

Local monitoring and enforcement as critical drivers for sustainability of forests and protected areas

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A large number of variables may potentially determine the success or failure of forest and protected area management. Yet the success in finding critical drivers has remained elusive. A research network called International Forestry Resources and Institutions (IFRI) through its large-N studies is attempting to precisely resolve this issue. Although the larger question is not fully settled, local monitoring and enforcement has emerged as one of the most important determinants of sustainable governance of forests, wildlife sanctuaries, national parks and protected areas. Drawing on the recent work of IFRI research programme, this review provides justification for instituting local monitoring and enforcement systems in the field. This document is part of the ongoing series of technical notes to support connecting science to decision making aimed at bridging the science—management divide. The new research clearly shows that even when a number of other factors are taken into account, higher levels of local enforcement can result in improved regeneration and lower the possibility of habitat destruction across a variety of ecological, economic and social contexts. This understanding has immediate practical utility in the field. Also, because this review paper draws on the robust research available world-wide, it has applicability in a diversity of geographical contexts, including India. We are now at a juncture when enough science is available to persuade practitioners to craft robust systems of local monitoring and enforcement. Practitioners themselves have argued earlier that given the stakes and complexity involved, the crux of the sustainability of forests and protected areas is proper monitoring and adaptation. Accumulating scientific understanding should provide us a conclusive evidence for giving the desired thrust for *local monitoring* to generate context-specific knowledge, and *local enforcement* to link that knowledge to action in forests and protected areas in Rajasthan.

There have been numerous attempts by researchers and practitioners to identify factors that determine the sustainability of forests protected areas. Indeed, a large number of variables are suggested in literature that may potentially determine the success or failure of management approaches in forests¹⁻³ and protected areas^{4,5}. Yet the success in finding critical drivers has remained

elusive. There is now a great urgency to identify the institutional mechanisms that are most likely to succeed in management of multifunctional forests and protected areas in an era of growing anthropogenic stresses and climate change⁶.

The search for leading success factors is often hampered, because field-based data collection, using uniform methods across continents and countries (i.e. large-N studies) have been difficult to design and implement. While good science on its own is no guarantee for better implementation, production of knowledge from large-N studies is necessary to improve the policy and practice in the field. A research network called International Forestry Resources and Institutions (IFRI) is attempting to precisely resolve this issue. IFRI is a unique field-based research network that has accumulated sufficiently comparable data to support large-N analyses related to collective action in natural resource management⁷. Although inquiry about what facilitates the sustainable governance of forests and protected areas is not fully settled, the IFRI research programme has started yielding some of the most useful research relevant to practitioners of natural resource management in the field.

While a large number of different causal mechanisms including local monitoring and adaptations may potentially influence the management outcome⁸, the local enforcement is now emerging as one of the most important determinants of sustainable governance of forests and protected areas^{9,10}.

For example, researchers at IFRI⁹ earlier have demonstrated that fundamental necessity of just one factor—enforcement—is so critical for the better outcome of natural resource management that other factors (such as high level of social capital, presence of formal organization, and peoples' degree of dependence on forest products) seem either less important, or rather these factors may simply influence the outcome via their positive effect on monitoring and consequent improvement of interventions on the ground. This study showed that it is highly unlikely for forest condition to be good if there is no monitoring and rule enforcement regardless of whether social capital of stakeholders is high or

low. Likewise, better forest outcome is also associated with rule enforcement (i.e. adaptations based on the insights through local monitoring) regardless of the degree of formal organization of the stakeholders. And finally, better monitoring and local rule enforcement is also significantly associated with better forest condition, regardless of whether or not a group's dependence on the forests is light or heavy.

Another case in point is the Kumbhalgarh Wildlife Sanctuary in Rajasthan. Research suggests¹¹ that although anthropogenic factors influence land cover, they do so in complex and multidirectional ways that reflect uneven enforcement authority rather than solely reflecting the issues related to access, density, infrastructure, or economic activity.

Drawing on the recent work of IFRI research¹² this policy-brief provides justification for instituting local monitoring and enforcement systems in the field. Although their research concentrates on forests, many of the IFRI forest sample sites fall within wildlife sanctuaries, national parks and other protected areas. For instance, an earlier IFRI study⁵ reported that 76 of research sample forest sites were parks and protected areas, and 87 sample forests were non-parks. Thus, the findings of new IFRI research are broadly applicable in forests and protected areas.

The new research on importance of local enforcement

Advancing the research on local enforcement, the recent work by Chhatre and Agrawal (2008)¹² uses a sample of 152 cases from 9 countries, including India, to study the relationship of enforcement with changes in the condition of forests. The analysis examines local enforcement in conjunction with four other factors that are supposed to be central to the sustainable governance of forests: size of forests, collective action around forests, user group size, and dependence on forests. The analysis by Chhatre and Agrawal (2008) also explores how local enforcement moderates the impact of these four factors.

This research shows that forests with a higher probability of regeneration are likely to be small to medium in size with low levels of subsistence dependence, low commercial value, high levels of local enforcement, and strong collective action for improving the quality of the forest. Larger forests in the sample with high subsistence dependence, low enforcement, and high commercial value have a higher probability of having degraded. While the influence of individual factors—group size, patch size, collective action, subsistence dependence, and commercial value—is as predicted, Chhatre and Agrawal (2008) demonstrate the significant role played by the level of enforcement in moderating the influence of these factors on changes in the condition of forests.

In terms of local enforcement, collective action, and changes in forest condition, Chhatre and Agrawal (2008) find that probability of degradation of a forest declines with increases in the level of local enforcement, and, as expected, the probability of regeneration increases with levels of enforcement. Controlling for other factors, forests with high levels of enforcement are far more likely to have regenerated compared to those with no enforcement even for large sized forests. Forests where local communities have undertaken collective action related to improvement activities (planting of saplings and weeding and hoeing) are more likely to have regenerated. But more importantly, as Chhatre and Agrawal (2008) show, “such forests respond better to increasing levels of enforcement, so that a forest with improvement activities has a more than 50% probability of regeneration at a medium level of enforcement, compared to a 25% probability for regeneration for forests without any improvement activities but the same level of enforcement”. Likewise, change in level of enforcement has a similar effect on the relationship between change in forest condition and improvement activities, i.e. higher the levels of enforcement more the probability of forest regeneration and lesser the probability of degradation.

In terms of local enforcement, forest use/dependence, and changes in forest condition, Chhatre and Agrawal (2008) demonstrate that the number of people

using a forest for subsistence has almost no relationship with the probability of degradation. Instead, they find that the probability of degradation increases—and probability of regeneration decreases—with increasing proportion of firewood needs supplied from a forest. But, this relationship changes when enforcement comes into picture: “Forests that supply higher levels of firewood and also have high levels of enforcement have a more than 60% probability of regeneration, compared to less than 20% for forests with similar firewood dependence but no local enforcement”.

This crucial work by Chhatre and Agrawal (2008) is of exceptional importance in the domain of sustainability science. It not only examines the importance of enforcement in combination with a large number of other causal factors, it also draws on field data on local forestry initiatives from multiple countries (United States, Mexico, Guatemala, Bolivia, Kenya, Uganda, Tanzania, Nepal and India). To our knowledge this is the most comprehensive and significant scientific research that provides insights on collective action with practical implications for sustainability of forests and protected areas.

Linking knowledge to action in the field

Tropical forests are vital for social, economic, and ecological reasons. Connecting science to decision making is fundamental to sustainability of forests, and livelihoods of people dependent on these ecosystems^{13,14}. As we discussed in this policy-brief, research by Chhatre and Agrawal (2008) clearly shows that even when a number of other factors are taken into account, higher levels of local enforcement can result in improved regeneration and reduced possibility of forest degradation across a variety of ecological, economic and social contexts. This understanding has immediate practical utility in the field (see table 1).

Table 1: Experiential knowledge on factors that make forest and protected area management successful and their relationship with local enforcement

No.	Key factors that determine success (practitioners' perspective)	How key success factors relate to local enforcement?
1.	Institutions (I)	Locally evolved institutional arrangements (norms, rules and regulations which are locally made and enforced) are major factors that contribute to good management. Good leadership and layered institutions are capable of local rule making, local monitoring and local enforcement.
2.	Interactions (I)	Social capital, social networks, peer-to-peer learning and local interactions of stakeholders (and, how the decision taken in these interactions are followed / ways in which promises are kept or broken) contribute to design and implement an effective mechanism for local monitoring and local enforcement.
3.	Monitoring and adaptation (MA)	Local monitoring is a powerful tool for management of ignorance among stakeholders and managers. Participatory monitoring helps generate locally-relevant data, information and knowledge, and adaptive actions by stakeholders ensure the use of knowledge for solid actions on the ground. These adaptive actions directly contribute to enforcement.
4.	Local rule making and local enforcement (LE)	As opposed to exogenous rule making and enforcement by external agencies, local rule making and local enforcement is the key driver for success. Key indicators of existence of local enforcement are continuous learning about the social—ecological systems, rule compliance, patrolling, guarding against unauthorized use, patrolling, fines and sanctions in dealing with offenders.
5.	Livelihoods improvement (LI)	Livelihoods improvement is possible through four ways—employment, village development, sharing of goods, and sharing of service payments. Payments for environmental services (ecotourism, watershed protection, carbon sequestration, biodiversity conservation) provide new avenue for livelihoods improvement. All these contributions are realized when managers design and implement effective local monitoring and enforcement on the ground.
6.	Generating and linking knowledge to action (KA)	Linking knowledge to action (read <i>enforcement</i>) is necessary so that the creative ideas result in solid innovations. Different components such as availability of resources to link knowledge to action, easy access to knowledge, a habit of evidence-based decision making, co-production and co-synthesis of problem-based knowledge, integration of knowledge systems etc. are possible only if there is a mechanism for local monitoring and local enforcement.
<p>In summary, the factors that are assumed to be critical for the success and sustainability of forests and protected areas (i.e., I-I-MA-LE-LI-KA framework) are likely to work well only when we have effective local monitoring and local enforcement. The idea that <i>local enforcement</i> is critical for sustainability of forests and protected areas figures in the list of practitioners, and has now assumed the fundamental importance in the light of IFRI's new research.</p>		

The most important implications for practice are that in order to ensure the sustainability of forests and protected areas through community-based management systems or otherwise, we must design and implement local enforcement mechanisms in the field. In the context of eco-development around protected areas, for example, eco-development committees that have a local rule-making, local monitoring and local enforcement are more likely to succeed in their efforts directed towards better conservation outcome and improved livelihoods.

While community-based management is not the only approach to successful forest and protected area management^{15,16}, evidence is now mounting that local monitoring and enforcement by community-based institutions can potentially halt and reverse trends in forest fragmentation and deforestation¹⁷. As Ostrom and Nagendra 2006¹⁸ note, “when the users themselves have a role in making local rules, or at least consider the rules to be legitimate, they are frequently willing to engage themselves in monitoring and sanctioning of uses considered illegal, even of public property. When users are genuinely engaged in decisions regarding rules that affect their use, the likelihood of users following the rules and monitoring others is much greater than when an authority simply imposes rules on users”.

Conservation science of tomorrow will be a bouquet of tools drawn across disciplines from the natural and social sciences, and local and formal knowledge systems. The well-being of human society is closely related to that of natural ecosystems. Ecological, economic, social, spiritual, ethical, and aesthetic perspectives all have a role to play in bringing conservation science into the hearts and minds of people. In this respect, local monitoring and enforcement facilitates a careful use of cultural resources such as local knowledge, and thus provides options to design innovative policies and programmes for biodiversity conservation in Rajasthan¹⁹.

When management is initiated and owned locally, communities have demonstrated their capacity for putting effective and adaptive forest

management practices in place to address future forest governance and livelihoods challenges^{20,21}. Effective implementation of community-based forest and protected area management also offers potentially significant livelihoods outcomes. For example, a recent study²² estimated that for the area presently under JFM alone in India, total forest income from commercial timber, bamboo and non-timber products on improved forests could rise from an estimated US\$222 million in 2004 to approximately US\$2 billion per annum in 2020. These potentials of biodiversity conservation and livelihoods improvement could only be realized if effective systems of forest and protected area governance in India are implemented^{23,24}.

The foregoing review suggests that we are now at a juncture when enough scientific evidence is available to persuade practitioners to craft robust systems of monitoring and enforcement in community-based forest management systems. Practitioners themselves have argued earlier that given the stakes and complexity involved, the crux of the sustainability of forests and protected areas is the proper monitoring and adaptation^{25,26}. Likewise, voices of advocacy on the debate on tiger conservation have opined that poaching laws are useless without solid enforcement such that due to undersupplied local enforcement poachers were found to have wiped out the entire tiger population of Sariska Tiger Reserve²⁷. Numerous studies have suggested that such threats in protected areas are still prevailing²⁸⁻³¹, forcing us to appreciate the role of local monitoring and local enforcement for wildlife management³². Thus, new and accumulating empirical evidence in favour of local monitoring and enforcement as critical factors for success is of paramount importance for biodiversity conservation. The research reviewed here should provide us a conclusive evidence for giving the desired thrust for *local monitoring* to generate context-specific knowledge, and *local enforcement* to link that knowledge to action.

Acknowledgements: This paper was written as a policy-brief for practitioners. I have drawn heavily on the research conducted by Dr. Ashwini Chhatre of the Department of Geography, University of Illinois, USA and Dr. Arun Agrawal of the School of Natural Resources and Environment, University of Michigan, USA. I am grateful Dr Arun Agrawal for insightful comments on an earlier version of the paper. This document is part of the ongoing series of technical notes to support connecting science to decision making aimed at bridging the science—management divide.

Endnotes

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