

Linking Forests, Trees, and People: From the Air, on the Ground, and in the Lab

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Governing natural resources sustainably is a continuing struggle. Major debates occur over what types of policy ‘interventions’ best protect forests, with the types of property and land tenure systems being central issues. Evaluating the impacts of different tenure regimes in a systematic manner is not an easy task. Ecological systems rarely exist isolated from human use. The challenge of good scientific observation of linked social-ecological systems is made even more difficult because relevant variables operate at different scales and their impacts differ radically. We provide an overview of findings from a long-term interdisciplinary, multiscale, international research program that studies factors affecting forest cover. We describe insights obtained from a series of explorations from the air (landscape scale), on the ground (forest-patch scale), and in the lab (individual decision-maker scale).

From the Air: Observations Over Time

Remotely sensed images generate important information about the landscape dimensions of forest processes, and allow us to go back in time. Based on a rigorous set of methods developed over the past decade at the Center for the Study of Institutions, Population, and Environmental Change (CIPEC, www.cipec.org), we have studied forests managed under a variety of tenure arrangements across the world. Here, we follow

forest change in three landscapes, two located in the Indian states of Maharashtra and West Bengal and the third in Chitwan District of Nepal. By overlaying boundaries of different management regimes on these images, we are able to interpret the impacts of management regime on forest change. Through in-depth interviews conducted with local inhabitants, we can understand the major social factors associated with overharvesting in these forested landscapes.

From these and other CIPEC studies, the official designation of a forest as government, community, or co-managed does not appear to impact forest conservation as much as the legitimacy of ownership and degree of monitoring that takes place on the ground. In the Nepal buffer-zone and community forests, where user groups are provided with secure tenure rights to their forest resources and ownership is perceived as legitimate and fair, communities themselves engage in monitoring efforts to successfully manage their forests. In the Mahananda Wildlife Sanctuary of West Bengal, we see that traditional, strict public protection of parks can work to protect forests but has a high fiscal cost as well as a high cost in terms of increased conflicts with local communities. Such strict protection approaches are not feasible in all government protected areas, as seen in the Tadoba Andhari Tiger Reserve in Maharashtra, indicating the difficulties in sustaining such

efforts over the long term.

From the Ground: Cross-Sectional Data

In order to examine the performance of diverse institutional arrangements using “on-the-ground” measures, we rely on data gathered by the International Forestry Resources and Institutions (IFRI) research program initiated in 1992, with research locations in over 13 countries across the world (see www.indiana.edu/~ifri). This program uses 10 research protocols for obtaining reliable information about users, forest governance, and the ecological conditions of sampled forests.

A long-term goal of the IFRI research program is to use the forest mensuration data collected at each site to compare measures over time for the same forest (thus, holding the ecological zone constant over time). We now have long-term data from 42 forests: five in India, three in Kenya, 10 in Nepal, 18 in Uganda, and six in the USA. Number of stems, diameter at breast height (DBH), and basal area were obtained for all trees within randomly sampled 10 m circular plots. We find that the type of ownership of these 42 forests does not have a statistically significant relationship with any of these three dependent variables. However, the involvement of at least one user group in regular monitoring of compliance with the rules related to entry and use patterns is significantly associated with

maintenance of or improvement in forest condition.

From the Lab

The repeated findings from the field, of high levels of cooperation in activities such as monitoring, challenge core economic theories of human behavior. This is because the benefits of well-enforced rules regarding entry and harvesting from a resource are shared by all members of a group while the costs are borne by the individual. We have conducted a series of laboratory experiments of behavior in common-pool resource (CPR) situations. The subjects were undergraduate students at Indiana University who voluntarily agreed to participate.

We find that providing opportunities for face-to-face communication between subjects greatly increased cooperation, and allowed them to substantially increase the maximum attainable returns from their investments. Next, we examined the impact of a diverse set of sanctioning experiments. When the sanctioning rules were imposed by the experimenters, subjects received lower returns than in contexts where they were given the opportunity to choose whether they would implement their own sanctioning institution.

Discussion

The temptations to overharvest from natural resources are always large. We conclude that a simple formula focusing on formal ownership, particularly one based solely on public ownership of forest lands, will not solve the problems of resource overuse. If the formal rules limiting access and harvest levels are not known to or considered legitimate by local resource users, substantial investment in fences and official guards to patrol

boundaries are needed to prevent ‘illegal’ harvesting. Without these expensive inputs, government-owned, ‘protected’ forests may not be protected in practice. When users are genuinely engaged in decisions about rules affecting their use, the likelihood of users following the rules and monitoring others is much greater than when an authority simply imposes rules on users. These results help to open up a new frontier of research on the most effective institutional and tenure arrangements for protecting forests. This moves the debate beyond the internal and external boundaries of protected areas into much larger landscapes where protection also occurs, and helps us understand when and why protection, recovery, and clearing occur in specific regions within these larger landscapes. Further, focusing on a single research method used by one academic discipline for understanding complex, multiscale processes does not provide a cumulative understanding of how individuals in dynamic, complex social-ecological settings react to institutional rules and affect ecological systems.

Multidisciplinary research in diverse international settings is essential for developing an integrated perspective to achieving sustainability.

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Photo: Sajid Pareeth

Mounds of bicycles confiscated from people caught illegally removing large logs from Mahananda Wildlife Sanctuary and the adjacent Baikunthapur Forest Reserve in West Bengal. Note the circular modifications in the cycle frames made to enable people to secure and easily move large, heavy logs of teak wood.