount of inputs required in the form of labor, material, or money, as determined by provision rules.*

new 02a **CONGRUENCE WITH LOCAL CONDITIONS**
Appropriation and provision rules are congruent with local social and environmental conditions.

new 02b **APPROPRIATION AND PROVISION**
The benefits obtained by users from a CPR, as determined by appropriation rules, are proportional to the amount of inputs required in the form of labor, material, or money, as determined by provision rules.

03

COLLECTIVE-CHOICE ARRANGMENTS

Most individuals affected by the operational rules can participate in modifying the operational rules.

04

MONITORING

a *Monitors are present and actively audit CPR conditions and appropriator behavior.*

b *Monitors are accountable to or are the appropriators.*

new 03a

MONITORING USERS

Monitors who are accountable to the users monitor the appropriation and provision levels of the users.

new 03b

MONITORING THE RESOURCE

Monitors who are accountable to the users monitor the condition of the resource.

05

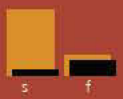
GRADUATED SANCTIONS

Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and the context of the offense) by other appropriators, by officials accountable to these appropriators, or both.

06

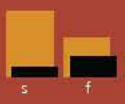
CONFLICT-RESOLUTION MECHANISMS

Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.



07

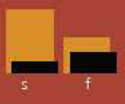
MINIMAL RECOGNITION OF RIGHTS TO ORGANIZE



The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.

08

NESTED ENTERPRISES



Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

Ostrom, E. 1990. Governing the Commons: the evolution of institutions for collective action.

Cox et al. 2010. Ecology and Society 15(4): 38


IFRI
DEFORESTATION
LOCAL COMMUNITIES
TAKE DEFINITIVE ACTION
COMMON
PROPERTY
MANAGEMENT:
a revolution
Pencil Sauce

Common Property Theory, Elinor Ostrom & the IFRI Network

How are forests collectively used and governed across the world? Inspired by the research of Ostrom and other scholars, the IFRI network has developed standardised research methods applicable across various cultural, social and biophysical contexts.

Introduction

Founded in 1992 at Indiana University and with its current home at the University of Michigan, the International Forestry Resources and Institutions (IFRI) research network addresses one of the pervasive gaps in research on the commons—the lack of systematic data that can be analyzed, using coherent conceptual frameworks and advanced quantitative and qualitative analytical approaches. Focusing on forest commons, and finding inspiration in the research of Elinor Ostrom and other scholars of the commons, IFRI researchers and scientists have implemented common data collection protocols and approaches across a variety of cultural, social, biophysical, and national contexts, in order to improve the understanding, of how forests are collectively used and governed, and with what effects.

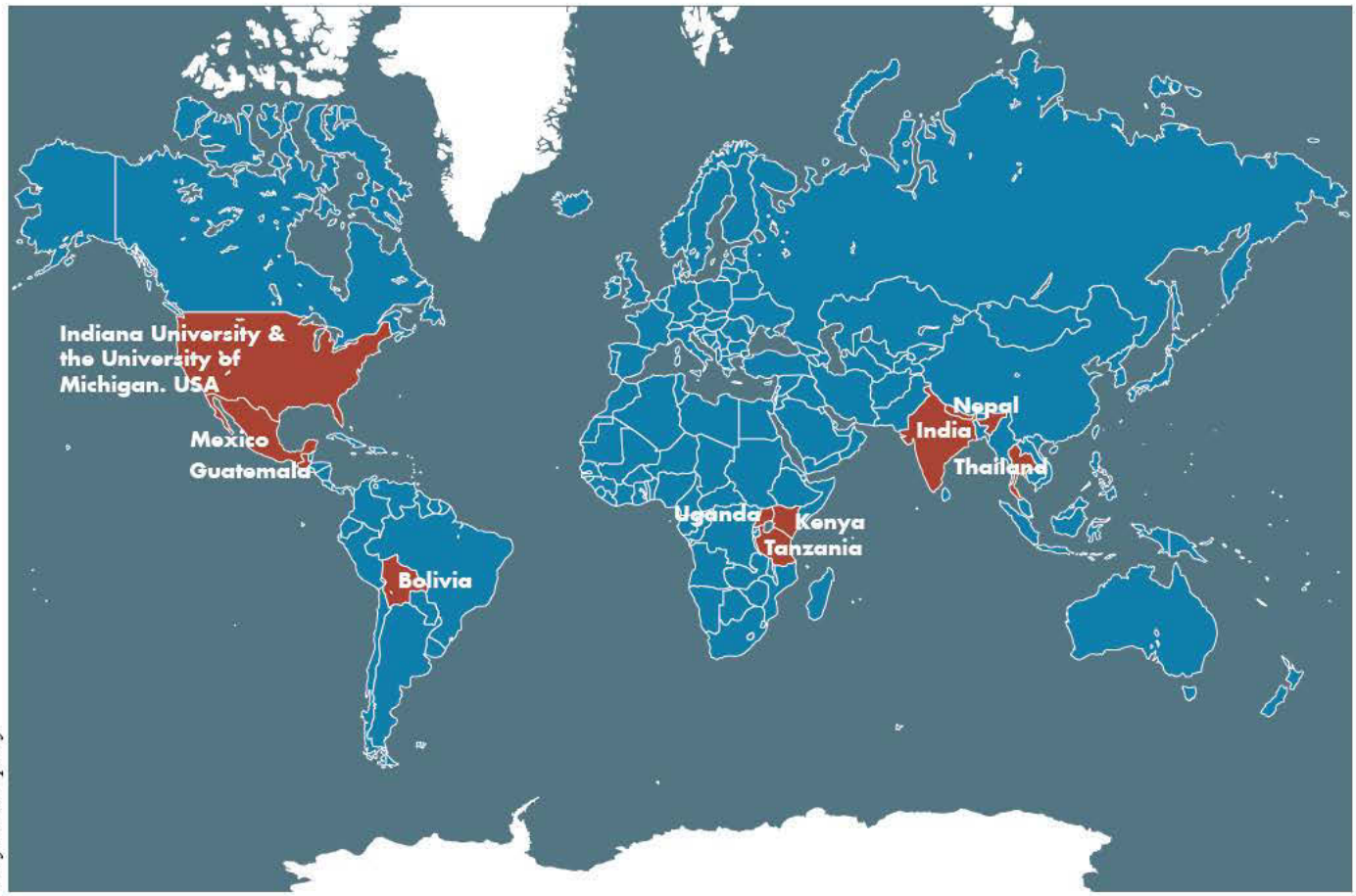
At the time the IFRI network came into being nearly twenty years ago, there were few studies of the commons that used statistical, quantitative, or modeling methods and approaches, to examine social and ecological outcomes, across a large number of cases or across different contexts. The preponderance of case-based approaches meant that the scholarship on the commons had a plethora of potential explanations, derived from specific cases, but limited means to test, whether explanations that appeared reasonable and persuasive in a given case, were also relevant to other cases and contexts. For example, high levels of participation and collective action in a given case study, could well explain the effectiveness of local resource management institutions and positive resource outcomes. But, did high participation lead to improved management institutions and positive resource outcomes in other contexts as well? In that early period of research on the commons, different case studies collectively highlighted scores of potential theoretical explanations of commons outcomes. Scholars of common property and those interested in resource governance did not have the data that could be used to test explanations. The IFRI initiative has helped address this major gap in research on the commons.

The IFRI Network

The IFRI network has 11 collaborative research centers (CRCs) in 10 countries, and has collected data from 17 countries in all. The 10 CRCs are located in East Africa—in Kenya (Kenya Forestry Research Institute), Tanzania (Department of Forest Mensuration at Sokoine University of Agriculture), and Uganda (Uganda Forestry Resources and Institutions Center at Makerere University); in Latin America—in Bolivia (CERES), Guatemala (Universidad del Valle de Guatemala), and Mexico (Instituto de Investigaciones Sociales Universidad Nacional Autonoma de Mexico); in Asia—in India (SHODH, The Institute for Research and Development), Nepal (Forest-Action Nepal), and Thailand (School of Environment, Resources and Development at the Asian Institute of Technology); and in the United States—at Indiana University and at the University of Michigan. The University of Michigan coordinates the research relationships among these centers.

The IFRI Approach

Researchers associated with IFRI program developed their research methods in 1992–1993, based on the Institutional Analysis and Development (IAD) framework advanced by Elinor Ostrom and her colleagues at Indiana University. With the IAD framework providing an over-arching set of principles to guide research, IFRI scholars have created a standardized methodology for fieldwork, based on 700 questions organized in 11 data collection instruments (instruments and an instruction manual for conducting field work are available at www.umich.edu/~ifri). IFRI researchers are currently developing a more streamlined set of questions and variables, that they have found useful to address resource governance and institution-related questions.



Kalyani Ganapathy

The data collected by IFRI scholars at different sites are incorporated into a relational database, currently housed at the University of Michigan and Indiana University. IFRI offers a training seminar each year, for researchers interested in using IFRI methods, in order to maintain standardization in the application of IFRI methods, and has trained more than 200 researchers in the last 18 years. IFRI field research teams comprise at least 1 forester and 1 social scientist, but frequently include 4 to 6 researchers with different disciplinary backgrounds. Data is typically collected over 2 to 4 weeks, depending on the size and accessibility of the site and the diversity of vegetation in the local forests. To collect social, economic, institutional, and demographic data related to forest use, management and governance, IFRI researchers use group participatory research methods. They complete the research collectively, after collating data gathered through individual interviews, group conversations, and secondary materials. More recently, IFRI researchers also employ a household survey. For ecological data, IFRI researchers collect forest mensuration information on trees, shrubs, and ground-cover, via stratified random plot sampling in the local forests.

Findings of the IFRI Research Program

Although IFRI started as an effort to examine and understand how forests are managed, as a commons resource by groups of individuals, and whether collectively managed forests are doomed to extinction, the data collected by IFRI scholars is pertinent today, to address questions about resource governance in a far more general way. With systematically and consistently collected data on social, institutional, demographic, economic, biophysical, and policy-related variables, from more than 250 forest commons in Latin America, East Africa, and South Asia, a growing number of which now have longitudinal site-visit data as well, the IFRI research network provides an unparalleled resource, with which to examine and test different aspects of institutional theories of human actions, the relationship between governance and social-ecological outcomes, and the relative importance of multiple explanations of trade-offs, across the different social and ecological benefits that forests provide.

The first generation of IFRI-inspired research focused on addressing conceptual and theoretical puzzles, related to insti-

tutions and outcomes of resource governance, using case-based and comparative approaches. This research pointed to the importance of many different factors relevant to effective resource governance, and focused on how local users and communities can manage forests sustainably. In doing so, it pointed to the importance of many of the same factors, that earlier scholarship on the commons had highlighted, as being critical to effective institutional functioning and sustainable governance. These factors included the level of dependence of users on forests, group size and heterogeneity, and equity in allocation of benefits from forest commons.

More recent findings from the IFRI research program have used the full weight of the data collected to open new areas of research and analysis. This has included analyses across large datasets, which highlight the roles of monitoring, enforcement and rule-making participation by forest users. in producing more sustainable forest governance outcomes, as well as comparative assessments of outcomes, as they relate to decentralization processes, and across formalized protected areas and informally managed forests. Together, this work has also drawn attention to the need to better understand how key elements of governance structures and other socio-economic, demographic and related variables interact and contribute to more or less successful outcomes, irrespective of whether the governance system itself is in name public, communal, private or a hybrid combination of these different systems.

Another such direction is the analysis of the relationships, among the many different benefits that forests produce, and the driving causes of these relationships. In a series of studies, IFRI scientists have focused on the factors, that simultaneously influence the amount of carbon stored in forest commons, the diversity of vegetation in the same commons, and the livelihood benefits that forest commons provide to their users, and have come up with some interesting and highly policy-relevant findings. Their work suggests that larger forest commons, that are managed more autonomously by local communities and users, are more likely to provide higher livelihood benefits and carbon storage than small forest commons, over whose management, local users have little control. These findings suggest, not only that forest-dependent communities have the capacity to manage their forests for local benefits, but that such communities can also simultaneously enhance global public goods, that are increasingly sought from forests, if they possess sufficient autonomy to decide how to manage their forests. Such work has strong policy relevance in the context of ongoing decentralization reforms, underway in many

Catherine M Tucker

** View of IFRI study site. Mexico*

countries around the world, as well as in the context of emerging global policy regimes, which seek to generate multiple social and ecological co-benefits from forests, notably strategies for Reducing Emissions from Deforestation and Forest Degradation (REDD+).

The full potential of IFRI-based research is only beginning to be realized. We invite scholars and students to engage with the IFRI research program, and use the infor-mation we have collected, to solve enduring research puzzles around renewable resource governance, ecosystem services, and relationships across multiple outcomes in social ecological systems.

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Pencil Sauce

What are the Lessons of Elinor Ostrom's Work for south asian forests?

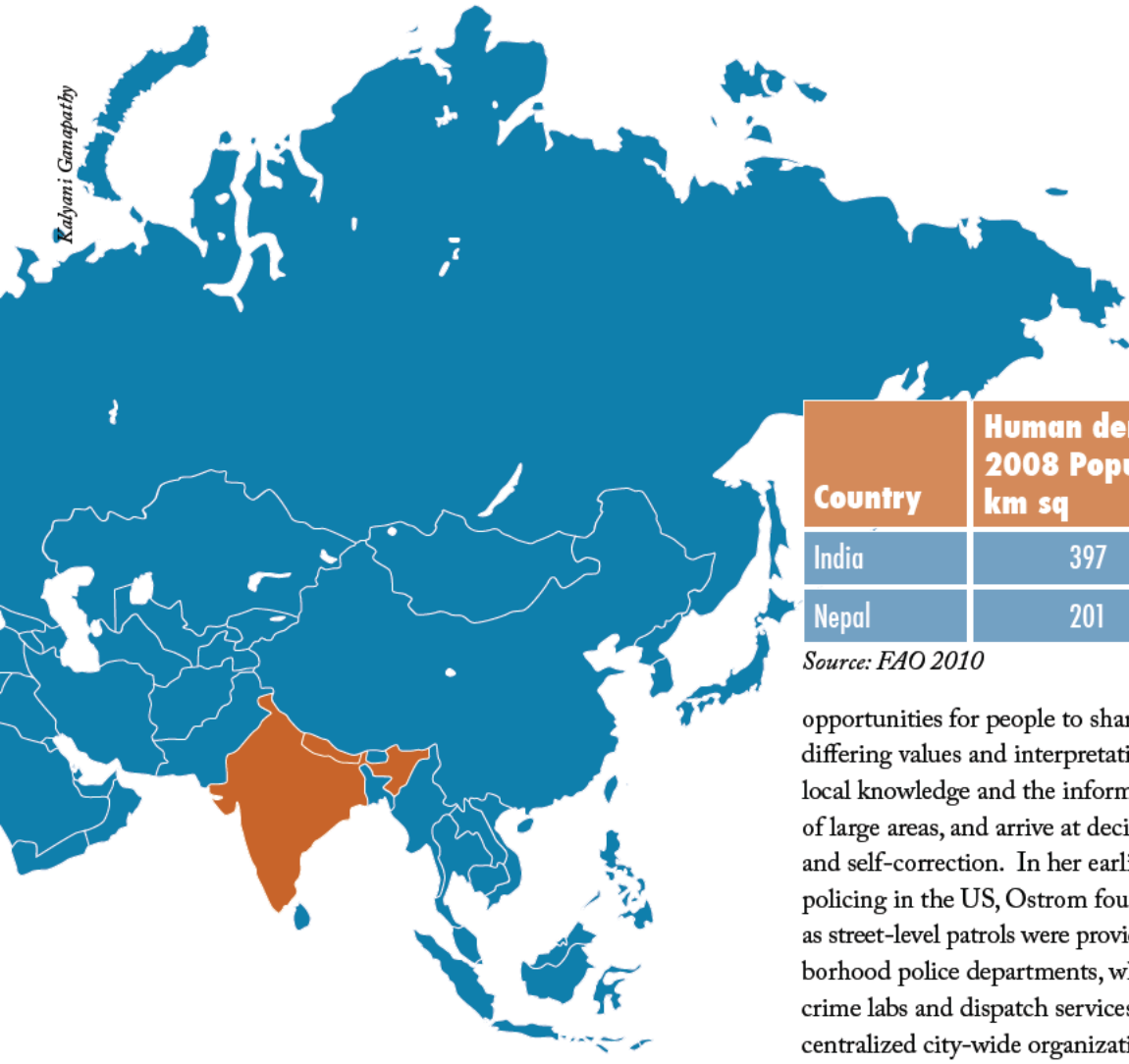
South Asia is diverse in culture and ecosystems and management of common resources is often challenging. IFRI studies in India and Nepal suggest that Ostrom's principles of institutional diversity and polycentricity might provide a roadmap to sustainable management.

Elinor Ostrom's research shows that empowering local forest users to manage their own forests may lead to better forest conservation under certain circumstances. This finding lends credence to movements in South Asia, which has had a long history of local governance of natural resources, and across the developing world, where people are trying to govern the resources they have used for centuries. It has also convinced many policy-makers and academics that local governments can contribute to sustainability. Ostrom's work convincingly shows that sustainable governance, though difficult, is possible. Implementing a broadscale system for sustainable governance requires building on historical roots. This helps to develop diverse institutions, that link local ecological knowledge and livelihood needs with higher level sources of technical expertise, political power, and funding.

The South Asia Connection

Since the publication of her classic work, Governing the Commons, in 1990, Ostrom and her colleagues have developed an impressive research program on forest governance in South Asia. The International Forestry Resources and Institutions (IFRI) program was begun by Ostrom and her colleagues, at The Workshop in Political Theory and Policy Analysis at Indiana University, at the urging of FAO colleagues, who wished to replicate the successes of the Nepal Irrigation Institutions and Systems (NIIS) database, which showed that farmer-run irrigations systems consistently out-performed public systems, because farmers could make rules that fit local requirements. The IFRI program aimed to combine the benefits of case studies with the building of a large database, that could be used to test broader hypotheses about forest governance. From the start, the IFRI program included sites in India and Nepal, and two of the 11 current IFRI collaborating research centers are located in South Asia. Ostrom has co-authored a number of publications, that draw on this work to address challenges of forest governance in Nepal and India, which show that government requires effective institutions to overcome many collective action problems, and that, "when users are genuinely engaged in decisions regarding rules affecting their use, the likelihood of them following the rules and monitoring others is much greater than when an authority simply imposes rules." These studies show that her conclusions from Governing the Commons are relevant for South Asia.

Before the publication of Governing the Commons, several authors had already demonstrated the impressive capacities of local users to manage the commons in South Asia. Robert Wade's studies of the centuries-old south Indian irrigation systems demonstrated, that such traditional systems could be quite successful even in the modern era, while Narpat Jodha's surveys of livelihood patterns in several arid regions of India, documented the great importance of the commons for the poor. By the time Governing the Commons was published, there were community



Kalyani Ganapathy

Country	Human density 2008 Population/ km sq	Forest 2008 1000 ha
India	397	68434
Nepal	201	3636

Source: FAO 2010

irrigation cooperatives in many parts of South Asia, and both India and Nepal had taken steps towards greater involvement of community in forest management, through Joint Forest Management (JFM) and Community Forest Management (CFM) programs respectively. However these programs have not been as successful as many had hoped, and Ostrom's work is helpful in understanding how future policy improvements can support conservation and livelihood development outcomes. Taken as a whole, Ostrom's work is important because it recognizes that, while communities can successfully manage their resources, they do not necessarily do so. In fact, like governments and market institutions, comm-unity-based institutions often fail. Much of Ostrom's work has been devoted to explaining these successes and failures.

Institutional Diversity & Polycentricity

Two organizing concepts that Ostrom has used, to understand the potential for self-governance, are polycentricity and institutional diversity. Polycentricity literally means multiple centers, and Ostrom uses it to mean that political orders should contain several different centers of decision-making authority. These overlapping arenas of authority provide opportunities for people to share information, argue over differing values and interpretations, take advantage of both local knowledge and the information and financial resources of large areas, and arrive at decisions through argumentation and self-correction. In her earlier studies of metropolitan policing in the US, Ostrom found that certain services—such as street-level patrols were provided more cheaply by neighborhood police departments, while other services—such as crime labs and dispatch services—were best provided by centralized city-wide organizations.

IFRI studies have repeatedly found similar patterns in forest management. Local enforcement of rules—including monitoring and sanctioning—is the single most useful predictor of forest conditions in several IFRI studies. Although in some cases, local enforcement can be carried out by government officers, it is well documented that in South Asia, forest guards are frequently unable to carry out such enforcement. This is because guards have to cover large areas of forest in rough terrain, and are lightly armed. Even when guards and their superiors aren't specifically bought off by rule-breakers, rule-breakers frequently are more socially and politically powerful than the guards, and thus the guards may be frightened to enforce rules. A guard who enforces rules against politically well-connected law-breakers may see his case ignored by his superiors, and may be threatened or transferred. Although rare, it is not unheard of, for forest guards to be murdered by smugglers. Furthermore, many of the people who live near protected forests are desperately poor, and may have little choice but to attempt to draw on resources illegally. Guards, who live in these communities, may be extremely reluctant to punish impoverished neighbors, for taking goods from the forest that are needed for their neighbors' subsistence.

Local rule-makers are frequently in a better position to enforce rules. Therefore, even if the well-being of local communities is not the basic objective, as in the case of protected areas, conservation of resources will not be possible unless the local community is involved. Ostrom's work with Harini Nagendra on the Chitwan National Park in Nepal, and the Mahananda Wildlife Sanctuary and Tadoba-Andhari Tiger Reserve in India suggest, "without ensuring the livelihoods of those living around or within a forest, major investment in monitoring is not a sufficient, long-run management strategy and might even be counter-productive."

South Asia contains an enormous diversity of cultures and eco-systems. In Governing the Commons Ostrom found that long-term sustainable resource management was more likely to occur where "rules are congruent with local social and environmental conditions". It is because of the need to adapt institutions to diverse contexts that Ostrom titled her recent theoretical work Understanding Institutional Diversity. Here she writes, "since ecological, economic, social, and political settings are always changing over time, no specific set of rules will produce the same distribution of benefits and costs over time." The necessity for adapting diverse institutions to changes over time is one reason, why another common aspect of long-term sustainable resource management is, that local resource users who are in the best position to know the status of the resource can play a role in changing the rules.

Several of the IFRI network's studies of forest governance have provided evidence of the importance of these ideas. Hayes and Ostrom show that different institutional arrangements, including protected areas, reserved forests, and community-managed forests can have comparable vegetation densities. No institutional arrangement is necessarily superior to the others. It is the diversity of contexts and goals that should be the determining factor in the choice of appropriate institutional structure. For example, studies of forest cooperatives set up in the 1930s in Himachal Pradesh find that high levels of involvement by government officials are negatively associated with forest condition. Government involvement sometimes slows down decision-making and introduces a strong element of power inequality, hindering community commitment in an otherwise close-knit and relatively egalitarian society. By contrast, in a study of 3 villages in Maharashtra where forest protection work got started in 3 different ways- community initiated, NGO promoted, and Forest Department supported JFM—Ghate concluded "neither community nor enforcers are sufficient, both are needed and can enhance the other."

Ostrom's Analytical Tools

Ostrom has provided us tools that help us to design appropriate programs and policies that result in diverse sustainable institutions. The "design principles", based on the study of institutions that have survived for a long time, direct us to certain factors that are likely to contribute to the successful design of new programs. We have already noted the importance of monitoring and congruence with local conditions. Two other design principles that are particularly important for resource governance in South Asia are "minimal recognition of rights to organize", which is being reflected to some extent in JFM/CFM and Forest Rights Act and nested enterprises. By their nature, natural resources have multiple uses and have users at multiple spatial scales. Local forest-user groups may possess superior knowledge of their local resources, but may have insufficient power to battle well-connected smugglers, and insufficient land to insure conservation of large predators such as tigers. Interaction and coordination between these local users and higher levels of government are likely to contribute to sustainability.

Ostrom directs our attention to the fact that attributes of the resource contribute to the likelihood of sustainable management. The predictability and spatial extent of a resource may determine if a community will invest in protection. Similarly, only if resource users value the resource, expect the resource to improve and can see clear indicators of their success, are they likely to self-organize.

In the last two decades, South Asia, a region that continues to be under the influence of colonization, has realized that many indigenous resource management institutions worked in the past and can be adapted to the modern context. Studies of natural resource decentralization in South Asia have found mixed results. It is important to understand that simply creating community-based institutions is insufficient. Institutional development requires long-term investment and a willingness to adapt policies to local conditions. Governments can assist this process by facilitating the development of local social capital, and providing space for locally empowered actors to craft their own solutions. Ostrom's work indicates this and provides us a roadmap for how to get there.

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Institutional Analysis & Forest Management and Policy in Latin America

Case studies from Latin America illustrate application of Ostrom's principles in forest management.

Pencil Sauce

Latin America's forests are managed under diverse property rights, institutional arrangements and environmental policies. Public and private property forests can be found throughout the region along with traditionally held, common property forests, which sometimes lack legal recognition and overlap with other property regimes. Many national parks have been established to conserve forests, but institutions (rules-in-use) to manage parks vary greatly. Some parks have strict institutions to limit human activities but others—"paper parks"—have no effective institutions. Protecting Latin American forests proves difficult, because many interest groups depend on forests and use them for diverse purposes—ranging from firewood collection, hunting, gathering of plants, and eco-tourism, to large-scale logging, clearing for agriculture or pasture, and road-building. Where human activities have been poorly governed, forests have suffered degradation, deforestation and loss of biodiversity. In other places, institutions for forest management have controlled resource extraction, encouraged reforestation or even maintained well-conserved forests. The FAO report Global Forest Resources Assessment 2010 indicated that deforestation rates have declined in many Latin American countries since the 1990s, suggesting that progress is being made in forest management. Nonetheless, South America led the world in forest loss between 2000 and 2010, with an average annual rate of 4 million hectares lost to mainly to agriculture or infrastructure.

As researchers have attempted to understand the factors that shape the conditions and change processes in Latin American forests, Elinor Ostrom's work on sustainable common-pool resource management has become increasingly influential. Ostrom has shared her ideas and research findings with innumerable Latin American researchers, political thinkers, environmental organizations, and students. The influence of Ostrom's work has been particularly notable in the institutional analyses of forest use and management, most clearly through the International Forestry Resources and Institutions (IFRI) Research Program. Her work has begun to influence the design of development initiatives and forest policy in certain countries.

Ostrom's Contributions to Research on Forest Management in Latin America

The focus on local institutions for sustainable forest management has been one of Ostrom's most important contributions to forest management research in Latin America. In particular, her work has provided a rigorous basis upon which to challenge assumptions that rural communities and slash-and-burn farmers are incapable of managing forests sustainably. Researchers had challenged these assumptions through case studies of communities with well-managed forests, but these uncoordinated studies gained little attention beyond academic circles. With Governing the Commons—translated into Spanish in 2000, Ostrom presented a theoretically rigorous analysis, which showed that local groups could manage resources sustainably. She identified eight design principles associated with success in managing common-pool resources, including forests (see poster on page 6 for details). Subsequently, she presented evidence that attributes of user groups and attributes of the resource, influ- ence the likelihood that user groups will form and maintain effective resource management institutions. Attributes of the resource encompass feasibility of improvement, reliability of indicators, predictability of resource availability, and spatial extent amenable to effective management given available means. Key attributes of user groups associated with the emergence of institutions include dependence on the resource base, common understanding, trust and reciprocity, autonomy, and prior organizational experience. In addition, people are more likely to create institutions for sustainable management when they value a resource, mainly as a source of ongoing benefits for current and future generations, rather than desiring the benefits of immediate exploitation (such as income from logging or cash crops in case the forest is cleared).

The design principles and sets of attributes can be observed and tested. Thus Ostrom's work inspired researchers to pay greater attention to institutional arrangements, and to evaluate the institutions, user group attributes and resource attributes. In addition, certain governments and development agencies, notably in Mexico, began to consider Ostrom's findings when designing forest policies and programs (personal communication, Leticia Merino, September 13, 2010).

Findings from Research on Forest Institutions

Researchers influenced by Ostrom's theoretical approach have contributed to comparative analyses that largely support and occasionally refine Ostrom's theoretical propositions. For example, one design principle holds that clear boundaries are necessary for sustainable forest management. Effective boundaries typically involve fences or other human-made demarcation; however, work in Honduras and Mexico shows that topographic obstacles or lack of roads can serve as boundaries against incursions by outsiders. In Honduras, Celaque National Park

** IFRI researcher recording forest observations*

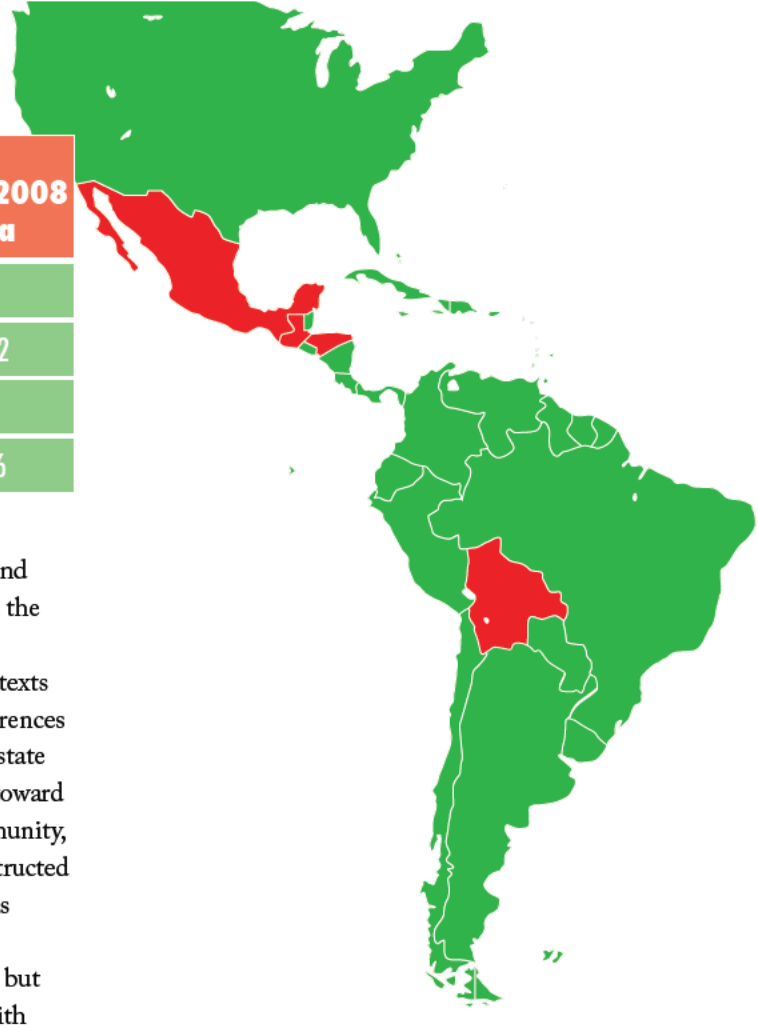
has few institutional protections, and lacks forest guards or rule enforcement to control tourist entry and behavior. It offers rare attractions, including endangered animals, sparkling waterfalls, and endemic orchids. The park nevertheless retains dense cloud forest, resulting in minimal incursions and few visitors, because no roads come to the park, and its steep slopes discourage all but determined, experienced climbers from penetrating very far. In Mexico, a Zapotec community created a wildlife refuge in the least accessible part of their forest; IFRI researchers had to rappel into the area to assess its conditions. They found the largest trees of the community in that section. Loggers had not been able to reach it when the Mexican government had included the community's forests in a concession to a paper mill in the 1960s and 1970s. Thus, preventing new road construction offers a simple and effective means to help conserve forests, but most governments want to build more roads to facilitate transportation and promote economic development. When people have easy access to forests by roads or other means, the design principles of monitoring and enforcement appear critical to prevent degradation. Large comparative studies based on IFRI data confirm that effective monitoring correlates positively with forests in better conditions. Moreover, work in Latin America has contributed to a strong finding that forests are in better conditions, when forest users participate in designing and modifying management rules.

In several IFRI communities, forest degradation occurred because people did not perceive that the resource base was threatened, or did not value it. These results support a scholarly consensus, that people are more likely to develop institutions for resource management when they find the resource to be salient, and perceive that it is scarce or threatened. A community in Ecuador, for example, owned a large forest that community members were gradually cutting for timber and agricultural fields, while allowing a neighboring landowner to clear parts of the forest for pasture. Although the community had strong organizational experience, it did not form institutions to stop forest degradation. The forest users and farmers did not see deforestation as an imminent problem, and valued the economic benefits of using the forest freely. Therefore, they lacked motivation to invest the time and energy required to design rules to monitor and protect the forest.

Studies also point to the importance of understanding the interplay of socio-economic circumstances, market processes, biophysical conditions, and national policies. In Guatemala and Honduras, the expansion of export coffee production has tended to transform communal forests to private plantations, and national laws favor private property over common property. Even so, IFRI researchers discovered that several communities have created communally-managed forest reserves to protect watersheds, because they value the water. In Mexico, IFRI

Country	Human density 2008 Population/ km sq	Forest 2008 1000 ha
Honduras	65	5192
Mexico	56	64802
Guatemala	129	3657
Bolivia	9	57196

Source: FAO 2010



Kalyani Ganapathy

work in the Monarch Butterfly Reserve (MBR) has found that communities vary greatly in their relationship with the reserve and their dependence on forest resources. MBR management has involved thorny challenges due to contexts of extreme poverty and high population densities. Differences in forest conditions, and experiences with national and state government agencies, have influenced people's attitudes toward the MBR and local rates of deforestation. In one community, residents refused to plant trees in a deforested area as instructed by government authorities, because they interpreted it as helping a government that did not help them. Another community attempted in vain to stop illegal harvesting, but they could not stop incursions by well-armed loggers with friends in high places. A different community, with an optimal location, gained government permission to guide tourists into the reserve to view the butterflies. Community members have developed interest in protecting the reserve, now that they benefit from it. In Oaxaca, a number of forest communities have developed forestry enterprises, even obtaining green certification. But they have found it difficult to compete against lower-priced imports. Out-migration to urban areas and the USA threatens to weaken community governance and institutions that often have managed forests well. National policies have had mixed impacts, at times allowing increased autonomy, and at other times inhibiting community forest management.

Influence on Forestry Development Initiatives and Policies

Researchers in Mexico have found Ostrom's research to be particularly relevant. Mexico has a long history of supporting community forest ownership. According to Mexico's National Institute of Statistics and Geography, approximately 80% of Mexico's remaining forests are owned in common by rural communities (ejidos and comunidades indígenas). Mexican scholars of community-based forestry have paid attention to Ostrom's work, at least since the 1990s. In the last decade, two major community forestry programs (The Forest Conservation and Management Program—PROCYMAF, and the Indigenous and Community Biodiversity Conservation Project-COINBIO) were developed with input from scholars and World Bank officials, who had links to IFRI or knew of Ostrom's work on common-pool resource management. These programs sought to strengthen community forestry enterprises and institutional capacity for forest governance and biodiversity conservation. The programs were well-received among communities, and contributed to improved timber production as well as community protected areas. Recently, Ostrom participated in a meeting with officials representing the World Bank and the National Forestry Commission of Mexico (CONAFOR), to discuss how to integrate lessons from her research to the new REDD+ program. The degree to which policy-makers are open to her message remains uncertain, particularly given the Mexican government's recent trend to centralize control over forest management (personal communication, Leticia Merino, September 13, 2010).

Guatemala's forest concession policy reflects knowledge of Ostrom's work, dating back to the 1980s. Evidently, participants in the political process were exposed to one of Ostrom's early publications on design principles. The forest concession policy entrusted municipalities with decision-making rights, and held them responsible for their municipal forests. Adherence to Ostrom's design principles contributed to the policy's

** Tourists in the Monarch Butterfly Reserve, Mexico*

** IFRI researchers studying forest map, Honduras*

successful dimensions (personal communication, Lilian Márquez-Barrientos, September 10, 2010).

In Bolivia, the IFRI research center is actively engaging with policy processes. An IFRI study contributed to the establishment of the Yuracaré indigenous people's Community Territory of Origin, including official land titles. One of Ostrom's former students, an IFRI scholar, works as a senior advisor to the Morales government on land tenure issues (personal communication, Krister Andersson, September 16, 2010).

Interestingly, the recent international popularity of decentralization resonates with Ostrom's recognition that local communities can manage forests well, if appropriate conditions are present. National-level motivations for decentralization, however, may relate to cost-cutting pressures, or other incentives than a commitment to local-level forest management. Research on forest decentralization in Guatemala has shown that, devolution of authority and autonomy in forest management decisions provided incentives to mayors to invest in forestry. In Bolivia, by contrast, the national government devolved less authority and allowed less autonomy than in Guatemala. As a result, Bolivian mayors showed less interest in forestry than their Guatemalan counterparts who had more freedom in decision-making, as well as greater potential for gain.

Potential for Future Influence

Ostrom's work has the potential to make even greater contributions to forest management and conservation in Latin America. Convincing policy-makers to pay attention to her findings, and to design appropriate policies, remains a challenge. Risks exist if community-level forest management, or adherence to design principles, becomes construed as guarantees of successful outcomes. In some cases, well-designed institutions may fail due to rapid changes or external shocks. Some communities may not be in a position to govern forests well, as, when they lack experience or confront legal obstacles. As Ostrom cautions, there are no panaceas. Diverse institutional arrangements, and multiple approaches to forest governance, are likely to provide greater resilience than a single model. Currently, Ostrom's research aims to understand the factors that support sustainable social and ecological systems. As this work builds on Ostrom's past findings, it promises further insights for the complex challenges of forest conservation in Latin America.

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Ostrom and Namibian conservancies

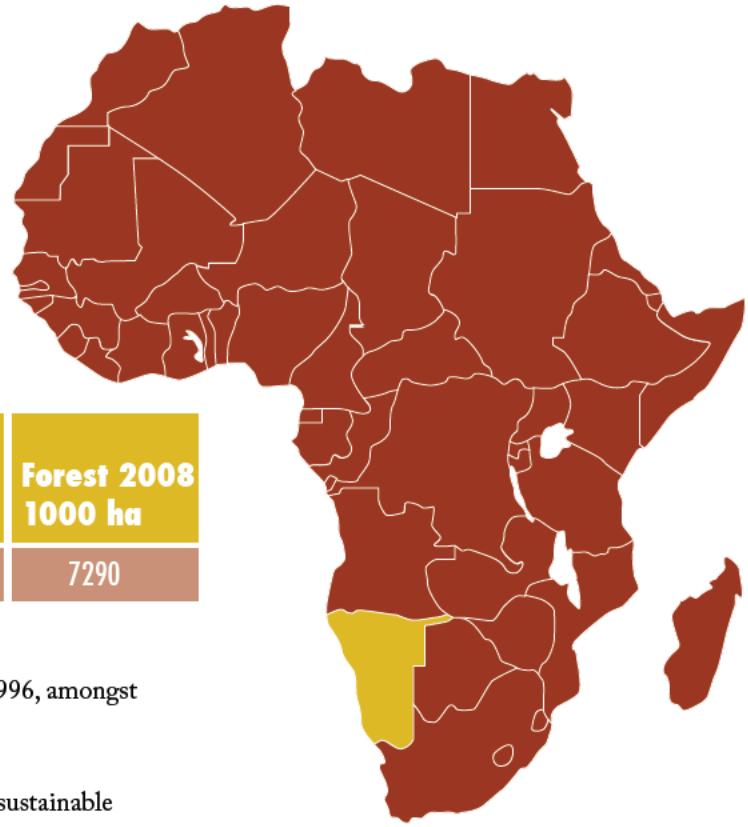
Penal Sauce

Wildlife outside protected areas are managed sustainably by Community-based managment conservancies, an intiative that was largely developed on Ostrom's theory. They represent a radical experiment that is continually evolving, as Brian Jones describes with examples.

Community-based Natural Resource Management (CBNRM) has been adopted in Namibia as a means to manage wildlife sustainably on communal land outside protected areas. Its proponents argue that CBNRM can be used as a means to promote rural development through the income and other benefits derived from wildlife utilisation and tourism. The Namibian CBNRM programme is built on the successes seen on freehold land in Zimbabwe, Namibia and South Africa where the state devolved strong proprietorial rights over wildlife to white farmers. The results were increases in wildlife numbers, the development of significant wildlife and tourism industries on freehold land and an expansion of the land area under some form of conservation. In trying to develop similar approaches on communal land after Namibia's independence from South Africa in 1990, Namibian policy planners were faced with important legal and institutional issues: How to identify communities of collective interest in which individuals would collaborate to manage wildlife and how to develop institutions for collective management. Policy planners sought the answer through "the concept of a common property regime, that is a regime in which a defined group, collectively manages and exploits a common property resource within a defined jurisdiction". However, there was a further complication on communal land as it is vested in the State, not the communities who use and live on the land. So there was a need to address the issue of how tenurially strong units of proprietorship could be created on communal lands under State tenure. The approach taken by policy planners in the Ministry of Wildlife, Conservation and Tourism (MWCT) was to embark on a strategic process of policy and legislative change providing devolution of authority over wildlife to localised units of jurisdiction.

Namibian conservancies and Ostrom's common property design principles

In designing the new policy and legislation Namibian government officials drew in particular on the work of Elinor Ostrom. Using these principles as guidelines the policy planners developed policy and legislation that made provision for wildlife and tourism rights to be devolved by the State to common property institutions called "conservancies". In terms of the



Kalyani Ganapathy

Country	Human density 2008 Population/ km sq	Forest 2008 1000 ha
Namibia	3	7290

Source: FAO 2010

Nature Conservation Amendment Act of 1996, amongst other conditions, a conservancy must have:

* A representative committee;
* A legal constitution which provides for the sustainable management and utilisation of game in the conservancy;
* A method for the equitable distribution of income from the sustainable use of wildlife and from tourism;
* A defined membership;
* Defined boundaries agreed by neighbouring communities.

In terms of Ostrom's design principles, the State confers legitimacy on the CPR institution through the legislation, communities define themselves and the jurisdictional boundaries in agreement with neighbours, and the likelihood of rules relating to appropriation and provision being congruent to local conditions is high because decision-making is taken by local residents or their representatives not by distant officials. Conservancies provide opportunities for individuals affected by the operational rules to make or change the rules through participation in decision-making processes and conservancy meetings. They have appointed their own resource monitors (community game guards) who are accountable to the membership through the conservancy committee. The conservancy approach is flexible enough to allow for nested layers of decision-making, authority and resource use to develop over time. In this regard, some conservancies are creating more localized sub-units which provide for more regular face-to-face interaction of residents and improved governance. In others conservancies have "scaled up" and cooperate with neighbouring protected areas and community forest institutions to manage resources over a larger landscape.

Conservancies as functioning CPR institutions?

In many respects conservancies are different to other CPR institutions analysed by Ostrom and other scholars. In these cases resource users themselves realised the need to develop collective management approaches because of the nature or the scarcity of the resource. Conservancy members did not come together to establish institutions for managing a resource they directly depend upon such as alpine grazing lands or water. Although people used wildlife in the past it was not crucial to the livelihoods of most communal area residents. Through conservancies communal area residents respond to government legislation which enables them to gain new rights over a common resource. The conservancy manages this resource and the income derived from its use. Some uses of this income are for social projects such as support to local schools, which do not directly benefit all conservancy members. Known poachers are not necessarily excluded from benefit from social projects or cash payments to members when these are made. These circumstances provide the opportunity for "free riding". Conservancies generally represent a community of residents rather than a group of resource users.

In addition the conservancy approach has fit uneasily with institutional arrangements for livestock management in many

parts of Namibia where arid and semi-arid conditions require mobility for successful tracking of rainfall and grazing. While in conservancies there is an emphasis on creating rules and institutions for wildlife management based on closing jurisdictional boundaries, local grazing management in many areas is based on fuzzy boundaries, mobility and negotiated rights of access rather than access determined by rules.

Yet despite these anomalies and incongruences with CPR theory, conservancies appear to be successful in some respects. The number of conservancies in Namibia has grown from four in 1998 to 59, covering 132,697 km^2 of communal land and embracing more than 230 000 people. Around 25 more communities are establishing conservancies. Total direct payments from wildlife and tourism to conservancies from wildlife use and tourism amounted to N$25 919 349 (US$3 455 913). Wildlife is increasing in most conservancies in Kunene and Caprivi regions. Government is sufficiently confident in the level of management and the lack of poaching in conservancies to translocate wildlife (including the endangered black rhino) from protected areas to conservancies.

Based on the "Ostrom design principles" and other contributions to CPR theory, communal area conservancies in Namibia represent a considerable experiment in trying to create opportunities through legislation for communal area residents to establish effective common property resource management institutions and regimes. As indicated above, conservancy implementation does not always conform to the theory, but is working and evolving after its own fashion. More research is required to explore some of the anomalies and inconsistencies with theory, asses the extent to which successful common property resource management is taking place, and to identify broader lessons that can be learned.

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Elinor Ostrom answers

Elinor Ostrom's work on the study of common pool resources has contributed significantly to our understanding of how groups of people organize to successfully and sustainably manage the ecosystem resources on which they are critically dependent. For her ground breaking work on the governance of the commons, she has received a number of awards and international recognition, the most recent of these being the 2009 Nobel Memorial Prize in Economic Sciences. Based on an exhaustive analysis of diverse institutional arrangements developed by communities across the world to manage a range of common pool resources including forests, fisheries, irrigation systems and pastures, her work identified a set of eight "design principles" that determine the likelihood of successful, stable local institutional arrangements to manage common natural resources. Yet, her research also cautions against the simplistic incorporation of these principles into blueprint solutions to fit all global and local problems of ecosystem destruction. Instead, she emphasizes the need to treat human impacted ecosystems as complex social-ecological systems, where it is equally important to get the institutional and ecological aspects right. Ostrom's insights on the approaches most suited for effective management of forests, savannas, grazing lands and fisheries have had a major impact on research, practice and policy related to the collective management of natural resources by communities. Her vision of an adaptive, polycentric governance approach with multiple tiers of decision making that involve international agencies, governments and local communities in resource management issues provides us with critical insights on how to approach the overarching global problem of resource degradation and climate change in a cooperative and collaborative manner.

Looking back at the application of your ideas to conservation practice in contexts across the world – do you feel the challenges your research points to have been sufficiently addressed? Are there any success stories that you are particularly happy with? And what major gaps do you perceive?

Since the research that many colleagues have engaged in related to common-pool resources and common property regimes was looked upon by many scholars and public officials, as being a little unusual and out of the mainstream, I do not think our work has received as much attention as it could. Now with the recent recognition by the Nobel award, there is much more attention being paid to it. I think this may be very healthy. However, there is the fear that people grab hold of simple ideas, rather than the nested complex ideas of our findings. Thank goodness, ecologists long ago recognized there was no ideal ecology, and that different ecological systems were composed of a variety of living things located in an environment related to soil type, elevation, rainfall patterns, etc., that affect that pattern over time. Obviously, when humans start to interact, patterns established over long times are disrupted. We understand the capacity of humans to disrupt. What we need is further understanding of, when and how, groups of individuals and their governments can enhance ecological systems, rather than destroy. Given the variety in the ecological system, we must assume that a variety of arrangements for governance and management is also essential, rather than one ideal form that is proposed to work everywhere.

Ruth Meinzen-Dick, who heads the CGIAR Network on Collective Action and Property Rights (CAPRi), has been one colleague, who is active in both the world of policy and the world of academia. A considerable amount of work of this network is highly consistent with our research and is outstanding.

Your research points to the dangers of "blueprint thinking", and under- lines that there are no panaceas for forest management that can be applied across all contexts. Yet, governments and large NGOs continue to search for simple design principles that they can apply to conservation and forest management across

multiple locations. Given the hundreds of thousands of forests and communities and social-ecological-institutional contexts in the world, how would you suggest that large organizations such as national and state governments and intern- ational NGOs deal with this challenge of balancing complexity against confusion?

Addressing complexity, in a way that we can eventually harness complexity in the field, is the biggest challenge that academics and policy-makers jointly face. We need to be thinking more like architects or doctors. A good architect tries to determine the needs that a client indicates are very important in a particular environment. So knowledge of the underlying structure for where a building will occur is essential, or the building will collapse soon after construction. An architect also tries to determine whether having a building with multiple floors is better for the users, given their site, than having a building that is spread out, and uses up all the green area. There are a large number of questions that architects are trained to ask about the users and the condition of the site, before they start designing any new building. Yes, they can sometimes use some aspects of an earlier design a second time, but no architect gains a good reputation, if all they do is redraw on the same old design, time after time after time. That seems to be what policymakers and NGOs are calling for, when it comes to the delicate task of designing institutions.

Do you think that there is a need for a fresh look at the relative role and influence of government protected areas vis-à-vis local institutions for forest management? If so, what would your main suggestions be?

Yes, I think there is a very substantial need for rethinking. The initial thought was that you cleared all the people out of a protected area, and then it would be "protected." There are multiple problems with this. One, you shift people who have protected an area for a very long time, out of it. They have to resettle at great cost, and frequently, there are substantial problems of unemployment, starvation, and human suffering. The problem is not clearing everybody out, but rather finding ways of having complementary activities inside a protected area that helps protect it, so that both the humans and the ecological area can sustain themselves over the long run. In our extensive research on forests, we find that protected areas, compared to all other kinds of forests, do not show any evidence of greater forest intensity. We also find that when users monitor the conditions of a forest—regardless of the formal property rights and ownership—the forest shows signs of sustainability, if not regeneration, over time.

Thus, we need to rethink how protected areas can involve indigenous people living in or nearby. The planning efforts should involve them in activities that give them income and do not just push them aside, while simultaneously enhancing the protected area.

Based on your experiences with forest communities across the world – what do you see as the major challenges for communities to sustain collective action, cooperation and trust, both in the short term and over longer durations?

The major challenge in all groups of humans attempting to do common activities—including work teams in large private corporations—is to develop ways of meeting regularly, without making the transaction costs of such meetings unbearable. They need to get plans of action that are do-able. If relatively simple plans can be developed at the beginning of a process, then over time, people learn how to work together and what their relative skills are, and how to develop even better plans for the long run. People learn to trust one another when they all agree to undertake X activities, and they find that the others are keeping to that promise.

The biggest challenge that many communities face, is that they were evicted from local resources multiple years ago, and they find that public officials are not trustworthy, take bribes easily and do not know one another very well. Once corruption starts to become an everyday occurrence, people begin to assume that the way of getting anything accomplished is to pay for it, rather than organize a group and try to tackle that on their own. Building trust, after an era in which substantial mistrust has grown, is a very difficult problem. The challenge has to be recognized. Naively, some governments and NGOs call for participatory meetings of 1-2 hours, which do not really accomplish much, except enable an agency to mark off that a meeting was held.

Conserving diversity: biological and institutional

** Using street theatre to form a sense of community in an urban context*

Most people love nature, and marvel at its incredible diversity. Even an ecosystem patch as small as a tiny pond can contain hundreds of different kinds of species, with complex life systems working at multiple levels, that have evolved over millennia. We admire this complexity, are amazed by it, and deeply appreciate the need to save it. Witness for instance the ongoing discussion in the Indian media about the crisis of the fast disappearing tiger, India's flagship conservation species, and the depleting diversity of the dry tropical forest habitats where it has a large home range.

It is quite surprising to observe the almost total lack of similar awareness of the incredible institutional diversity that exists across the world, and the deep connections between this kind of institutional diversity, and the conservation of biological diversity. From Africa to Alaska and India to Iceland, traditional tribes and local communities have developed complex, multi-level, astonishingly detailed and varied systems of rules and norms that have enabled them to conserve and sustainably use the natural resources with which their lives are so intricately interwoven. Some of these institutions have a documented existence of time scales spanning several centuries. From forest-specific rules that include a ban on the killing of specific species during the breeding season, to complex multi- level irrigation systems that specify when downstream and upstream farmer groups engage in maintenance activities, to spatially and temporally varying

guidelines for pastoral grazing communities that move across hundreds of kilometers and many ecological regimes, these communities have developed innovative, complex and constantly adapting approaches to deal with the varying challenges that they face while nested in a certain ecology.

For those who have interacted with local communities governing ecological commons in any part of the world, it is easy to see that the "natural" environment in these contexts in fact exists as an interconnected social-ecological system. Social and institutional rules are modified in response to ecological condition, while at the same time acting as a major force shaping ecosystem change. Yet, many policy makers, governments and administrators, conservation agencies, and even the average city dweller, tend to be unaware of the vast history, heritage, learning—and potential—of community institutions. Thus, most discussions around wildlife conservation tend to center around the assertion that effective conservation is simply a matter of keeping the people out, and allowing nature to take care of itself. Again, the discussions in the Indian media about the ways in which to save the tiger point to a good example of this, where relocation of villages, and enforcement of conservation with guns and guards is automatically assumed to be the most effective way of achieving tiger conservation, and lack of finances the major stumbling block.

Elinor Ostrom's pioneering work has done much to change this situation, but there is still a long way to go. As the articles in this special issue indicate, her research has made a substantial case for governments to involve local communities in conservation, by providing a substantial body of evidence that affirms the capacity of local communities to sustainably manage natural resources. In Latin America, Asia and Africa, governments have initiated policies of decentralization that attempt to return some degree of control over forests and other local resources to communities. Yet, Ostrom's reasoning is far from prescriptive or naïve—she clearly warns of the dangers inherent in rapid decentralization without effective controls, and lays out a clear set of principles that indicate conditions under which communities are likely to be successful managers of common resources. She cautions that a large part of the reasons why communities are successful is that they have the freedom to craft diverse rules that apply to their local context, and to modify these rules based on their real life learnings, and in response to changes in the condition of the natural resource over time. Unfortunately, many governmental, regional and international policies—even those aimed at engaging with local communities—fail because they tend to be prescriptive, assuming that one approach to conservation, with a few simple rules (such as the need to raise money for more guns and more guards) will always work. She also argues eloquently for the need for polycentric institutions—those with multiple levels of administration and decision making, national and local, government and community—working in synergy for better management at all appropriate scales. Thus her work does not pit community against state, but asks for better and closer engagements between these two sets of actors, with greater trust, and opportunities for participation at an equal footing.

Since the award of the Nobel Prize, broader awareness of her influential ideas has increased, and this is a good sign for the future of the world, and its indigenous peoples. Elinor Ostrom's indefatigable energy has taken her across the globe several times over, traveling to meet with policy makers, governments and think tanks and explain to them the main message of her work, without losing out on the essential details of complexity, adaptiveness and change. It is a hard task, but one made more accessible by the energy and spirit with which she delivers her message. It is also a goal made more feasible by the rich body of resources she has developed over decades in the form of colleagues, networks, postdocs and students, who now engage with similar issues across the world, expanding on these ideas in a range of local contexts. This special section brings to you a glimpse of the work—theoretical and applied—inspired by Ostrom's principles of the commons—in different parts of the world.

The challenge for our future is to apply these principles for effective management in a world impacted by urbanization, climate change and deforestation, where the scale and intensity of environmental and ecological problems are changing before our very eyes. Treating people as part of the solution, rather than just part of the problem, will have to constitute the way forward. The area of work initiated by Elinor Ostrom and her network of colleagues will provide a critical component in searching for new solutions to the emerging crisis.

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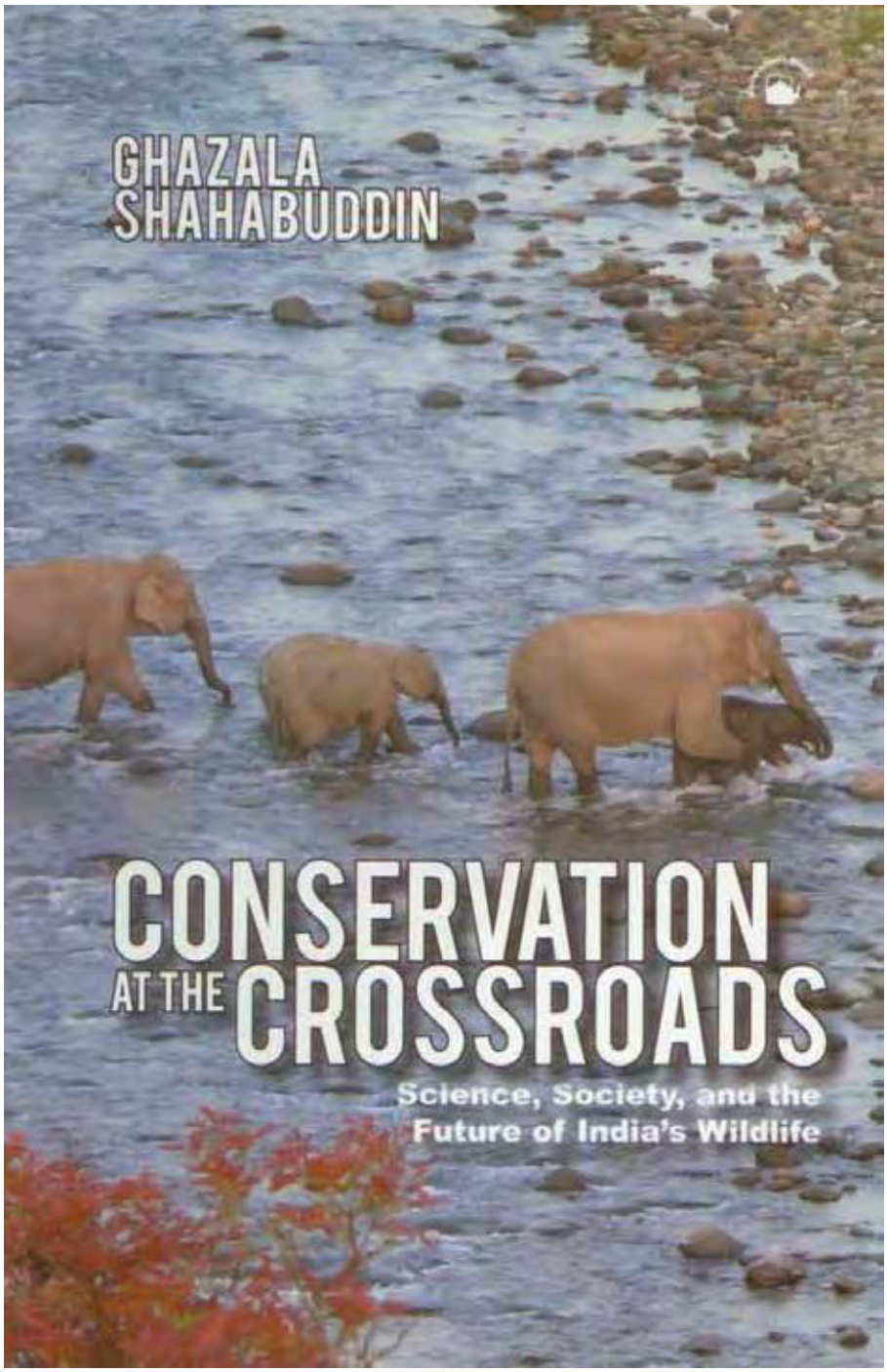
Conservation in today's India



India is rich heritage of biologically diverse habitats and species is at risk. Over exploitation of our ecosystems has led to deteriorating ecological services with many species sliding towards decline and extinction. India's race towards modernity and economic development against a backdrop of crippling population pressures and widespread poverty has significantly influenced the rapid loss of species and ecosystems. This well-timed book critically analyses prevailing conservation paradigms to determine what went wrong, why, and what it will take to tackle chronic implementation flaws and achieve conservation in India. In the first chapter, the author uses the case of the Sariska Tiger Reserve to trace the socio-economic and political processes that led to its status as an 'exclusive' preserve in the early twentieth century to its recent demise as a prime tiger reserve. The author analyses in excruciating detail, the micro-level processes defining inefficient PA management following the disappearance of the tiger from Sariska. Rigorous data and logical inference is used to show how the misplaced emphasis on local forest dependency ignored the complex historical legacy of commercial forest use. The rush to create 'people-free' zones within the reserve was thus not only poorly conceived but shoddy implementation of the relocation process seems to have achieved little for conservation.

In the subsequent chapters, the author elaborates on why these very same issues-village displacement, natural resource use and PA management have largely failed to stall the spiralling loss of biodiversity in the country. The second chapter outlines how ineffectual

wildlife and natural resource policies have resulted in faulty planning processes and inadequate relocation packages that have doomed several village displacement programs to failure. Focusing entirely on monetary compensation and land allotment, these programs have largely ignored important issues such as skill development, social adjustment and establishment of relevant infrastructure.

Reconciling human demands on India's diminishing wild areas with the protection of wild species is a pressing need. Yet, there is an unfortunate lack of relevant, multi-disciplinary research that can inform management effectively. The third chapter dissects this problem by outlining how regulatory guidelines and policy instruments pose severe restrictions on obtaining research permits and discourage potentially beneficial foreign collaborations. Given the low technical capacity of the Indian Forest Department, open exchange between managers and scientists seems to be hugely relevant, yet a yawning gap exists.

The earlier part of the book focuses on how the exclusionary nature of India's wildlife policies together with poor governance and implementation and lack of rigorous science have largely led to conservation failures. The latter part examines potential alternatives for existing approaches focusing on effectiveness of community based conservation, India's Joint Forest Management experience and the legacy of the India Eco Development project. The author systematically analyzes the many factors that impact the effectiveness of community-based conservation—from scientific difficulties associated with establishing sustainable extraction limits to conditions beyond tenurial security such as accessibility to markets, social capital, governance, population growth that are equally relevant. While community-based conservation has undoubtedly played a role in preserving and often regenerating native biodiversity in India, it is useful to understand that habitats under some form of extraction, even subsistence-level use may not harbour the full range of species that are found in completely protected areas.

The case study of Mendha (Lekha) reveals the complex intertwining of issues that influence community-managed forests in India. Joint Forest Management represents one of India's largest exercises in the decentralization of natural forest management. In chapter 6, the author traces the historical origins of the concept, implementation challenges and the resulting patchwork of successes and failures. Clear, useful and detailed guidelines are outlined on how JFM could achieve ecological, institutional and financial sustainability. In a similar vein, Chapter 7 outlines the conceptual framework underlying the India Eco Development Project with detailed analyses of operating principles, implementation failures, issues such as lack of ownership and weak PA management influencing outcomes and ultimately, the lack of real impacts on livelihoods or conservation objectives.

The final chapter is based on an optimistic premise that it is realistically possible to reconcile diverse ideologies to achieve conservation, to transform failures and to utilize lessons from implementation failures towards more effective approaches that benefit people and wildlife. The author underscores the need to embrace a mosaic of approaches based on equity principles that include strictly protected areas and community-managed areas, highlighting the potential of appropriate models of non-consumptive uses such as ecotourism to benefit both wildlife and communities.

Suggested solutions to the crisis relate to fundamental yet tangible issues such as improved buffer zone management through timely compensation in human-wildlife conflict situations, the juxtaposition of community based approaches with strict nature protection, controlled access to forest resources via a licensing system and site-based solutions. The author reminds us that India's rich history of people's participation in environmental movements and informed civil society movement will lie at the core of the much-needed radical shift in current conservation paradigms.

Years of rigorous field work and thorough research make this book invaluable to anyone interested in learning how to make conservation work in a country as challenging as India. More stringent editing of some chapters and cutting back on details in others would have enhanced readability. Most notably, the author's deep passion for India's wilderness and peoples comes through in every chapter of this instructive book.

Science, society and the future of India's wildlife: Ghazala Shahabuddin. 244 Pages. Permanent Black

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Rice fields: friend or foe for waterfowl?

** Hari Sridhar*

While a large body of science has shown that agricultural landscapes harbour less iodiversity one study implies otherwise

The spread of agriculture is known to be an important driver of biodiversity loss, but can the opposite also be true? Can agriculture aid wild species? A recent study by Gregorio Toral & Jordi Figuerola published in the journal Biodiversity and Conservation is a case in point.

The marshes of southwestern Spain are an important wintering site for European waterbirds using the east Atlantic flyway. Over the last century however, many of these marshes have been converted into fields of rice. Toral and Figuerola decided to investigate how this conversion of natural habitats to crop fields affected waterbird populations. They examined the trends in populations of species over a 23-year period (1980-2003) and related it to the species' willingness to use rice fields. They found that species which did not mind using rice fields, increased in numbers over the study period, whereas those that minded did not do very well. Therefore, at least for some species, the creation of rice fields had actually been beneficial .The authors speculate that these are likely to be, either species whose natural habitats are structurally similar to rice fields, or those which are generally not fussy about the habitats they choose to live in. Rice fields provide these species with alternate habitats, when suitable natural areas are not available.

These findings have implications for agricultural policy in the European union because they suggest properly managed rice fields could be a win-win situation for both biodiversity and agriculture. More importantly, they highlight the fact that agriculture is not always inimical to wild fauna.

Toral, G.M. & Figuerola, J. 2010. Unraveling the importance of rice fields for waterbird populations in Europe. Biodiversity & Conservation 19:3459-3469

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Where the wild things are – Culture & Conservation

**Ema Fatima*

Cultural perceptions of wildlands affect preservation and use of these regions

Cedric O'Driscoll Worman defines 'wilderness' as the landscape on the other side of the Great Divide that separates Human from Nature. He explore the idea that different cultures have different wilderness archetypes (a habitat that represents the ultimate or ideal wilderness to a culture) due to different external and internal forces, which may result in differing landscape use patterns and differing conservation priorities, concerns, and opportunities.

Worman studied three different cultures: Irish, German and Korean, incorporating fairytales and names of protected areas from them. A large unrecognized, influence cultural details have on land use patterns. When a wilderness archetype is present in a culture, the attitudes towards the wilderness are likely to have the effect of keeping the wilderness undeveloped and outside the cultural sphere. While a wilderness archetype may protect a habitat or landscape, development is then concentrated in non-archetypical wilderness areas. In addition, the reluctance to develop an archetypical wilderness results in less fragmentation.

Kalyani Ganapathy

Topographically-defined wilderness archetypes (e.g., mountains) are likely more resistant to development than the more easily obliterated land cover-defined wilderness archetypes (e.g., forests), which should lead to divergent landscape patterns. However, a mountain can be topographical wilderness archetype but when mountains themselves may be a culture's home terrain; in these cases, a wilderness archetype might develop in which the valleys or lowlands were the archetypical wilderness.

Incorporating local cultures can be an effective way of engaging communities in conservation programs through the celebration of positive cultural attitudes towards wildlife and the use of traditional methods of conflict resolution. Unfortunately, increasing population pressure and globalization are likely to speed cultural change and eventually break down traditional cultural and psychological barriers to development in archetypical wildernesses. These shifts could result in increasing development of previously avoided wilderness areas, necessitating a re-evaluation of conservation priorities. Thus, wilderness archetypes are important to conservation not only because of their influence on past and current land use patterns and their worth in promoting conservation, but also because of their potential for change.

Worman C.D., 2010. Trooping fairies, trolls, and talking tigers: the influence of traditional wilderness archetypes on current land use patterns. Biodiversity Conservation (19): 3171–3193.

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Hunting for power

** Sandhya Sekar*

Kalyani Ganapathy

How hunting practices were a reflection of colonialism in British India

The ecologically diverse Kashmir valley, inhabited by exotic species like the snow leopard, markhor, ibex, blue sheep and musk deer, became a sporting ground for big game hunters in British India. Organized hunting or 'shikar', consisting of one British officer and a group of Indians– a skilled hunter, a cook and porters, regularly set off from Srinagar. Shikar had also existed among indigenous rulers of colonial India; tiger and lion hunting were considered a symbol of kingship. In the context of the British Raj, shikar assumed a different configuration of power - the domination of western cultures over 'natives', a way for English gentlemen to establish their masculinity and societal status, and at a different level, the victory of European culture over nature.

As hunting as a sport became more popular, there was rampant hunting of ungulates all over the Kashmir valley, almost wiping out the markhor. This triggered the formation of the Kashmir Game Preservation Department to formulate laws for fair hunting practices. The author Shafaqat Hussain views the hunting laws as a reflection of liberal political ideas of the enlightenment era - equality, justice and fairness - in all aspects of British social life. Firstly, sportsmen were only allowed to take the biggest head, since the biggest markhor were seen to occupy the difficult to access higher reaches. Experiencing hardship and risk in order to obtain the trophy was seen to be fair play. Secondly, driving the game was prohibited, because they did not give the prey a fair chance to escape. Thirdly, there was a restriction on the number of animals that could be shot.

The Forest Act that came in to regulate hunting proved effective and the game population did recover. But the protected species were no longer accessible to the indigenous populations due to steep licensing; also, the British criticized indigenous hunting practices, blaming them for wiping out the ungulates, without considering that the practice was mainly for subsistence, especially during the harsh winter. Thus colonial hunters' insistence on adherence to fair hunting codes and practices had a wider, unfair, impact on local society. Like other colonial cultural projects, hunting was fraught with internal inconsistencies and contradictions that could only be resolved through perpetuating and creating unfair, and hence unjust, social relations in the wider society.

Climate-smart solutions are the next paradigm shift

** Ema Fatima*

NASA/USGS

** Sundarbans, Bangladesh*

Climate-change is a reality, and conservation efforts must adapt to deal with it

In 2003, Parmeson and Yohe alarmed conservationists around the world, stating, with strong evidences, that climate change was already affecting ecosystems across the globe. But this change has turned out to be faster than originally expected. Lara Hansen and colleagues insist that conservation efforts must adapt to deal with this new reality, fully integrating the effects of climate change into all conservation projects.

They devised four basic tenets for climate-smart conservation design:
01. Identifying adequate and appropriate space, by considering the past, present and future effects of climate change. The underlying objective is to support processes, places and features that minimise/mitigate climate change.

02. Reduce non-climate stress (e.g., habitat degradation and destruction, overharvest, pollution, invasive species) by recaliberating acceptable or manageable levels. Since these stressors act synergistically with climate change.

03. Adopt adaptive management which runs on a cycle of implementation, monitoring, evaluation and adjustments, where implementation and testing must occur simultaneously

04. Reduce the rate and extent of climate change by invoking the precautionary principle and taking corrective action.

The above proposed guidelines were applied and their feasibility was studied on coral reefs in the Florida Keys; mangrove forests in Fiji, Tanzania, and Cameroon; sea-level rise and sea turtles in the Caribbean; tigers in the Sundarbans of India; and national planning in Madagascar. Through implementation of these tenets, conservation efforts can be made more robust in the face of climate change. Although these approaches require reconsidering some traditional approaches to conservation, this new paradigm is technologically, economically, and intellectually feasible.

Hansen L, Hoffman J, Drews C & Mielbrecht E. 2009. Designing climate-smart conservation: guidance and case studies. Conservation Biology 24(1): 63-69.

Tropical ectotherms under threat due to warming

** Sandhya Sekar*

Estimated changes in terrestrial metabolic rates in the tropics are equivalent to those in the northern latitudes

Biotic effects of global warming have been extensively documented in the high latitudes of the Northern Hemisphere, because of the rapid increase in temperatures here. To fill the gap on responses to warming in tropical biota, 3 scientists from the US have used temperature data with broad geographical coverage and empirical data about ectotherms to arrive at metabolic rates. Metabolic rate is used because it is a fundamental physiological index of an organism's energetic and material needs, its processing capacity and its ecological impact.

Temperature data for the period 1961 to 2009 was collected from 3186 weather stations, with over 500 million temperature measurements. Ever since 1980, temperatures rose fastest in the Arctic,

followed by north temperate zones and the tropics, but remained more or less unchanged in the south temperate zone. Surprisingly, absolute changes in metabolic rates (total energy used by an organism) increased most quickly in the tropics and north temperate zones and less in the Arctic. This is because tropical warming took place in an environment that was initially warm. Alternatively, trends in percent metabolic rate (effect of warming on individual organisms) closely match temperature changes, indicating individual ectotherms have been severely affected in the Arctic and north temperate zones.

Overall, the projected increases in median surface air temperature by the end of the twenty- first century for the two regions (3.5–4.0 °C in the tropics, and 4.0–5.5 °C in the north temperate zone) should cause roughly similar absolute increases in metabolic rates of tropical and north temperate organisms. Such increases will have physiological and ecological impacts: warmed tropical ectotherms will have increased need for food and increased vulnerability to starvation, reduced energy for reproduction, increased rates of evaporative water loss in dry environments and altered demographies. Furthermore, metabolic increases should alter food web dynamics, leading to elevated rates of herbivory and predation, as well as changes in the spread of insect-borne tropical diseases. Because the tropics are the centre of Earth's biodiversity and its chief engine of primary productivity, the relatively large effects of temperature change on the metabolism of tropical ectotherms may have profound local and global consequences.

Dillon ME, Wang G & Huey RB. 2010. Global metabolic impacts of recent climate warming. Nature 467: 704–706.

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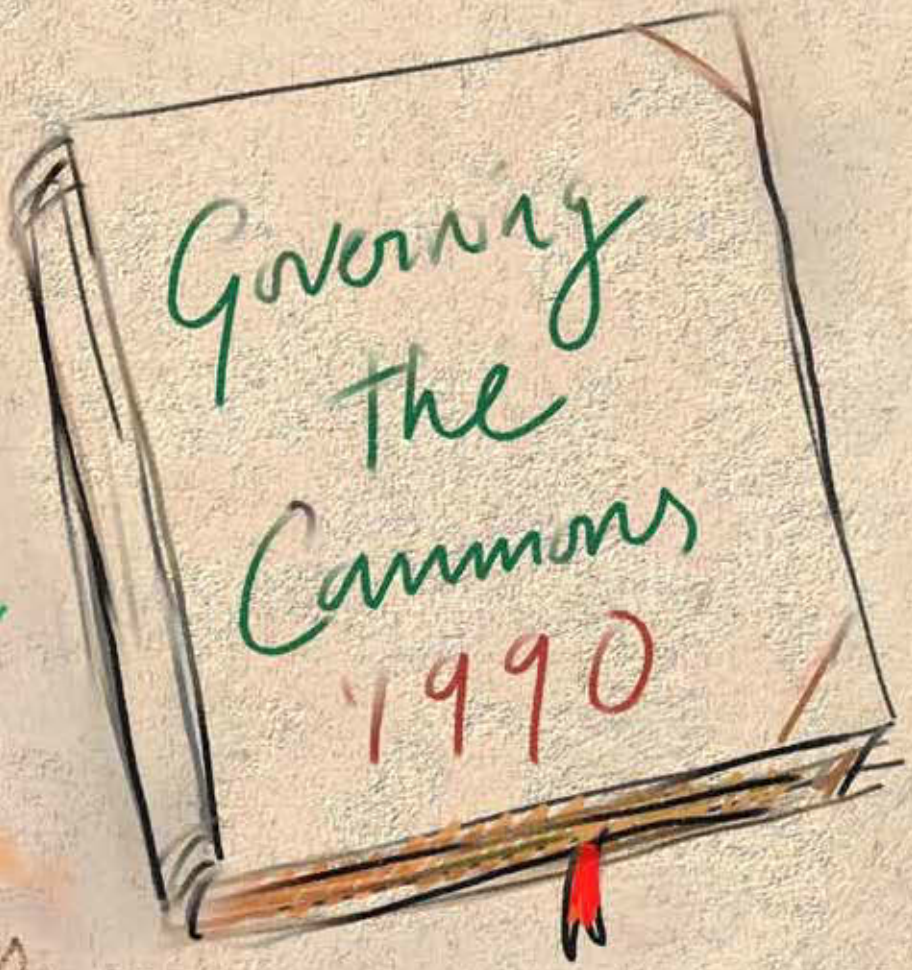
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