Institutional Resilience of Community-based Conservation to the Maoist Insurgency in Nepal

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ABSTRACT

To explore the institutional resilience of community-based conservation, I undertook empirical research in the Annapurna Conservation Area (ACA), Nepal, a protected area managed by the Annapurna Conservation Area Project (ACAP) and local communities organized into 56 Conservation Area Management Committees (CAMCs). I conducted scripted interviews with 212 members of 30 representative CAMCs, 13 ACAP staff members who closely monitor those CAMCs, and 868 local villagers who are the beneficiaries of the conservation programs. The field research was undertaken during the summer of 2007 and fall of 2008. Both quantitative and qualitative data were collected and analyzed. I estimated capital stocks and assessed the organizational resilience of each CAMC during and following the Maoist insurgency. I used confirmatory factor analysis to develop scales for measuring the two theoretical constructs of legitimacy and institutional resilience, the latter of which refers to the overall system of community-based conservation in the area. I used the adaptive cycle framework of growth, maturation, collapse and reorganization to assess changes in structures and processes and to explore the past, present and possible future trends in ACA.

Villagers largely considered the CAMCs as legitimate institutions, and their executive members as trustworthy. CAMC members understood the organizational mission and were confident about assuming greater management responsibility of the area in the near future. Human and social capital stocks were positively related to the resilience of the CAMCs. Particularly, themes of intra-committee trust, help networks, and the duration of members'

tenure on the committees were important. Furthermore, natural capital stocks showed a parabolic relationship with organizational resilience; the most resilient CAMCs had moderate amounts of natural capital under their jurisdictions.

The scales used to measure legitimacy and institutional resilience were reliable, and showed a significant positive correlation with each other. Five variables significantly predicted the villagers' perceptions of legitimacy: performance assessments of CAMCs, social norms as measured by perceptions of peers' attitudes towards CAMCs, empowerment as measured by villagers' perceptions of their influence in the CAMCs' decision making processes, perceived benefits and costs associated with having the CAMC in a village, and reported levels of personal participation in CAMCs' activities.

The conservation institution appeared to have been resilient to the insurgency, as the system maintained its identity throughout, avoided alternative undesirable states, and entered into the reorganization phase following collapse. All forms of capital and institutional performance decreased to some extent during collapse but institutional memory, available capital and some structural changes facilitated reorganization. The institutional system is reorganizing along the original regime, but it has also developed an alternative pathway of a new governance model for the area that will transform the present regime in the near term.

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I define my learning style as 'warrior learning,' because I need to immerse in the real life field situations to learn more. I learn some basic principles and theories from 'armchair contemplation,' which I have termed as 'royal learning.' I tend to see the big picture and

practical applications of my learning from ‘fieldwork perspiration’ rather than ‘armchair contemplation’. Due to my learning style, I was not overly engaged in intellectual discussions with my committee. I consider my Ph.D. process as a practitioner’s learning experience in academia. While conducting the field research, many villagers asked me what benefits they would get from this study. At that time, I did not have any concrete answers, and still I don’t have one. If these research findings make a difference in the practice of community-based conservation and the upliftment of the socioeconomic status of rural people through appropriate policies, then I considered my efforts as successful.

My special thanks go to the ACAP office for granting permission for the research, as well as the staff members for helping me in the field. Particularly, Lizan Maskey, Nawa Raj Chapagain, Bhim Upadhaya, Laxmi Pun, Raj Kumar Gurung, Manish Pandey, Krishna Gurung, Ram Gurung, Shree Krishna Neupane and Suresh Thapa went an extra mile to help me during the course of field research. I highly appreciate the help of Dr. Som Ale and Dr. Shant R. Jnawali for writing strong recommendations in support of my grant applications.

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CHAPTER ONE

Introduction

Modern community-based conservation (CBC) models have been promoted, particularly in the developing world, as an alternative to the top-down approach of natural resource management implemented by governments. In CBC, capacity-building, environmental education, and other forms of external support work to empower local communities to more sustainably manage natural resources for both use and conservation objectives. To this end, CBC can be considered as a paradigm shift in natural resource management, moving the conservation field toward a systems view, including humans in the ecosystem and adopting participatory approaches to ecosystem management (Berkes 2004). Throughout the developing world, local communities are one of the major actors managing officially designated protected areas and unofficial ones (Kothari 2006).

The term institution can be conceptualized in myriad ways. In this research, I address institutional resilience at two theoretical scales. Institutions can be conceptualized as a set of mechanisms and structures guiding the governance of a particular place, where governance refers to the arrangements and processes that guide decision-making (Ostrom 1990). In ACA, the community-based conservation institution can be viewed in a hierarchical, nested arrangement, with national laws and national and international organizations influencing the local, primary managers of natural resources in the area. I explore the concept at the broader scale of a protected area in which formal rules, regulations, non-governmental organizations and community-based organizations interact to influence the management of the protected area. At the narrower scale, the concept of institution is also explicitly explored at the local

level, in which the conservation functions of community-based organizations are the focus. The sustainability of protected areas managed under the CBC approach remains weak in many cases primarily due to burgeoning human populations within or in the periphery of parks, increasing consumptive use of resources, dearth of financial support and ineffective enforcement (e.g. Infield and Adams 1999, Barrett et al. 2001, Barber et al. 2004). Furthermore, failing to reconcile external pressures such as markets, globalization and political instability, tends to weaken conservation institutions (Brown 2003). Achieving sustainability in governing systems is critical if CBC is to prove to be an alternative conservation paradigm. To make a transition to sustainability, the effectiveness of the governing systems is critical (Orr 2002). Sustainability is a difficult concept to succinctly define. In this dissertation, I conceptualize sustainability of the governing system as the continuation of the overall conservation function of a community managed protected area in spite of the disturbance.

In the analysis of sustainability, it is critical to make assessments regarding how institutions are impacted by disturbance and stochastic events. The resilience paradigm is helpful to this end. Resilience can be defined as the amount of change a system can absorb while maintaining its same structures and functions, the system's ability to self-organize, and the degree to which the system is capable of learning and adapting (Carpenter et al. 2001). Management strategies that provide opportunities for adaptation, innovation and learning are indispensable within the resilience paradigm, particularly in protected areas under duress.

The political, social and economic systems in which protected areas exist can change abruptly, further complicating their management. Political instability in the forms of civil warfare, insurgencies and revolutions can place large pressures on natural resource management institutions through habitat destruction, exploitation of resources, pollution, and the collapse of management structures (Price 2003, McNeely 2003, Oglethorpe et al. 2004). Nepal provides an excellent example in which the integrity of protected areas management was compromised by a decade-long Maoist insurgency (1996-2006). The insurgency not only claimed more than 13,000 human lives, but also sabotaged the nature conservation sector. The Maoist rebels damaged physical facilities, took over protected areas and forests forcibly, colluded with poachers and smugglers in illicit trade of endangered animals and plants, and re-directed conservation funds to support the insurgency directly (Baral and Heinen 2006, Rechlin et al. 2007).

The insurgency brought about the institutional collapse of government park management authorities in Nepal (Shakya and Chitrakar 2006). However, some protected areas run by local communities managed to survive the insurgency. This research aims to explore potential explanations for why this has been the case. To accomplish the research goal, I focused on the Annapurna Conservation Area (ACA), one such community-managed protected area that appeared to survive the insurgency. ACA is an IUCN Category VI protected area managed by the Annapurna Conservation Area Project (ACAP) and local Conservation Area Management Committees (CAMCs) are the primary managers of community-based conservation. CAMCs make decisions regarding all aspects of nature

conservation (for example, when to open forests for harvesting) and sustainable development (for example, where to establish a school) at the local level within ACA.

The adaptive cycle hypothesizes that complex systems such as protected areas tend to follow the four phases of growth, maturation, collapse and reorganization in a cyclical manner (Holling 1987). The resilience of a system expands and contracts rather than remaining fixed in the adaptive cycle. Here, I explore resilience through an examination of the capacity of existing conservation entities and processes to maintain their function in the face of the Maoist insurgency.

This research attempts to broaden our understanding of institutional resilience concept by asking a broad research question, **"How and why was community-based conservation in ACA resilient to the Maoist insurgency?"** To meet this research goal, I posed the following four specific research questions:

1. **What role did governance arrangements play in resilience in ACA?**
2. **Which capital stocks appear to have been most powerfully linked to the resilience of CAMCs within ACA?**
3. **What predicts legitimacy and how does it relate to institutional resilience in ACA?**
4. **How did the resilience of ACA change during the four phases of the adaptive cycle?**

To answer these questions, I used mixed methods to collect and analyze the data. Both quantitative and qualitative data were collected from three primary sources: the CAMC members who implement conservation programs at the local level, the ACAP staff who monitor the CAMCs closely, and local villagers who are the beneficiaries of the conservation programs. During the summer of 2007, I conducted semi-structured interviews with 190 executive members of 30 representative CAMCs within ACA and 13 ACAP staff. I also solicited villager perceptions of the trustworthiness and legitimacy of the CAMCs through quota sampling of 207 households lying within four management units. In the fall of 2008, I interviewed 661 local villagers in six CAMC management units selected by stratified random sampling of households. As a follow-up, I interviewed 22 members (both new and old) of 12 CAMCs, and 6 ACAP officials to gather information about what changes had occurred during the previous year.

I also drew upon document reviews, key informant interviews and direct observations. All interviews with the CAMC members and ACAP staff were recorded and transcribed in Nepali. English translation was done for information deemed highly relevant to the main questions. I also reviewed scholarly articles, reports, official records, legal Acts and financial documents related to ACA.

The following broad theories and concepts are integrated in this research to explore institutional resilience: the adaptive cycle, resilience, governance, legitimacy and capital stocks. The details of these theories and other specific theories relevant to answer each research question are summarized in Chapters Two to Five. This research has two units of

analysis: individuals and groups (i.e. CAMCs). The analytic approach of the quantitative data varied from simple descriptive statistics to regression models to structural equation modeling. I also analyzed the qualitative data drawing out relevant themes that provided depth, context and rich information about institutional resilience.

The research methods, analyses and findings are organized in four manuscripts that form the following four chapters of the dissertation. The final chapter summarizes the implications of research and future directions for the research.

The second chapter is entitled “Looking back and looking ahead: local empowerment and governance in the Annapurna Conservation Area, Nepal.” The manuscript has been accepted by *Environmental Conservation* and is due to be published in the May 2010 special themed issue entitled “Community-based Natural Resource Management: Designing the next generation.” In this manuscript, we explore the issue of how governance arrangements within ACA have helped to build resilience. The manuscript also focuses on critical elements of known management effectiveness frameworks such as vision, management processes, and outcomes. The manuscript explores how governing actors understand and fulfill their organizational mission and assesses the performance of governing actors during and following the insurgency. In doing so, the study provides a baseline from which to measure future progress in the region.

The third chapter is entitled “Capital stocks and organizational resilience of Conservation Area Management Committees in Annapurna Conservation Area, Nepal.” The manuscript

has been accepted for publication in *Society and Natural Resources*. The manuscript argues that all five forms of capital (financial, physical, natural, social and human) must be present at a certain critical level for organizations to function, but beyond those critical levels, different forms of capital might enhance resilience in different contexts. This proposition is tested in the context of CAMCs, which are local-level organizations created to conserve, manage and use natural resources within ACA. We explore the degree to which available capital stocks appear to enhance the organizations' resiliency in the context of the decade-long Maoist insurgency (1996-2006) as a major disturbance. Resilience of the organizations on which broader conservation institutions are crafted can go a long way in building institutional resilience. The study provides new ways to operationalize and measure concepts such as organizational resilience, social capital and human capital at the group level and reveals which capitals were the best predictors of resilience in Annapurna.

The fourth chapter is entitled "Legitimacy and institutional resilience in the Annapurna Conservation Area, Nepal." The manuscript has been submitted to *Oryx* and is currently under review. The manuscript aims to establish a relationship between the two theoretical concepts of legitimacy and institutional resilience. The manuscript defines, operationalizes and develops scales for measuring these two critical theoretical constructs in the community-based conservation context. Furthermore, it explores key predictors of perceptions of legitimacy and discusses the importance of these concepts to the resilience of community-based conservation.

The fifth chapter is entitled “Growth, collapse and reorganization of the Annapurna Conservation Area, Nepal: an analysis of institutional resilience.” The manuscript has been conditionally accepted by *Ecology and Society*, requiring some revisions after the reviewers’ comments. Conceptualizing community-based conservation institutions as complex adaptive systems, this manuscript traces a cycle of growth, maturation, collapse and reorganization in ACA over the past two decades. It focuses on the crisis brought about by the Maoist insurgency and changes that took place in ACA before, during, and following the insurgency. The manuscript addresses whether ACA has been successful in maintaining its identity as a functional conservation area and the historical events that have shaped the present system’s dynamics. This manuscript summarizes a complex history of the Annapurna region and explains plausible reasons for enhanced resilience in ACA.

The final chapter summarizes important research findings that are described in detail in Chapters Two to Five. It also describes the research’s contributions towards theory development and praxis in the fields of community-based conservation and protected areas management.

The status of the four manuscripts is as follows: two are already accepted for publication in journals, one is conditionally accepted by a journal and another is ready to submit to a journal. As of today, I have not officially transferred the copy rights of any of the manuscripts to the publishers. I am the first author in all four manuscripts. Marc J. Stern is a coauthor in all four manuscripts; and Joel T. Heinen is a coauthor in the fourth manuscript. I designed the research project, implemented it in the field, collected all the data and analyzed

them. I spearheaded and wrote the first draft and subsequent revisions of all the manuscripts. I am also responsible for all administrative work and communications with journal publishers including submission, follow-up, and proof reading. I also acknowledge the contributions of my two coauthors in these manuscripts. Dr. Stern served as my primary advisor on all aspects of each of the manuscripts. I wrote the first draft of each manuscript, and we jointly revised them until they were ready for submission. We jointly considered peer reviewer comments, though I took the leading role in revision and resubmission. Dr. Stern contributed substantial revisions to each paper, discussed the interpretation of all results and their analyses, and provided English language support. Dr. Heinen reviewed and suggested substantial revisions to the fourth manuscript.

CHAPTER TWO

Looking Back and Looking Ahead: Local Empowerment and Governance in the Annapurna Conservation Area, Nepal

Nabin Baral and Marc J. Stern, article accepted for publication

Summary

Diversifying governance models for protected areas serves as one strategy to address some of the challenges they are facing. This paper explores the potential of local communities to be the primary actor in the governance of the Annapurna Conservation Area (ACA) following its planned handover to them in 2012. In doing so, the paper serves as an important baseline from which to monitor a new experiment in protected areas governance. We conducted field research in ACA during the summer of 2007, interviewing the executive members and implementing staff of the Conservation Area Management Committees (CAMCs) and surveying local villagers. Both quantitative and qualitative data were collected to assess the CAMCs' capacities to manage ACA without outside support. All CAMCs had more than a decade of managerial experience and considerable local support. Villagers largely considered the CAMCs as legitimate institutions, and their executive members as trustworthy. CAMC members were confident about assuming the ACA's management responsibility. The devolution of power to an overarching local council to govern ACA will present some challenges, especially with regard to lower-performing CAMCs. However, key factors identified in the literature as critical to good governance portend positive prospects for the transition.

Keywords: Annapurna; biodiversity conservation; community-based conservation; governance; Nepal; park governance; protected areas management

Introduction

The "governance" concept became a major part of the international conservation discourse soon after the Fourth World Park Congress emphasized the participation of communities, non-governmental organizations (NGOs), and the private sector in the establishment and management of protected areas (PAs) (McNeely 1993; Dearden *et al.* 2005). Governance refers to the interactions among structures, processes, and traditions that determine how power is exercised, how decisions are made, and who is accountable for decision outcomes (Graham *et al.* 2003). Four main types of governance for PAs include: (i) government PAs managed by the centralized government authority, (ii) co-managed PAs governed by shared power among various actors, (iii) private PAs owned by private parties and sometimes NGOs, and (iv) community conserved areas governed by local communities (Borrini-Feyerabend *et al.* 2006). The IUCN has yet to officially recognize community conserved areas, though some recommend a revision to the IUCN categories in light of their predominance (Kothari 2006).

Each form of protected areas governance has its own benefits and disadvantages. Citizens often consider government agencies as legitimate actors to provide public benefits with direct accountability to the public (Borrini-Feyerabend *et al.* 2006). However, ineptitude, corruption, inefficiency and bureaucratization of government agencies can lead to the 'paper park' problem – parks that are formally recognized, but not actively managed (Brandon *et al.*

1998; Borrini-Feyerabend & Tarnowski 2005). NGOs tend to be comparatively more effective and efficient than government agencies, can bring in information and innovative ideas, mobilize the public, promote associations and coalitions, and provide financial and technical support (Wells *et al.* 1992; Alcorn *et al.* 2005). However, NGOs may often create a culture of dependency among constituencies; their accountability and legitimacy are questioned due to their reliance on donor funds; and governments tend to be reluctant to handover authority to them (Zaidi 1999; del Valle 2002; Ostrom 2005). Local communities sometimes have developed knowledge, skills and institutions to effectively manage the ecosystems they depend upon as a result of co-evolution (Barber *et al.* 2004). As such, some argue for communities' participation in PAs management in order to cure the 'paper park' syndrome (Bonham *et al.* 2008). Critics, however, argue that relatively powerless local communities can not shoulder the burden of enforcing conservation; in addition, they often engage in the exploitation of natural resources (Redford & Sanderson 2000; Terborgh 2000). Community management can also lead to parochialism, exclusion, intolerance, or racism (Borrini-Feyerabend & Tarnowski 2005). Local communities can gain access rights and share revenues by participating in collaborative management of PAs, but they rarely have the management authority on their own (Menzies 2007).

Lately, there has been a marked shift from a top-down model of 'government' to a more horizontal power-sharing model of 'governance' to manage natural resources throughout the world (Agrawal *et al.* 2008). This broader idea of 'governance' is recognized as an integral aspect of PAs management in the Convention on Biological Diversity (CBD). Taking into

account the ongoing political instability in many areas of significant biodiversity value, exploring governance models that can secure PAs in areas of turmoil is particularly critical.

The Annapurna Conservation Area (ACA) in Nepal represents one such area, having survived a decade-long Maoist Insurgency (1996-2006) that undermined the integrity of park management across Nepal. The Maoist rebels assumed control over PAs, killed park staff or forcibly evicted them, damaged physical infrastructure, and exploited natural resources within PAs. While many government-run PAs struggled to survive the insurgency, ACA appeared to be more or less resilient owing to its empowered grass-roots institutions, despite heavy Maoist presence and disruption in the area (Baral & Heinen 2006).

The Government of Nepal formulated a legal agreement in 1992 that allowed for the King Mahendra Trust for Nature Conservation (now NTNC – National Trust for Nature Conservation) to manage the present size ACA (7,629 sq km) for 10 years and collect tourist entry fees to fund conservation and local-level development projects (Bunting et al. 1991; Thakali 1995). As dictated by the rules, the NTNC manages ACA with the help of 56 legally instituted grassroots level Conservation Area Management Committees (CAMCs). About 120,000 people belonging to various ethnic groups and Hindu castes reside inside the area. As one of the most famous trekking destinations in the world, ACA was financially self-sustaining through international tourists' entry fees in times of peace (Baral *et al.* 2008).

Unlike many conservation projects that do not answer in advance 'what happens afterwards?' (Sayer & Wells 2004), in 2000 all the CAMC chairs and secretaries, representatives from

local governments, local leaders, and the NTNC staff discussed the future of ACA after the termination of the legal agreement inked between the NTNC and the government. The meeting recommended the formation of an overarching council representing all the CAMCs in order to enter into a legal agreement with the government to manage ACA (ACAP 2001). The participants also felt that additional capacity-building was in order prior to the handover, so they requested that the government extend the contractual agreement with NTNC until 2012 (ACAP 2001). A similar power transfer has already taken place when in 2006, the government transferred the management authority of the Kanchenjunga Conservation Area (KCA) from an NGO to a council of local communities. Others, like the Manaslu Conservation Area, which has a similar governance structure to ACA, might follow in the years to come.

CAMCs have been involved in decision making and in the management of natural resources of the area since the ACA's inception. This 'bottom-up approach' has been credited as one of the critical factors for the project's success (Hough & Sherpa 1989). Over time, the CAMC leadership has contributed to improved biodiversity status, increased conservation awareness, and improved local socio-economic development (Bajracharya *et al.* 2005; Baral *et al.* 2007). Concerns remain, however, about how to sustain the achievements of local leadership and about whether the CAMCs can stand on their own in the long-term without government or NGO support (Wells 1994; Stevens 1997). In the present governance model, local communities are subsidiaries of the managing NGO; however, they are expected to be leaders in governing ACA when the NGO withdraws.

To evaluate the viability of future governance of ACA, we assess the performance of the CAMCs using a typology that describes the evolution of local groups through three stages (Pretty & Ward 2001): (i) reactive-dependence – at first, groups form in reaction to a crisis or due to the prompting of an agency, and tend to be dependent on external facilitators, (ii) realization-independence – in the second stage, groups become increasingly independent and come to realize their emerging capabilities, so they have the capacity to develop solutions to problems, and (iii) awareness-interdependence – in the final stage, groups are capable of initiating actions independently, and are sufficiently resilient to external threats. We also assess the CAMCs' commitment to conservation by gauging members' perceptions of their critical task and their leadership effectiveness by gauging internal perceptions of leadership within each CAMC.

Local support for conservation management entities has also been shown to be critical to conservation success.Without voluntary compliance of local constituencies, enforcement strategies alone may not be sufficient for effective park management (Stern 2008b). A key to voluntary compliance is the development of perceptions of legitimacy of governing bodies among local populations (Gearey & Jeffrey 2006; Viteri & Chávez 2007; Pinkerton & John 2008; Stern 2008b). Brechin and others (2002: 46) define legitimacy as "any behavior or set of circumstances that society defines as just, correct, or appropriate."

Legitimacy may come about through multiple pathways; critical among them is the development of trust for the governing by the governed (Stern 2008b). A lack of trust among stakeholders can derail a governance system (McClanahan *et al.* 2005). For example, Stern

(2008a) found that local distrust for park managers was the most consistent predictor of active opposition toward neighbouring national parks amongst local populations, overpowering even the perceived costs and benefits of the protected areas. Institutions may also accrue legitimacy by providing instrumental benefits to their constituencies (Suchman 1995; Stern 2008b) and through adequately representing their interests (Stern 2008a).

One key indicator of whether local interests are adequately represented is whether the membership of the governing body adequately reflects the diversity of its constituency. We examined organizational representativeness in terms of inclusiveness and participation of minorities such as women and lower caste people. In Nepal, as in many other developing countries, women tend to have a major impact on natural resource management, because they are often more directly connected in their work with natural resources, have knowledge about resource conservation issues, and have incentives for conservation (Astolfi 1995). Furthermore, not only can diversity among group members can also enhance group performance by bringing in various perspectives (Phillips *et al.* 2006, the participation of minority members in group decision making processes can avoid erroneous assumptions that could lead to poor decision-making by majority members (De Dreu & West 2001).

Based upon an assessment of CAMC performance, perceptions of CAMC members, and perceptions of legitimacy of local population, we evaluate the prospects for success of the impending handover of authority to CAMCs in ACA. In doing so, this study provides critical baseline data from which to monitor the effectiveness of the proposed governance model. It

also provides insights regarding the some of the underlying drivers of the program's success to date.

Methods of Data Collection and Analysis

Through interviews and questionnaires, we collected data from three sources: ACAP conservation officers, local villagers, and CAMC members. We collected all data on-site from May to August of 2007. While most quantitative data came from structured questionnaires, qualitative assessments were made based on document reviews, interviews and field observations. All interviews were conducted and transcribed in the Nepali language. The translation of transcripts into English was done for information deemed highly relevant to the research question.

To make assessments regarding the evolutionary stages of CAMCs, the ACAP staff were asked to rate each CAMC they supervise on a 10-point scale regarding its performance during and in the year following the Maoist insurgency. The staff were given three reference points: 10 indicating that the CAMCs carried out almost all of their mandated functions; 5 indicating that the CAMCs carried out about half of their mandated functions; and 1 indicating that the CAMCs completely failed to carry out any of their mandated functions. Two to four staff rated the performance of each CAMC, and an average of their ratings was taken. We classified the performance of each CAMC as 'high' if the score was 8 or above, 'medium' if the score was in between 6 and 7.9, and 'low' if the score was less than 6. The performance rating may not capture all the dynamics of group evolution, but our interviews indicated that the rating served as a reasonable proxy for the stage in which each CAMC

could be categorized. All CAMCs effectively lost their ability to rely on external entities for continuous direct assistance during the insurgency. Thus, those ranked “low” on our scale appeared to be reactive-dependent groups, whereas those ranked “medium” and “high” correlate with our definitions of realization-independent and awareness-interdependent, respectively.

The 1996 Conservation Area Management Regulation required that a CAMC be formed for each Village Development Committee (VDC) located within the conservation area. VDCs, the lowest level administrative and political units, are local-level authorities common to all villages in rural Nepal. There are seven management units (or field bases) for NTNC within ACA: three lie on the northern slope and four on the southern slope of the Annapurna Himalayas (Fig. 1). We selected two management units from the north (Jomsom and Manang) and two units from the south (Ghandruk and Lwang) for the study based on our experience, review of reports and consultation with the ACAP staff. These four management units reasonably represent the diversity of ACA. Ghandruk, Lwang, Jomsom and Manang have 5, 7, 9 and 12 CAMCs, respectively. In Manang, we could not survey three CAMCs due to remoteness, time constraints and language barriers. The total number of CAMCs surveyed was 30.

A total of 15 members serve on each CAMC’s executive committee. The VDC chairperson is an automatically designated member. One member is elected by user groups (local villagers) in each ward (there are generally nine wards per VDC), and five members are nominated by the ACAP’s conservation officer (CO). The CO is instructed to include representation of

women and lower castes in each CAMC. The members select a chairperson and a secretary among themselves who become the appointed leaders of the CAMCs. At the time of fieldwork, VDC chairpersons were not present on the CAMCs due to the expiration of their tenure within the VDCs. As a result, the sampling frame for the 30 CAMCs consisted of 420 members.

We targeted 210 members (seven in each CAMC) for interviews. It was expected that the chairs and secretaries (the appointed leaders) would be more knowledgeable about facts and figures of CAMCs than the other members; therefore, they were selected purposively. The other CAMC members were selected by a simple random method within each CAMC to reduce potential biases associated with convenience sampling. CAMC member interviews focused on their views of the mission of their CAMC, of the leadership of their CAMC, and of their confidence in the managerial capacity of the CAMCs to take over sole governance of the protected area. The appointed leaders also provided a great deal of factual data, while the other members enriched our understanding with more subjective viewpoints and complementary factual information. Leach (2002) recommends this form of sampling within groups to maximize analyses of groups' success and function. We conducted 190 scripted one-on-one interviews with the CAMC members (90.5% response rate), of which 23 (12.1%) were chairs, 23 (12.1%) were secretaries, and 144 (75.8%) were general members. We interviewed 6 members on average in each committee, with a minimum of 4 and a maximum of 9. The interviews averaged 35 minutes in length.

We conducted surveys of villagers through quota sampling of 207 households lying within four CAMC management units. The surveys were conducted in one low-performing (reactive-dependent), one medium-performing (realization-independent), and two high-performing (awareness-interdependent) CAMCs. We first segmented the population (households) into three mutually exclusive groups based on economic status: wealthy, middle class and poor. This was done following interviews with the ACAP staff who reported that 20%, 50% and 30% of the households in the area typically fall into wealthy, middle class and poor categories, respectively. We then selected sampling units from each group proportional to the estimated population distribution. We assigned economic status of respondents based on the dimensions of their houses, which is a reasonable proxy of economic status in rural areas of Nepal. When verified with the ACAP staff, our classification matched in most cases, and in cases of inconsistency, we followed the staff's classification. To reduce potential biases, we attempted to interview male and female respondents in an alternating fashion. Taking into account time and resource constraints, and a lack of the up-to-date sampling frame, quota sampling was an expedient way to gather the information required for this study. Face-to-face surveys were conducted, typically lasting less than 15 minutes each.

The information gathered from villagers' interviews was also used to cross-validate the information collected from both the ACAP staff and the CAMC members. As a separate measure of CAMC performance, we solicited villagers' perceptions regarding the status of natural resources (improved, remained the same or diminished) of the area during three time periods: before the inception of ACA, over the last ten years, and over the last five years

(since the beginning of the Maoist insurgency in the area). Other data collected from villagers regarded measures of trust and legitimacy.

We characterized trust as a tripartite relationship in which entity A trusts entity B to do X (Hardin 2002). In our study, entity A refers to villagers and entity B refers to CAMC members. We asked villagers to respond to three definitions of X: 'to work on behalf of all villagers' interests,' 'to treat all villagers equally,' and 'to be honest.' We operationalized legitimacy by soliciting villagers' perceptions about whether the CAMC is the "right authority" to manage natural resources and about whether most villagers abide by its rules. We also asked villagers (1) have you benefited from the CAMC? and (2) would it be better not have the conservation area here?

Results

Respondents' characteristics

The average age of the 190 CAMC members was 51.1 ± 12.1 years. Only 6 (3.2%) were 30 years of age or less. Their level of education was typically low: 12.6% were illiterate; 40.5% had 1-5 years of schooling; 36.3% had 6-10 years; and 10.5% had more than 11 years. Among the present members, 45.8% had served on the CAMC before, of which 23.0% served two terms, and 77.0% served one term. They averaged 6.7 ± 3.5 years of experience on the committees. Male committee members were older, more educated, and had more CAMC experience than female committee members on average (Table 1). Only two CAMC members had migrated into the area.

Of 207 villagers surveyed, 56% were male and 44% were female. The average age was 45.9 ± 16.1 years. In our villager surveys, 20%, 47% and 33% households were categorized as wealthy, middle class and poor, respectively. Only 15% of villagers had migrated to the study area.

CAMCs' performance

Based on the ACAP staff's assessment and field research, there were 9 'high performer' CAMCs, 12 'medium performer' CAMCs, and 9 'low performer' CAMCs. The high performers often initiated actions independently and accomplished their goals despite the challenge of the Maoist insurgency. They were categorized under the final stage of group evolution – 'awareness-interdependence.' The medium performers had developed capabilities to work independently, but their performance depended upon ACAP's inputs and the intensity of the insurgency. Thus, they were categorized as being in the second stage of 'realization-independence.' The low performers were mostly dependent upon ACAP to run their offices and often failed to accomplish major goals in absence of the ACAP's prompting. They were at the first stage of 'reactive-dependence.' CAMC performance was not correlated with the duration (age) of CAMCs ($r = -0.23$, $p = 0.230$).

Local villagers also favorably evaluated the performance of CAMCs, as indirectly assessed by their perceptions regarding the status of natural resources of the area. Most villagers surveyed perceived that the status of natural resources had improved compared to the pre-ACA era (70.4%) and over the past ten years (76.7%). About half perceived that natural resources remained in good condition even during the Maoist insurgency (49.0%). A

significantly higher proportion of villagers from areas governed by high performing CAMCs suggested that the status of natural resources improved even during the insurgency (Fig. 2).

Organizational representativeness

As of 2007, the youngest CAMC – Narchyang – was 10 years old while the oldest CAMC – Ghandruk – was 17 years old. All the CAMCs had completed at least two 5-year terms, and their average lifespan was 12.4 ± 1.5 years. Over the decade, the presence of women and lower caste members had expanded considerably from nearly non-existent at the project's outset. Two CAMCs had female chairs, and one CAMC had a female secretary. In a few CAMCs, lower caste members and females defeated respectively higher caste members and males in their elections. In many CAMCs, lower caste and female members were nominated by the CO instead of being elected. There were four lower caste members in 1 CAMC, two in 6 CAMCs, one in 17 CAMCs, and none in 6 CAMCs. There were four women in 1 CAMC, three in 2 CAMCs, two in 17 CAMCs, and one in 10 CAMCs. There was no significant difference in the average number of women and lower caste members among low, medium and high performing CAMCs ($F_{2, 27} < 1.0$, $p > .10$).

Effectiveness of CAMC leadership

When asked to rate their committees' leadership effectiveness on a three-point scale, 56.3% of surveyed CAMC members described their CAMCs as "highly effective," 36.3% as "effective," and 7.4% as "not effective at all." Although appointed leaders were more likely to rate themselves as "highly effective" than general members ($\chi^2_2 = 6.53$, $p = 0.038$, $N = 190$), more than half of the general members agreed with this sentiment (Table 2). All but

one ACAP staff member regarded the CAMC's leadership as "effective." The Kruskal-Wallis test (for nonparametric one-way analysis of variance) showed no significant difference among three groups of CAMCs (high, medium and low performers) regarding the members' perceptions of leadership effectiveness ($\chi^2_2 = 2.37$, $p = 0.305$, $N = 190$).

Understanding the organization's mission

We asked CAMC members to define in their own words the mission of their CAMC. An overwhelming proportion (94%) of respondents expressed the mission in terms of 'conservation', 'development', or 'conservation and development' (Table 3). The appointed leaders were more likely to emphasize 'conservation' as the CAMC's mission than the general members ($\chi^2_2 = 9.56$, $p = 0.008$, $N = 179$). There was no significant relationship between the duration (age) of the CAMCs and how their members interpreted their organizational mission. At the 10% error level, there was an association between the performance of CAMCs and how their members interpreted the organizational mission ($\chi^2_4 = 7.97$, $p = 0.093$, $N = 179$): members belonging to medium and high performance CAMCs tended to emphasize 'conservation' as their mission more than others (Fig. 3).

Local support for CAMCs

The CAMCs appeared to have garnered local support, as measured by two factors: trust and legitimacy. A majority of villagers reported their trust for CAMC members: (i) to work on behalf of all villagers' interests, (ii) to treat all villagers equally, and (ii) to be honest (Table 4). Almost all villagers perceived the CAMCs to be the right authority to manage natural resources of their area. Most also reported that most villagers abide by the CAMC's rules

(Table 5), though only 51.3% of villagers from the areas governed by the lowest performing CAMCs agreed with the statement, compared to over 80% in the other CAMCs. Furthermore, 62.6% of villagers had participated in various activities carried out by the CAMCs. About two-thirds (66.2%) of villagers reported that they had benefited from the CAMC. Almost all villagers (96.5%) said that they would be worse off if not for ACA. Most villagers also perceived that the status of natural resources had improved over the past decade. We uncovered no other consistent trends for the CAMCs that distinguished different degrees of local support across the spectrum of performance of CAMCs.

CAMCs' managerial capacity

Sixty-nine percent of CAMC respondents believed that the CAMCs could manage ACA without support from ACAP; 27% disagreed; and 4% were unsure. There was no significant difference between appointed leaders (chair and secretary) and general members' perceptions regarding the CAMC's managerial capacity ($\chi^2_1 = 1.18$, $p = 0.343$, $N = 182$). Seventy-two percent of CAMC respondents who felt that CAMCs could manage ACA independently, felt ready do to so within four years. Answers ranged from less than one year to more than six years. All surveyed members of two of the high-performing CAMCs reported that they could manage ACA solely, while none the members of one medium-performing CAMC believed they could.

There was a significant association between the members who said they could manage ACA solely and the performance of CAMCs ($\chi^2_2 = 6.06$, $p = 0.048$, $N = 190$), with higher performing CAMCs more confident about being able to independently manage ACA. As

expected, members belonging to high or medium performance groups felt they needed less time for preparation to take over the ACA management responsibility (Table 6). This provides some degree of validation to ACAP officers' assessments of performance levels.

Six of the 13 ACAP staff interviewed reported that the CAMCs could manage ACA solely. Four reported that the CAMCs could take over the management responsibility before 2012, while two reported that they may take 1-2 years longer than this to be fully ready. During the interviews, the staff gave various explanations for their assessments. The most common explanations for believing the CAMCs were ready to manage ACA on their own included: (i) the experience they had gained since their inception; (ii) their sincere commitment to the formation of the overarching council; and (iii) their legal mandate to represent local people. Two major themes emerged from officials who did not believe the CAMCs would be ready: (i) local communities often fail to navigate complex legal and bureaucratic procedures; and (ii) unequal capacities between and within different CAMCs, which would weaken the proposed council.

Four major recurring arguments emerged in interviews with CAMC members regarding their beliefs for why they would be ready to manage ACA on their own: (i) support from villagers and their active participation in CAMCs' activities; (ii) the continuation of a traditional resource management system that had been practiced in the past; (iii) valuable experience gained while working with the ACAP; and (iv) legal recognition and guidance from well-established rules and regulations. One CAMC member used Kanchenjunga Conservation Area as a reference point: "People in Kanchenjunga have fewer resources and less experience

in conservation area management than us, but they have already formed a council and started managing the area solely, so why can't we?" He further added, "If we form and run the council ourselves, then we can benefit more than working under the NGO or the government."

Three primary reasons emerged as explanations by CAMC members for beliefs that CAMCs were not ready to take on sole management responsibility of ACA: (i) continued reliance on ACAP to run an office and members' lack of confidence; (ii) ongoing political instability that tends to discourage members to take on responsibility; and (iii) the challenge of the continued need for capacity development due to the turnover of CAMC members every 5 years.

Discussion

The findings of the study suggest that: (i) many CAMCs have become robust organizations after more than a decade of hands-on experience in nature conservation; (ii) the CAMCs and their associated conservation functions have survived the Maoist insurgency even though their degree of performance varied; (iii) most CAMC members have reported their confidence has increased in managing the conservation area without external support; (iv) most members can articulate the organizational mission and do so in terms of conservation; and (v) the CAMCs have garnered considerable local support. Many members are now arguing for ACA's turnover to the proposed council, claiming that they have the capacity to organize, fund and carry out devolved responsibilities at a local level. The ACAP staff further corroborate the CAMCs' capacities to manage ACA.

Still, not all CAMCs appear equally capable of assuming local governance of the protected area. All of our measures regarding ACAP staff perceptions of CAMC performance were also corroborated by other data. It appears that some work yet needs to be done to build capacities in lower performing CAMCs. Many appear to still be in the reactive-dependent stage of development. Our research suggests that this capacity-building may be feasible within the timeframe of the proposed handover, as even some of the younger CAMCs appear to have achieved higher levels of performance. That is, their success does not necessarily appear to be based on the duration of their experience. The high degree of resilience of most CAMCs to the Maoist insurgency further supports the notion that many are performing at particularly advanced levels of group evolution (many at the awareness-interdependence level). The presence of these groups can further solidify those at lower levels through continued capacity-building and network strengthening following the creation of a single overarching council.

The timing of the proposed handover of authority will present real challenges, but there are many reasons to believe that local governance can be successful in Annapurna. Baral *et al.* (2007) found that CAMCs in existence for more than a decade typically made more decisions to take on conservation actions than development actions. All CAMCs have now reached this age. The current study further reflects a high degree of understanding of the conservation mission of the area amongst CAMC members. Other research has suggested that the empowerment of the CAMCs is crucial to the successful delivery of the benefits of conservation to local people (Bajracharya *et al.* 2005), which can be critical to the

development of local support and perceptions of legitimacy (Stern 2008b). The symbolic and real empowerment of local people associated with handing over authority to a local council can instill a sense of pride and ownership amongst local residents, often associated with enhanced sustainability of community-based conservation (McShane & Wells 2004).

The proposed governance model for ACA reflects the essential features of co-managed PAs, but the local communities will lead governance instead of the government. In this proposed model, the government hands over the management authority of ACA to the council of CAMCs. The power will be shared mainly between the government and the council. The government owns the conservation area, while the council gains tenurial rights (or proprietorship) over the area. With tenurial rights, the council will have *access rights* to all resources within the conservation area, *withdrawal rights* to govern the appropriation of resources, *management rights* to regulate the withdrawal and improvement of resources, and *exclusion rights* to define the qualifications for the access. However, they will not have *alienation rights* to transfer the management authority of the conservation area to any other entity (Schlager & Ostrom 1992). This power remains with the government, which holds title to the land.

The government is expected to devolve tenurial rights over the conservation area to the council on a contractual agreement basis. The time period of the contract is still undetermined. It will be the responsibility of the council to secure financial sustainability and steer governance by collaborating with various stakeholders. To this end, the council will require all the authorities that the NTNC currently has, for example, the collection of tourist

entry fees, user fees, and donations, which are critical for financial sustainability. The legal recognition of the council will likely serve to garner clout to protect the interest of the grassroots level CAMCs, which will also be critical for building networks at the national and international levels. Some argue that a major goal of many people-oriented conservation programs is to vest local communities with significant rights so that they emerge as a powerful actor in the governance of conservation programs (Child & Dalal-Clayton 2004). The essence of the ACA governance model is that the local communities use external institutional actors for their own integrated conservation and development ends, rather than as a means for an external institution's end (Murphee 1994).

There are some apparent challenges for the formation of an effective council. The CAMC members' profiles show a disproportionate number of older and uneducated members. When older members dominate, there may occur a transmission failure from one generation to the next of the operational principles on which community governance is based (Ostrom 2005). The problem can be exacerbated if youth move outside the project area (e.g. Fabricius *et al.* 2004). Furthermore, competition between individual CAMCs for power and resources within the newly proposed governance system is possible. Currently, ACAP allocates most resources to CAMCs, and it mediates any conflicts between them. In its absence, some mechanisms to resolve conflicts and mediate power differences among CAMCs within the council may be warranted (Morrow and Hull 1996).

In Kanchenjunga Conservation Area (KCA), local people have expressed concerns about the accountability and transparency of the council (Gurung 2006). Given the many similarities

between the two areas, these same concerns may surface in ACA. Yet, the reported levels of trust and legitimacy for CAMCs in this study may assuage local people's concerns to some degree.

It is too early to evaluate the performance of KCA; however, by the time ACA's proposed handover begins, there may be an opportunity to learn from the KCA's experience. In comparison to KCA, ACA may have a greater chance of success because of its financial sustainability through revenues from tourism and sales of non-timber forest products, long enduring institutions, and stocks of social and human capital (Baral *et al.* 2007; Baral *et al.* 2008). In addition, most CAMC members express an understanding of the organization's mission, appear to be motivated to shoulder the management responsibility, and consider the CAMC leadership as effective. These factors can facilitate the council formation.

Current conservation policies tend to give more power to states and NGOs for managing PAs (Brosius & Russell 2003). These policies often overlook the fact that local institutions might face fewer obstacles in developing trust and legitimacy than those from outside an area (Schwartzman *et al.* 2000; Stern 2008a,b). Recognizing a need for good governance of PAs and the involvement of various actors in it, local communities can have an important role to play to this end. The research findings suggest that the involvement of local communities in park management can enhance the legitimacy of PA governance, garner support of local constituencies, and strengthen local institutions. Neither governments nor NGOs are immune to failure (Barrett *et al.* 2001). Our results suggest that granting conservation leadership to

local communities in the governance of ACA appears a worthwhile experiment with a reasonable degree of likelihood of continued conservation success.

Conclusions

The ultimate goal of the present management plan is to hand over ACA to the CAMCs for its management. By the time the contractual agreement of the NTNC with the government expires in 2012, the local communities of ACA will have had more than two decades of hands-on experience in conservation area management. The Nepali park management agency does not have enough resources to manage a network of PAs under its jurisdiction (Heinen & Mehta 2000), so it has already introduced a policy of handing over the PAs to non-state actors for their management.

Government or NGO failures in PAs management clearly illustrate the risks associated with their governance (e.g. Brandon *et al.* 1998; Terborgh *et al.* 2002). Would testing the waters with local communities bear any greater risk? In the case of Annapurna, local perceptions, values, interests, and capacities seem well-suited to the test. According to key variables identified in prior research, the community's leadership in governance may be a more sustainable option for the long-term management of ACA than the existing governance arrangement. The new community conserved area in Annapurna will serve as an important experiment to contribute to the adaptive management of PAs worldwide in the years to come.

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We pay tribute to the conservation leaders who had participated in a ceremony in which the Government of Nepal handed over the management of Kanchenjunga Conservation Area to local communities, then lost their lives in a fatal helicopter accident.

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Table 1: Attributes of the respondents by gender with Student's t-tests

Attributes	Male	Female	Statistics*
Number of respondents	161 (84.7%)	29 (15.3%)	-
Average age in years	52.1 ± 11.8	45.6 ± 12.4	$t = 2.61$, $p = 0.013$
Average year of schooling	6.1 ± 4.2	3.6 ± 3.8	$t = 3.21$, $p = 0.003$
Average year of experience on the CAMC	7.1 ± 3.5	4.6 ± 2.2	$t = 4.94$, $p < 0.001$

* All the reported values of Student's t-test are statistically significant at the 5% error level.

Table 2: Members' perceptions of the effectiveness of CAMC's leadership

Leadership	Total	Appointed Leaders	General Members
Highly effective	107 (56.3%)	33 (71.7%)	74 (51.4%)
Effective	69 (36.3%)	12 (26.1%)	57 (39.6%)
Not effective at all	14 (7.4%)	1 (2.2%)	13 (9.0%)
Total	190 (100%)	46 (100%)	144 (100%)

Table 3: Members' understanding of the CAMC's mission

Stated mission typology	Total		Appointed Leaders		General Members	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Conservation and development	79	41.6%	27	58.7%	52	36.1%
Conservation	50	26.3%	14	30.4%	36	25.0%
Development	50	26.3%	5	10.9%	45	31.3%
Could not say	11	5.8%	0	0.0%	11	7.6%
Total	190	100%	46	100%	144	100%

Table 4: Local people's perceptions of the trustworthiness of the CAMC members

Question	Yes	Unsure	No	N
Do you trust CAMC members to work on behalf of all villagers' interests?	74.8%	20.4%	4.9%	206
Do you trust that CAMC members treat all villagers equally?	67.5%	6.0%	26.5%	200
Do you trust the CAMC members to be honest?	70.4%	6.4%	23.2%	203

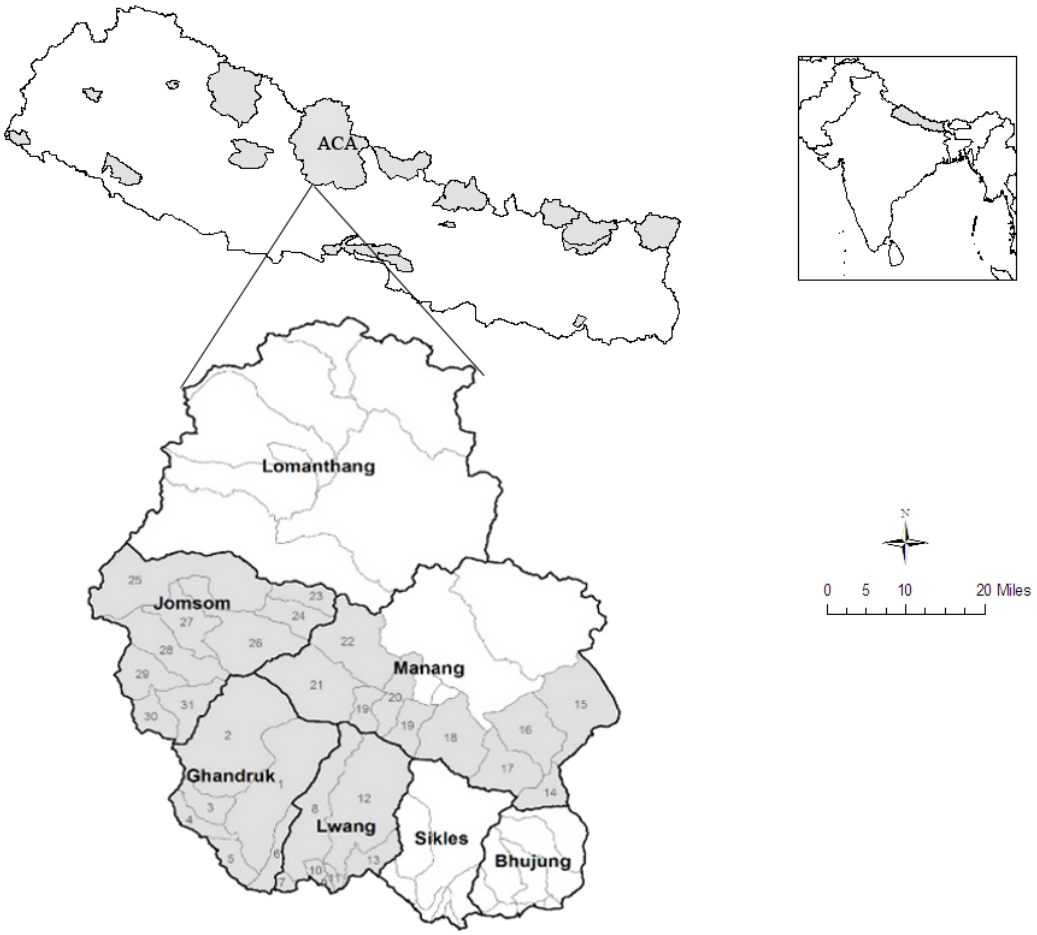
Table 5: Local people's perceptions regarding the legitimacy of CAMCs

Question	Yes	No	N
In your opinion, is CAMC the right authority to manage natural resources?	92.2%	7.8%	205
Do you think most villagers abide by CAMC's rule?	77.3%	22.7%	194

Table 6: Respondents' perception of preparatory time (in years) for CAMCs to take over the ACA management responsibility

CAMC performance	Percent of members mentioning ready to manage ACA alone	Of those who said ready, how long preparatory time they need to take over ACA management?			
		< 1 year	1-2 years	3-4 years	> 4 years
High	80%	67%	40%	25%	35%
Medium	66%	33%	39%	44%	35%
Low	59%	0%	21%	31%	30%
	N = 190	N = 9	N = 52	N = 32	N = 37

Figure 1: Map showing a network of Nepalese protected areas, seven management units of ACAP, and the intensive study area within the Annapurna Conservation Area. The shaded polygons with numbers are the sample CAMCs



Data source: GIS data provided by the Annapurna Conservation Area Project, Pokhara, 2008

Figure 2: Percent of villagers mentioning that the status of natural resources has improved during the three time periods (compared to the pre-ACA era, 10 years ago and 5 years ago from now) among high, medium and low performing CAMCs

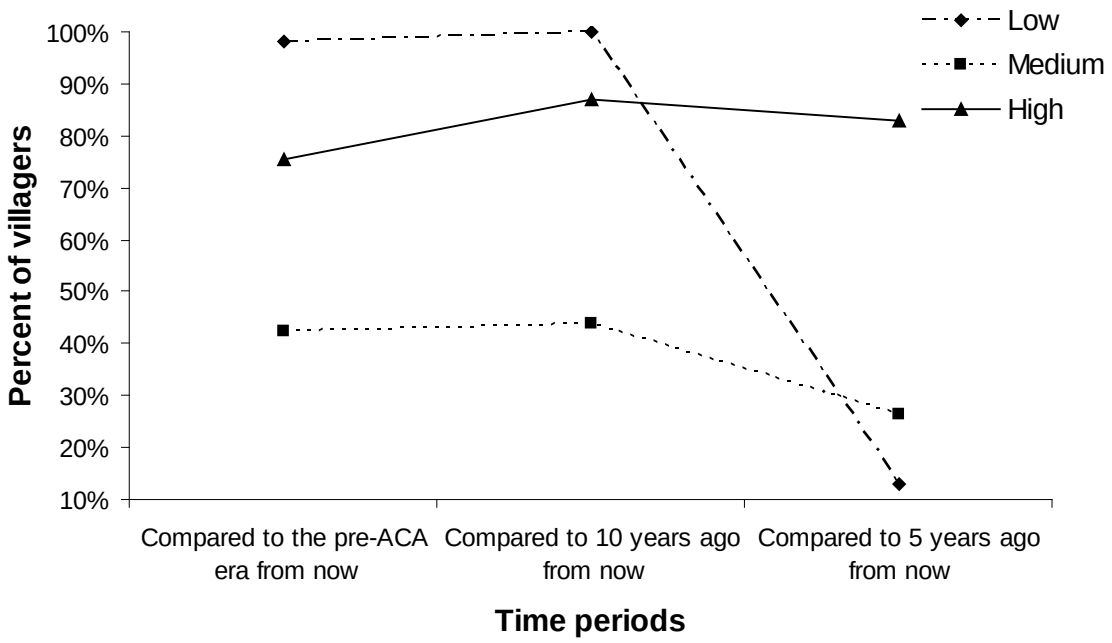
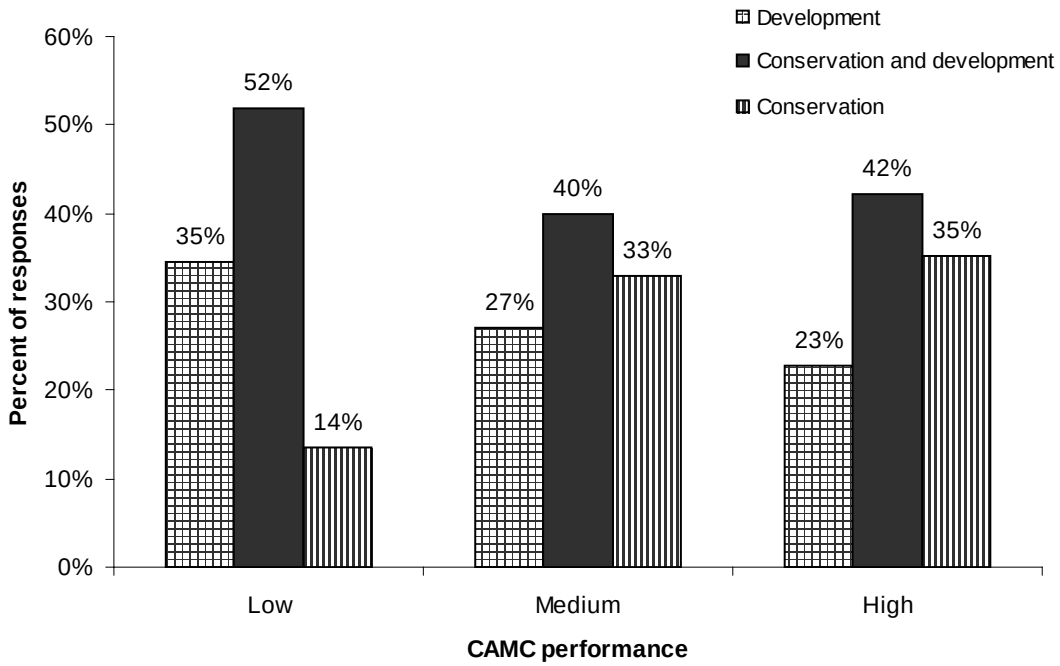


Figure 3: Interpretations of the missions of CAMC by CAMC members in low, medium, and high-performing CAMCs



CHAPTER THREE

Capital Stocks and Organizational Resilience of Conservation Area Management Committees in Annapurna Conservation Area, Nepal

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Abstract

We have undertaken empirical research to explore relationships between the stock of various capitals and the organizational resilience of Conservation Area Management Committees (CAMCs) – the functional decision-making units of community-based conservation – within the Annapurna Conservation Area, Nepal. We surveyed 190 members of 30 CAMCs during the summer of 2007, estimated the capital stocks of each CAMC, and interviewed 13 park officials to assess the degree of organizational resilience of each CAMC during and after the Maoist insurgency (1996-2006). Multiple regression analyses suggest that human and social capital stocks are positively related to the resilience of the CAMCs. Of particular importance are themes of intra-committee trust, help networks, and the duration of members' tenure on the committees. Furthermore, natural capital stocks showed a parabolic relationship with organizational resilience; the most resilient CAMCs had moderate amounts of natural capital under their jurisdictions.

Key words: Annapurna, community-based conservation, human capital, natural capital, Nepal, protected areas, resilience, social capital, sustainability

Introduction

Capital stock theory has become popular with the emergence of broad conceptual frameworks such as “sustainability” and “resilience” that attempt to emphasize the integrated concept of humans-in-nature (termed social-ecological systems by Berkes and Folke 1998). Capital can be defined broadly as a “stock that yields a flow of valuable goods and services into the future” (Costanza and Daly 1992, p. 38). We can disaggregate stocks into five different types of capital: physical, financial, human, social, and natural (Berkes and Folke 1992; Costanza 2003). *Physical capital* is the stock of all artifacts, infrastructure, and technologies of the human economy (Costanza 2003). *Financial capital* is the stock of cash, investments and savings that confers the purchasing power in the form of money available for production or consumption of goods and services in the modern economy (Costanza 2003). *Human capital* is “[t]he knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being” (OECD 2001, p. 18). *Social capital* refers to the stocks of social networks, associations, norms, and trust that enable participants to act together more effectively to pursue shared objectives or use them for productive purposes (Coleman 1988; Putnam 1995; Grootaert et al. 2004). Pretty and Ward (2001) identify four central aspects of social capital: (i) relations of trust; (ii) reciprocity and exchanges; (iii) common rules, norms and sanctions; and (iv) connectedness in networks and groups. *Natural capital* is the aggregation of all environmental assets that provide inputs for production, ecological services and waste assimilation services (Costanza 2003). Natural capital is the only form of capital that builds ecological resilience directly through the provision of ecosystem services and mechanisms to absorb shocks and stresses

(Pearce et al. 1989). As such, its critical functions cannot be supplanted by other forms of capitals.

The conventional concept of sustainability boils down to the maintenance of capital stocks. Sustainability can be defined as the continued transformation of flows from the capital stocks, without their depletion, into outputs (Brunckhorst 2001). The levels of and changes in the stocks of various capitals can influence the resilience and adaptability of social-ecological systems. In this context, resilience has been defined as the amount of change a system can absorb while maintaining its same structures and functions, the system's ability to self-organize, and the degree to which the system is capable of learning and adapting (Carpenter et al. 2001). More succinctly, resilience is the systems' capacity to deal with change and continue to develop (Folke and Gunderson 2006). Although both the concepts of sustainability and resilience appear to be similar, there are some nuances that differentiate them. Conventional sustainability involves the maintenance of some 'ideal' static state, while resilience preserves the dynamic ability of systems to manage changes. In sustainability, the emphasis is on the steady state of capital stocks. Meanwhile, in resilience the emphasis is on monitoring changes in the stocks of capital that influence the system's capacity to endure disturbances.

Multiple theorists draw a distinction between the key factors affecting institutional systems as "fast" and "slow" variables (Light et al. 1995; Carpenter et al. 2001; Yorque et al. 2002). Fast variables can change quickly, with time domains on the order of years or in some cases even months, whereas slow variables may turn over on the order of decades (Light et al.

1995). Financial and physical capitals are considered fast variables. Human, social, and natural capitals, on the other hand, are slow variables. It typically takes many years, even decades, for rules, norms, values, and landscapes to change. Human skills and experience develop over similarly long periods of time. It has been argued that the resilience of social-ecological systems is controlled primarily by slow changing variables (Carpenter et al. 2001). This research explores the relative relationships of the different forms of capitals to the resilience of community-based conservation organizations. As such, it provides one test of this hypothesis.

A few researchers have used the capital stocks framework to assess the resilience or sustainability of social-ecological systems (Cocklin and Margaret 2003; Abel et al. 2006; Garnett et al. 2007). Others have explored relationships between a particular form of capital and system resilience. Diamond (2005) argues that societies that have persisted over time have taken society-wide measures to protect the stock of capitals, especially natural capital. The connection between social capital, human capital and resilience in social-ecological systems has also been a recent focal point of investigation for a number of researchers (Folke et al. 2005; Munasinghe 2007). Munasinghe (2007) emphasizes the role of social capital for building community resilience. He argues that social capital embedded within traditional communities made them resilient to the 2004 Asian Tsunami in Sri Lanka. Folke and others (2005) argue that human capital is critical for understanding disturbances and enhancing the adaptive capacity of complex systems. There is a relative dearth of empirical research in which all the five forms of capital and resilience are studied together. Because these theoretical frameworks (capital stocks and resilience) are critical to understanding complex

social-ecological systems, we have undertaken empirical research to explore the roles of the five forms of capital in contributing to the organizational resilience of grassroots conservation committees to the Maoist insurgency in Nepal.

The Study Site and Context

The Annapurna Conservation Area (ACA) is the largest protected area in Nepal (7,629 sq km). In 1992, the Nepali government granted legal authority to the National Trust for Nature Conservation (NTNC) – a national-level nongovernmental organization – to implement a community-based conservation model in the area. The Annapurna Conservation Area Project (ACAP) – a subsidiary of the NTNC – manages ACA with the help of 56 legally instituted grassroots level Conservation Area Management Committees (CAMCs). The National Parks and Wildlife Conservation Act 1973 defines conservation areas as those reserves managed for integrated conservation and development, in which local communities participate in management, extractive uses of resources are allowed, and tourism is permitted and promoted. The primary goal of ACA is "to foster conservation through rural development" (Heinen and Mehta 1999), and it has achieved reasonable successes moving towards the goal (Baral et al. 2007). We consider ACA as an example of a social-ecological system, because the local communities' extractive uses of resources are an integral part of the conservation area's ecology. About 120,000 people belonging to various ethnic groups, including Gurung, Magar, Thakali and Manangi, and Hindu castes (mainly Brahman, Chhetri, and lower caste), reside within the area. Owing to the ACA's biological, cultural, and landscape diversity, it is one of the most famous trekking destinations in the world. The highest number of

international visitors was 75,278 in 2000, and ACA was financially self-sustaining by levying entry fees on international tourists in times of peace (Baral et al. 2008).

CAMCs are local-level organizations created to conserve, manage and use natural resources within ACA. We will explore the degree to which available capital stocks appear to enhance the organizations' resiliency in the context of the decade-long Maoist insurgency (1996-2006) as a major disturbance. The insurgency compromised the integrity of Nepali protected areas to a large extent when the Maoist rebels destroyed infrastructure, killed park staff, and forcibly took over some parks (Baral and Heinen 2006). The insurgency also had consequences on the performance of CAMCs in ACA (author citation removed by SNR). In this study, we define organizational resilience as the capacity of the CAMCs to maintain their function as agents of conservation management during and following the insurgency. We draw upon capital stock theory and the resilience concept to address the question: which capitals stocks appear to have been most powerfully linked to the organizational resilience of CAMCs within ACA? To our knowledge, no empirical research with quantitative data has tested the relative influence of the five forms of capital on organizational resilience. We undertook this comprehensive snapshot assessment of 30 CAMCs in Annapurna to deepen our understanding about the linkages between different forms of capital and organizational resilience.

Methods

Sampling

The 1996 Conservation Area Management Regulation required that a CAMC be formed for each Village Development Committee – the lowest level administrative and political unit in rural Nepal – located within the conservation area. There are seven management units (or field bases) for NTNC within ACA: three lie on the northern slope and four on the southern slope of the Annapurna Himalayas. We selected two management units from the north (Jomsom and Manang) and two units from the south (Ghandruk and Lwang) for the study as we felt them to be the most representative of the area as a whole based on our experience, review of reports, and consultation with the staff of ACAP. Lomanthang, the third management unit in the north, is separately-managed under somewhat different rules, so it was excluded. Both Sikles and Bhujung in the south are similar to Ghandruk and Lwang in ecological settings, ethnic composition and economic status. We selected Ghandruk and Lwang to save time and reduce transportation costs. ACAP was originally started in Ghandruk. These four sample management units reasonably represent the diversity of ACA. Ghandruk, Lwang, Jomsom and Manang have 5, 7, 9 and 12 CAMCs, respectively. In Manang, we could not survey the jurisdictions of three CAMCs due to remoteness, time constraints and language barriers. The total number of CAMC jurisdictions surveyed was 30 (of the 56 total CAMCs).

The research was undertaken in the immediate aftermath of the insurgency from May to August of 2007. While the insurgency officially ended in November, 2006, peace had not been completely restored at the time of the research. ACAP staff from the Southern sector of

ACA, who had fled to nearby Pokhara due to the insurgency, had yet to return full-time to their field offices in ACA. We conducted interviews with all 13 ACAP staff members officially tasked with monitoring the 30 CAMCs in the study that endured the insurgency. The terms of current CAMC members at the time of the research began in 2003, around the time when the insurgency escalated in the area. At the time of field research, 14 members served on each CAMC's executive committee. As a result, the sampling frame for the 30 CAMCs consisted of 420 members. We targeted 210 members (seven in each CAMC) for one-on-one interviews. Except for the chair and secretary, the number and configuration of members differ in meetings. A combination of purposive and simple random sampling was most efficient and representative in our case. We selected the chairs and secretaries purposively, and the other members by drawing a lottery from the name list to reduce potential biases associated with convenience sampling. The interviews were semi-structured, with both closed-ended and open-ended questions.

The study's unit of analysis is the CAMC. While we could obtain direct measures of three capitals (physical, financial and natural) associated with each CAMC, no measurements of social and human capitals were readily available. We, therefore, aggregated individual level measurements collected in our interviews to an organizational level of CAMCs. Specific aggregate measurements and their validity are explained further below.

Measurement of variables

Physical capital: The CAMCs are required by law to have an external audit of all their assets annually and to make the auditor's report public. We thoroughly reviewed the audit reports

and found that one third of the CAMCs in our sample had made complete inventories of their physical assets as of June 2006 and reported their monetary value in the Nepali currency. These secondary data gave reliable estimates of physical capital. When the estimate of properties was unavailable, we generated the inventory of physical assets through interviews with the CAMC secretaries and ACAP rangers. We included office furniture, office buildings, and all office equipment (including items such as calculators, measuring tape and stationery) to estimate the physical capital of each CAMC. An engineer and four accountants from ACAP respectively estimated the local market value of CAMC office buildings and all other physical properties. The first author also verified physical capital in the field whenever it was feasible. Values were converted into monetary units (Nepali Rupee) and totaled. Although each CAMC had invested significant amounts of financial capital in infrastructure development such as road construction, drinking water facility, micro-hydro plants and schools, we excluded them from the analysis due to a lack of consistent record keeping across the CAMCs.

Financial capital: Financial capital was calculated as the sum of money each CAMC had in their bank accounts and the amount they had loaned to local borrowers on interest as of June 2006. These data came from the 2006 audit reports, all of which included these mandatory data, and were expressed in local currency (Nepali Rupee).

Social capital: It is argued that participation, trust and networks are critical dimensions for measuring social capital (Grootaert et al. 2004); therefore, these dimensions formed the basis of our operationalization. To measure participation, we asked each respondent to estimate the

percentage of households participating in activities organized by their CAMCs. While other forms of trust could also clearly be considered important, our specific trust concept focused on intra-committee trust because of our focus on the organization as the key unit of analysis. We asked each CAMC member how many other members of the committee he/she trusted in general. We avoided discussing the specific names of other members of the CAMC to reduce discomfort in the honest reporting of intra-committee trust. We examined both the means of these responses and their distributions within each CAMC to assess the impacts of variation from one respondent to the next. For both the trust and participation variables, a significant negative linear relationship existed between the mean and the variance ($r > -0.85$, $p < .001$). That is, as perceptions of trust and participation increased, variance in response across the members of each CAMC decreased. This indicates a general trend toward consensus. More importantly, from a measurement standpoint, it suggests that means of each of these variables are reasonable proxies of the perceptions of each entire CAMC. To further justify aggregation of these variables to the CAMC level, we computed the eta-squared statistic (η^2), which indicates whether individual responses within the same CAMC are more similar than individual responses in different CAMCs (De Dreu and West 2001). Eta-squared statistics for trust and participation were 0.27 and 0.44, respectively, and exceeded Georgopoloulos's (1986) minimum criterion of 0.20. "Networks" were conceptualized as conglomerates of groups or organizations that the CAMC can call upon for help. We asked the members to report entities that their CAMCs called upon for help during the insurgency and its immediate aftermath. The size of the help network was captured by the total number of reported groups and organizations for each CAMC. Because these three proxies for social capital were measured on different scales, we first standardized the unit of measurement by

converting them to z-scores. Standardization facilitates the comparison of the three proxies on the same measurement scale. As we had no strong basis for differential weighting, a sum of the z-scores was taken as an index of social capital. Each proxy was also analyzed as a single item.

Human capital: It is a common practice to use educational achievement as a proxy measure for human capital (Coleman 1988; World Bank 2006). Recognizing the multidimensionality of the concept, we also included two other proxies in our study: members' years of experience on the CAMC and their training. We asked respondents how many years they had spent in formal schooling, how many years they had served on the CAMC, and whether they had received any CAMC-task-related training while serving on the committee. Like social capital, these three proxies were first converted to z-scores then totaled to create an index of human capital. Each was also analyzed as a single item.

Natural capital: As a quantitative measure of natural capital, we used the area of land covered by pastures, water bodies, shrubs, and forests within each CAMC. Agricultural lands were excluded, because they are privately owned and outside the CAMC's jurisdiction. These secondary data were taken from ACAP's GIS database and measured in sq km. We also asked CAMC members about changes in the status of natural resources in their area over the past decade. Most respondents (87.4%) reported that the status of natural resources in their areas had improved considerably to a level of high quality. Little variation existed in our observations and interviews regarding the quality of natural capital associated with each

CAMC. As a result, we limited our measurement to quantity in this respect. This measurement may not be the most advisable in other contexts.

Organizational resilience: Resilience is difficult to measure due to its abstract, multidimensional nature (Cumming et al. 2005). In this study, organizational resilience is defined as the CAMCs' capacity to endure the Maoist insurgency and still retain essentially the same function. High resilience would be attributed to those CAMCs which endured the negative consequences of the insurgency and showed undiminished performance on their mandated tasks. The Conservation Area Management Regulation 1996, which lays out the tasks of the CAMCs, specifies that ACAP staff members must closely monitor all tasks performed by the CAMCs to comply with the Regulation. We asked the ACAP staff (n = 13) to rate each CAMC they supervised on a 10-point scale regarding its performance throughout the Maoist insurgency and up to the present time (roughly six months following the insurgency). Each staff member provided one score for each CAMC for the entire time period. The staff were given three reference points: 10 indicating that the CAMCs carried out all or almost all of their mandated functions; 5 indicating that the CAMCs carried out about half of their mandated functions; and 1 indicating that the CAMCs completely failed to carry out any of their mandated functions. Two to four staff rated the performance of each CAMC, and an average of their ratings was taken. Standard deviations among the evaluators ranged from 0.0 to 2.3 across the 30 CAMCs. We took the performance rating as the organizational resilience score of the CAMCs. While this performance rating may not capture all the dynamics of resilience, it matched very well with villagers' perceptions regarding CAMC

resilience and our qualitative assessments during the field research (author citation removed by SNR).

Data analysis

We built a regression model by taking the organizational resilience score (which observed a normal distribution) as an outcome variable and the five forms of capital as explanatory variables. Theories suggest that higher stocks of capital increase the resilience of a system, and the amount of available capitals following any major disturbance determines whether the system can rebound or survive (Holling 1987; Abel et al. 2006). We hypothesized financial, physical, social and human capitals to have positive linear relationships with the organizational resilience score. We predicted a parabolic relationship between natural capital and organizational resilience in which resilience would be highest at intermediate levels of natural capital. We therefore used a quadratic term for natural capital in the regression model. Because our proxy for natural capital is related to the amount of land area under a CAMC's jurisdiction, we follow Ostrom's (2001) logic that moderate parcel sizes might be most effective for management purposes, as necessary extraction rates might be more likely to exceed replenishing rates in small areas while challenges associated with monitoring and enforcement are much greater on larger parcels. The overall fit of the regression model to the data was assessed by the F-test, and the significance of model parameters (the beta values) was assessed by the t-test.

Open-ended questions relevant to this research solicited explanations for trust or distrust of other CAMC members and specific narratives about how the CAMCs endured the

insurgency. All interviews were recorded. Open-ended responses were transcribed in the Nepali language and then translated into English. These responses were used primarily to provide context and to enhance the interpretation of quantitative results.

Results

Summary statistics

We interviewed 190 members of 30 CAMCs, of which 23 (12.1%) were chairs, 23 (12.1%) were secretaries, 144 (75.8%) were general members, 161 (84.7%) were males, and 29 (15.3%) were females. Across ACA, female members constituted about 14% of the total membership of CAMCs; thus, our sample reflects the gender distribution of the population. In each CAMC, we interviewed 6.0 ± 1.2 (mean ± SD) members on average, and the overall response rate was about 91%. We could not contact some of the members because they were physically out of village, sick and bed-ridden, or, in one case, deceased. No replacement samples were drawn. The average age of respondents was 51.1 ± 12.1 years, with male members being older (52.1) than female members (45.6; $t = 2.61$, $p = .013$). The male members had more CAMC experience on average (7.1 vs. 4.6 years; $t = 4.94$, $p < .001$) and more education (6.1 vs. 3.6 years of schooling; $t = 3.21$, $p = .003$) than the female members. There was no significant difference between male and female members in the amount of training they had received ($\chi^2_1 = 2.17$, $p = .140$). A summary of study variables is given in Table 1.

Table 2 displays the bivariate correlations between the key study variables. The organizational resilience score showed significant positive linear relationships with both

social and human capital. While controlling for the total number of households within the jurisdictions of each CAMC, partial correlations were similar to bivariate correlations (e.g., resilience and social capital: $\rho_{OR.SC} = 0.59$, $p = .001$, and resilience and human capital: $\rho_{OR.HC} = 0.42$, $p = .023$). Among predictor variables, only two pairs of relationships were significantly correlated: natural capital showed a significant positive linear relationship with financial capital and negative linear relationship with social capital. While controlling for the number of total households within the jurisdiction of each CAMC, the partial correlation coefficients were similar to the bivariate correlations (natural capital and financial capital: $\rho_{NC.FC} = 0.41$, $p = .029$, and natural capital and social capital: $\rho_{NC.SC} = - 0.45$, $p = .014$). These correlations were not of the magnitude to cause multicollinearity in the regression model.

Capital stocks and organizational resilience

The regression model reasonably fit the data ($F_{5, 24} = 6.95$, $p < .001$) and accounted for 59.2% of the variance in the organizational resilience score ($R^2 = .592$). Because of the small sample, we ran additional diagnostic procedures to explore the goodness of fit of our regression model. The histogram of residuals mirrored a normal distribution, and there were no outliers or influential cases. Furthermore, the standardized residuals were randomly distributed. The Durbin-Watson test statistic was 2.4. Its value close to 2 validates the assumption of independent errors, i.e. the residuals from the regression line (errors) are not correlated with the explanatory variables (see Field 2005). This speaks to the robustness of the model. Tests for multicollinearity were negative. The variance inflation factor (VIF) values were below 1.8 and the tolerance statistics all above 0.6 (a problem arises when the VIF is greater than 10 and the tolerance statistics is below .2; see Field 2005). A scatter plot

with a significant linear trend of observed and predicted values of the organizational resilience score further suggest the robustness of the regression model.

Of the five explanatory variables included in the regression model, three were statistically significant: social capital, human capital, and the quadratic function of natural capital (Table 3). In support of our hypothesis, both social and human capitals showed positive linear relationships with the organizational resilience score. The correlation between the organizational resilience score and natural capital, which is a measure of a linear relationship, was not significant, but the quadratic term of natural capital in the regression model was statistically significant. This supports our hypothesis regarding the curvilinear relationship between natural capital and organizational resilience in which moderate jurisdictional scales have the greatest association with organizational resilience. Contrary to our hypothesis, the model did not reveal significant relationships between the financial and physical capitals and organizational resilience. To explore potential interactions between the five forms of capital, we included 10 two-way interaction terms in the regression model one at a time, but none was statistically significant ($t < 1$, $p > .10$). We therefore did not include interaction terms in the final regression model.

We also individually regressed each item making up the social and human capital indices on organizational resilience. Within the items that made up the social capital index, help networks ($\beta = 0.883$, $t = 3.88$, $p = .001$) and intra-committee trust ($\beta = 0.634$, $t = 2.79$, $p = .010$) appeared to be the most critical. Perceptions of local participation were not significant. Within the human capital index, the length of CAMC members' tenure on the CAMCs were

most linked with organizational resilience ($\beta = 0.586$, $t = 2.09$, $p = .045$). Educational achievement and training did not exhibit statistically significant relationships with organizational resilience.

Partial Eta squared values are an approximate measure of the proportion of total variance observed in the dependent variable (organizational resilience) explained by the model that can be attributed to each explanatory variable. Of the total variance of the organizational resilience score explained by the regression model (59.2%), social, natural, and human capitals accounted for the largest portions of the variance, respectively, with social capital explaining nearly twice the variance as each of the other variables (Table 3).

Open-ended responses of CAMC members confirmed the importance of intra-committee trust for the effective functioning of the CAMC in times of strife. When the insurgency escalated, and formal meetings were too risky to hold, CAMC members gave authority to the chairs and secretaries to make decisions about conservation and sustainable development independently of the committee. Under normal circumstances, a majority vote is required to make such decisions. Intra-committee trust allowed the CAMCs to continue to fulfill their functions. Interviews further revealed that highly resilient CAMCs (defined as those having the resilience score more than eight) effectively mobilized local groups when they could not fully function due to the insurgency. For example, forest management committees issued permits for forest products harvesting and took charge of forest monitoring, and women's groups undertook development activities, such as drinking water projects, when called upon. CAMC members also commonly asked outside organizations for help in times of need.

CAMC members who reported higher numbers of entities upon which they called for help, typically included such outside organizations as the United Nations Development Program (UNDP), the Red Cross, and the United Nations Children's Fund (UNICEF). That is, most CAMCs reported local help networks, but the most resilient ones also tended to report extra-local help networks.

Highly resilient CAMCs also had more members who had served prior terms on the committee. Members reported that the collective knowledge, experience, and skills held by these members allowed them to respond more efficiently to the insurgency. Their institutional memory allowed them to focus less on some of the more mundane challenges faced day-to-day by the committees under normal circumstances and more upon responding to the new challenges brought on by the disturbance. According to respondents, CAMC chairs and secretaries along with the more experienced and educated members typically negotiated with the rebels to maintain the CAMCs' performance. The committee members and ACAP staff reported that natural capital remained largely intact in the areas with resilient CAMCs even during the insurgency, except for a few scattered incidents of minor exploitation.

Discussion

Our empirical findings support the claims of other scholars that capital stocks are critical in building resilience in social-ecological systems (Adger 2000; Gunderson 2000; Diamond 2005; Abel et al. 2006; Munasinghe 2007). The study suggests that the stock of three types of capital – social, human and natural – were strongly related to the organizational resilience of

local CAMCs to the Maoist insurgency in Nepal. While social and human capitals exhibited positive linear relationships with organizational resilience, natural capital had a parabolic relationship. That is, CAMCs with jurisdictions of intermediate size of land area tended to be the most resilient. It is likely that all five forms of capital must be present at a certain critical level for organizations to function, but beyond those critical levels, different forms of capital might enhance resilience in different contexts.

Themes of intra-committee trust, help networks, and the duration of members' tenure on the committees were the elements of social and human capital stocks most strongly related to resilience. As hypothesized by McEvily and others (2003), intra-committee trust served to sustain goal achievement when monitoring and formal control mechanisms could not function during the insurgency. Intra-committee trust allowed members to cede responsibility to others when necessary. Local and external help networks also appeared to contribute to resilience. Highly resilient CAMCs built bridges with outside their organizations in times of need. They also formed strong bonds with local groups by effectively mobilizing them during the climax of the insurgency. The most resilient CAMCs had both local and extra-local (often international) help networks. Highly resilient CAMCs also had a larger number of more experienced members. These members served as a source of institutional memory and helped to guide the CAMCs in times of turbulence.

Financial and physical capitals exhibited no significant linear relationships with organizational resilience. This may have been due, at least in part, to the nature of the disturbance. One might hypothesize that greater stores of these capitals could actually attract

additional attention from insurgents at the same time they could support organizational resilience to external disturbance. The Maoist rebels set CAMCs' office buildings on fire, destroyed furniture, and damaged official documents. Most CAMCs deserted their office buildings during the insurgency for security reasons. The rebels also extorted donations from the CAMCs and local communities. Thus, the CAMCs with higher stocks of physical and financial capital were likely unable to build on these capitals during the insurgency. Even in times of peace, however, the CAMCs commonly operated with minimal physical infrastructure; many did not yet have their own office buildings at the time of this study.

The primary source of financial capital for the CAMCs was revenue generated by selling forest products. This helps to explain the correlation between financial capital and natural capital. The significant negative correlation between natural and social capital could imply that abundant natural capital may have lessened the perceived need for collective conservation action. Songorwa (1999) observed a similar situation in Tanzania, and this relationship has also been observed by Ostrom (2001) and Crook and Decker (2006). Alternatively, because our measure of natural capital relied upon the size of the jurisdiction of each CAMC, we may have simply observed an issue of scale in which larger jurisdictions may have harbored weaker social ties.

The findings have some meaningful implications for community-based conservation in this and other contexts. While there can be no standardized pre-defined pathways for social capital formation (Brechin et al. 2003), organizing collective action and providing opportunities to build networks may help to stem its depletion in times of crisis. Our study

suggests that opportunities for experiential learning (as evidenced by the importance of time spent on CAMCs) may also enhance human capital formation. The study also raises a question regarding the most appropriate scales for community-based natural resource governance. While our hypothesis was supported that moderate stores of natural capital, in the form of land area containing important natural resources, would be linked with organizational resilience, the coarse-grained measure of this construct limits our ability to speculate on its origins.

Carpenter and others (2001) have argued that the resilience of social-ecological systems is controlled primarily by slow-changing variables (social, human, and natural capitals) rather than the fast-changing forms of capital (financial and physical). This study suggests that this may commonly be true in the case of the organizations governing them too. While other contexts have their own mixtures of and interactions between capital stocks, the importance of slow-changing variables in Annapurna suggests some critical lessons for conservation institutions in other community-based conservation efforts. While it is certainly easier for NGOs and other conservation agencies to focus most efforts upon fast-changing variables, such as finance and physical infrastructure, slow-changing human and social capital variables may be critical to the organizational resilience and sustainability of community-based conservation. In Annapurna, each of the capital stocks has likely played a role in the success of community-based conservation, including the financial viability of conservation efforts, the natural and cultural features that make the site an attractive tourism destination, and the physical infrastructure in place to utilize them (Baral et al. 2008). Social and human capitals, however, appear to be the key variables separating more resilient CAMCs from less resilient

ones. These findings align with other studies that have found that inadequate attention to the development of social capital has led to unsustainable conservation efforts (Brandon and Wells 1992; Stern 2008). The findings also further substantiate previous findings that expectations of sustainable long-term conservation returns based on short-term development interventions, which typically make greatest gains in fast-changing variables, may be unrealistic in many cases (Baral et al. 2007).

Limitations

The study has several limitations. First, it is a cross-sectional study. This design element limits our ability to make causal assertions, as we could not track changes in the stocks of capital over time. Second, we had a small sample size to study complex organizational behaviors. In regression analysis, sample size can be important both for estimation and inference; however, what constitutes an adequate sample size and avoids sample size-related problems is not at all clear. In small samples, estimates are susceptible to the effects of outlying data points. The diagnostic results indicate that our model appears to be robust, because there were no outliers or overly influential singular data points. Third, there are limitations to the generalizability of these findings outside ACA, because the data come from one protected area and one type of disturbance in isolation from all the other events that might have affected these communities. Fourth, the measurement of capital stocks is fraught with difficulty. Although we have used more proxies to measure human capital than others (Coleman 1988; World Bank 2006), we have not controlled for the quality of education and training of the respondents. We also have limited measurements of other types of capital as well. For example, we did not measure social cohesion, access to information,

communication infrastructure, or empowerment and political action in the measurement of social capital (Grootaert et al. 2004). Our natural capital measurement is a single measure of land area under the jurisdiction of the CAMC that does not directly account for the quality of the capital. In our case, we observed little difference in resource quality, but this would not be reasonable assumption in other cases. We excluded some infrastructure development projects while measuring physical capital. According to the staff, ACAP strives to distribute funds for such projects more or less equitably between CAMCs within ACA, thus a mechanism for control, albeit an imperfect one, may limit the impacts of this shortcoming. Fifth, systematic data keeping is disturbingly scarce in ACA; this further complicated tracking how these variables have changed over time. We consider this research a first attempt to gauge the relative importance of capital stocks to the resilience of community-based conservation organizations. We urge future researchers to expand upon the measurements used in this study.

Conclusions

Building resilience in community-based conservation initiatives is critical if they are to endure disturbances and succeed in the long run. To this end, maintaining or enhancing the stocks of social, natural and human capitals can pay dividends in turbulent times. If international agencies, governments and NGOs successfully aid the development of social and human capital, then community-based organizations may be expected to show a higher degree of resilience to political instabilities in the developing world. More empirical research is needed to explore whether physical and financial capitals correlate with resilience in other contexts or whether there is some critical threshold level for these and other forms of capital.

Future longitudinal studies would further our understanding of the relationship between changing capital stocks and organizational resilience.

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Table 1: Summary statistics of the study variables of 30 CAMCs

Variables	Minimum	Maximum	Mean	Std. Deviation	Measurement Unit
Organizational resilience score	3.5	9.5	6.82	1.59	1-10 point scale
Financial capital	247,902	2,004,264	620,175.58	401,057.14	Nepali Rupee[1]
Physical capital	6,000	849,700	190,363.44	224,886.29	Nepali Rupee[1]
Natural capital	3.20	194.60	57.95	48.16	sq. km.
Social capital	-4.45	2.86	0.00	1.83	Index
Participation	62.7%	95.7%	83.5%	10.6%	Estimated percent of villagers participating in CAMC activities
Trust	8.33	14.0	12.43	1.37	Average number of members trusted by each interviewed member
Help networks	1	8	3.07	1.62	Number of help networks cited by interviewees within each CAMC
Human capital	-5.63	5.15	0.00	2.54	Index
Education	1.14	9.40	5.62	2.49	Average number of years spent in school
CAMC experience	4.00	10.83	6.68	1.51	Average number of years on committee
Training	0.0%	88.0%	58.8%	23.2%	Percent of members having specialized training

[1] US $ 1 = NRs. 75.57 on May 22, 2009

Table 2: A bivariate correlation matrix consisting of Pearson's product-moment correlation coefficients between the study variables (n = 30)

Variables	OR	FC	PC	NC	SC	HC
Organizational resilience (OR)	1					
Financial capital (FC)	.080	1				
Physical capital (PC)	.287	.264	1			
Natural capital (NC)	-.106	.427*	-.048	1		
Social capital (SC)	.563*	.036	.350	-.487*	1	
Human capital (HC)	.386*	.154	.274	-.204	.115	1

* significant at $p < .05$

Table 3: Regression model of five forms of capital on organizational resilience. The model fit statistics are $F_{5, 24} = 6.95$, $p < .001$ and $R^2 = .592$

Explanatory variables included in the regression model	Unstandardized Coefficients		Standardized Coefficients			Partial Eta Squared
	B	Std. Error	Beta	t	Sig.	
Financial capital	-0.00000074	.00000059	-.186	-1.248	.224	.061
Physical capital	-0.00000023	.0000011	-.032	-0.217	.830	.002
(Natural capital)^2	0.000098	.000031	.541	3.154	**.004**	.293
Social capital	0.707	.146	.815	4.856	**<.001**	.496
Human capital	0.256	.087	.409	2.942	**.007**	.265
Constant	6.776	.402		16.855	<.001	

CHAPTER FOUR

Legitimacy and Institutional Resilience in the Annapurna Conservation Area, Nepal

Nabin Baral and Marc J. Stern, article in review

Abstract

The concepts of legitimacy and institutional resilience are widely considered to be critical to the sustainability of community-based conservation in a changing world. We undertook empirical research to investigate these concepts in the Annapurna Conservation Area (ACA), Nepal. We conducted villager surveys during the fall of 2008 within the jurisdictions of six Conservation Area Management Committees (CAMCs), local entities in charge of community-based conservation in ACA. We used confirmatory factor analysis to develop scales for measuring the two latent variables (legitimacy and institutional resilience). Regression analysis revealed five variables that significantly predicted the villagers' perceptions of legitimacy: performance assessments of CAMCs, social norms as measured by perceptions of peers' attitudes towards CAMCs, empowerment as measured by villagers' perceived influence in the CAMCs' decision making processes, perceived benefits and costs associated with having the CAMC in a village, and reported levels of personal participation in CAMCs' activities. The legitimacy and institutional resilience scales showed a significant positive correlation with each other, though our research design could not assess the directionality of causation. We discuss the policy implications of these results for sustaining community-based conservation against disturbances.

Key words: Annapurna, community-based conservation, legitimacy, protected areas management, resilience

Introduction

It is argued that enforcement alone does not lead to effective management of protected areas (PAs) in the developing world (Brechin et al. 2002; Dearden et al. 2005; Stern 2008a). PAs need the support of local constituencies for their long-term survival, as voluntary compliance with PA regulations can play a critical role in conserving natural resources (Stern 2008a). A key to voluntary compliance is the development of perceptions of legitimacy among local populations (Gearey & Jeffrey 2006; Viteri & Chávez 2007; Pinkerton & John 2008; Stern 2008a). Brechin and others (2002: 46) define legitimacy as "any behavior or set of circumstances that society defines as just, correct, or appropriate." Mechanisms for achieving legitimacy and voluntary compliance with PA regulations vary. Some argue for providing social and economic benefits to local people living in and around PAs by integrating conservation with sustainable development programs (Wells et al. 1992; Baral et al. 2007). Others argue for devolving the authority to local communities to manage PAs (see Western et al. 1994). These arguments assume that local people are more likely to voluntarily comply with conservation regulations if those regulations are aligned with their own value systems.

The political, social and economic systems in which PAs exist can change abruptly, further complicating PA management. A decade-long Maoist insurgency (1996 – 2006) in Nepal serves as an example. The insurgency compromised the integrity of Nepali PAs to a large

extent when the Maoist rebels destroyed infrastructure, killed park staff, and forcibly took over some parks (Baral & Heinen 2006).

The concept of resilience is gaining popularity in the management of complex systems such as PAs because of its emphasis on adaptation to uncertainties and external disturbances. Resilience has been defined as the amount of change a system can absorb while maintaining its same structures and functions, the system's ability to self-organize, and the degree to which the system is capable of learning and adapting (Carpenter et al. 2001). Resilience is a critical property of systems for their sustenance during turbulent times.

We explore the concepts of legitimacy and institutional resilience with a case study from the Annapurna Conservation Area (ACA) in Nepal. Prior failures of multiple conservation programs in the Himalayas have been attributed to a primary focus on regulations and coercive enforcement (Bunting et al. 1991). In many other Nepali PAs, the Nepali Army has been deployed to enforce conservation regulations. In ACA, Conservation Area Management Committees (CAMCs) made up of local community members have been formed to serve as the primary managers of natural resources. CAMCs emphasize voluntary compliance of local people rather than enforcement. Developing perceptions of legitimacy among local villagers has been a key strategy since ACA's inception.

Legitimacy refers to the beliefs of local villagers that CAMCs are appropriate, proper and just organizations (Tyler 2006). Institutional resilience is operationally defined in two stages. We define the term 'institution' as the set of arrangements and processes that influence

decision-making within CAMCs, the community-based organizations charged with conservation regulation within ACA. As such, our analyses focus on the primary processes governing conservation at the local level (Ostrom 1990). We define institutional resilience in this context as the ability of the CAMCs to make nature conservation happen in the face of the Maoist insurgency. Our definition of institutional resilience thus refers to the maintenance of local-level functions critical to conservation during and immediately following the period of shock.

We report here on the confirmation of scales to measure the two theoretical concepts of legitimacy and institutional resilience in the community-based conservation (CBC) context using confirmatory factor analysis. We then explore what explanatory variables best predict perceptions of legitimacy. Finally, we discuss how legitimacy relates with institutional resilience. In doing so, we are able to highlight some policy implications of the research for sustaining CBC against disturbances.

Theoretical framework

In this section, we summarize the major theories that we draw upon in this study. First, we operationally define legitimacy in our research context. Second, we hypothesize antecedent (explanatory) variables we expect to enhance or otherwise influence perceptions of legitimacy. Finally, we operationalize the concept of institutional resilience for CBC.

We define legitimacy as collective beliefs that the CAMCs are appropriate, just, and proper governance bodies (Tyler 2006). Legitimacy is a complex, multifaceted social construct that

can be conceptualized in various ways. Tyler (1990), for example, describes the importance of perceptions of procedural and distributive justice to establish authorities as legitimate. Procedural justice refers to the fairness of processes while distributive justice refers to the equitable treatment of all parties in both processes and outcomes (Tyler 1990). In support of these theories, Stern (2008a, 2008b) found that local people's perceptions of legitimacy and voluntary compliance were most consistently associated with perceptions of the trustworthiness of PA managers to be fair and honest with populations neighboring parks. Suchman (1995) argues that legitimacy can also rely upon a 'taken-for-grantedness' of existing authority. We operationalized legitimacy by soliciting the perceptions of villagers regarding whether they trust CAMC members to work on behalf of villagers' interests (LM1), trust that CAMC members treat all villagers equally (LM2), trust CAMC members to be honest (LM3), think that CAMCs are the right authority to manage natural resources (LM4), think that most villagers abide by CAMCs' rules (LM5), and think that the decisions made by CAMCs should be obeyed (LM6). Please refer to Table 1 for details.

We hypothesized that legitimacy of the conservation institution in ACA could be brought about through a number of mechanisms, including local participation in CAMC activities, the empowerment of local people in CAMC decision-making, positive social norms, perceptions of past performance, and local assessments of the benefits and disadvantages associated with the conservation institution. Participation of stakeholders in policy formulation or other conservation-related activities can be critical if a conservation policy is to gain their popular support (Gearey and Jeffrey 2006). For example, Schumann (2007) found that local fishers in Chile showed more compliance with fishery regulations when they worked together with

ecologists in stock assessments. The level of participation of boaters in their related organizations was also related to the compliance behavior (Viteri & Chávez 2007). We hypothesized participation to be an antecedent variable to the development of the perceptions of legitimacy. We operationalized participation by asking villagers about the degree to which they had participated in their local CAMC's activities. Thus, the emphasis here is on physical participation.

Local communities may not resist outside pressures to exploit their natural resources if they are politically weak (Alcorn and Toledo 1998). The degree of local people's influence in shaping conservation policies at the local level can be one measure of their empowerment. We define empowerment as the capacity of villagers to influence the decision making processes within CAMCs, following the World Bank's definition (World Bank 2002). We asked respondents about how much influence they have had in CAMC activities and how often CAMC members would listen to their suggestions, concerns and problems[1]. Stern (2008a, 2008b) found local perceptions of park managers' receptiveness to local input to be directly related to local assessments of park managers' trustworthiness and to voluntary compliance.

Social norms can sometimes be more effective than formal regulations or enforcement mechanisms to ensure compliance (Agrawal 2001). Norms are socially constructed and shared beliefs, which determine what is commonly approved culturally. It is argued that

[1] Theoretically, asking this last question in a hypothetical scenario would have been preferable. In prior questionnaire surveys with rural Nepali villagers, however, we found that most respondents did not understand hypothetical situations. Moreover, we found interaction between local villagers and CAMC members to be quite common, so asking directly about CAMCs' receptiveness to local input was more appropriate.

organizations can accrue legitimacy by reflecting socially desirable norms, standards and values of their members (Suchman 1995). We operationalized social norms by asking the respondents to estimate the proportion of their friends and relatives that had favorable attitudes towards their local CAMC.

In forming beliefs about regime legitimacy, citizens often weigh the performance of the system (Diamond 1999). Performance-related assessments have also been shown to be predictive of perceptions of trustworthiness (Jennings 1998; Stern 2008b). We asked villagers directly to share their perceptions of the overall performance of their CAMCs.

The provision of social and economic benefits from PAs has been shown to garner local support for PAs in the developing world (Wells and McShane 2004; Stern 2010). The assumption in such a strategy is that self-interest will create a self-enforcing regime requiring lesser external enforcement (Stern 2008a, 2008b). We asked villagers to identify any benefits and costs they associated with the existence of their local CAMC. We then asked them whether they felt the benefits outweighed the costs, the costs outweighed the benefits, or whether they were about equal.

Resilience is difficult to measure in empirical research, but it can be defined as the ability of a system to maintain its function, structure, and identity (Cumming et al. 2005; Gunderson et al. 2006). In our case, the main function of the CBC institution is to secure nature conservation. In line with our definition of institutional resilience, we operationalized the concept by measuring the following perceptions of villagers during the time of the Maoist

insurgency: how active CAMCs were during the insurgency (IR1), the quality of their overall performance during the insurgency[2] (IR2), the extent to which conservation was happening in a village during the insurgency (IR3), and the role of the CAMCs in making conservation happen during the insurgency (IR4). Please refer to Table 2 for details.

Study Site and Methods

The Annapurna Conservation Area

The Annapurna Conservation Area (ACA) is the largest protected area (7,629 sq km) in Nepal, legally established in 1992 (though the project started in 1986 in Ghandruk). The area is managed by a non-governmental organization, the National Trust for Nature Conservation (formerly, the King Mahendra Trust for Nature Conservation), together with local communities organized into 56 CAMCs. The CAMCs are charged with designing and overseeing all conservation activities at the local level, and they work directly with local villagers. As such, day-to-day conservation work is carried out by the CAMCs. The NTNC serves only in a supporting role. This role was greatly diminished during the insurgency, as NTNC offices throughout the region were abandoned. As such, the CAMCs themselves were the primary operating CBC institution throughout the insurgency.

The National Parks and Wildlife Conservation Act defines conservation areas as those PAs managed for integrated conservation and development, in which local communities participate in management, some extractive uses of resources are permitted, and tourism is

[2] This measure showed only a weak correlation with the overall performance described earlier (r = .19). As a result, this measurement which focuses on performance during the insurgency appears largely independent of the overall performance measure.

permitted and promoted. The primary goal of ACA is to foster conservation through rural development (Heinen and Mehta 1999). About 120,000 people belonging to various ethnic groups, including Gurung, Magar, Thakali and Manangi, and Hindu castes (mainly Brahman, Chhetri, and lower caste), reside inside the area. It is one of the most famous trekking destinations in the world. The highest number of international visitors was 75,278 in 2000. ACA was financially self-sustaining by levying entry fees on international tourists in times of peace (Baral et al. 2008).

Sampling

We used a two-stage stratified random sampling technique to conduct surveys with villagers between September 2008 and January 2009. We first stratified sample CAMCs based on their performance. Baral and Stern (2010) classified 30 CAMCs under the jurisdictions of the four regional headquarters of ACA into three categories: high, medium and low resilience. Because of limited resources and time constraints, we could not survey any of the 18 CAMCs under the jurisdictions of Jomsom and Manang regional headquarters in the northern sector of ACA. Of the 12 CAMCs under the jurisdictions of Ghandruk and Lwang regional headquarters in the southern sector of ACA, 5 were high-, 4 were medium- and 3 were low-resilience CAMCs. We selected one CAMC belonging to each resilience category from each regional headquarters based on broadest ethnic representation and smallest transaction costs of conducting the fieldwork. The three selected sample CAMCs under the jurisdiction of the Ghandruk regional headquarters were Narchyang (high), Sikha (medium) and Ghandruk (low). The three selected CAMCs from Lwang were Rivan (high), Lahachowk (medium) and Lwang (low).

There are typically nine wards (settlements) within the jurisdictions of each CAMC. We randomly selected 3 or 4 wards from the jurisdictions of each sample CAMC. We randomly selected 4 wards and 30 households per ward when the total number of households per ward was low (less than 80 households in a ward), and 3 wards and 40 households per ward when the total number of households per ward was high (more than 80 households in a ward) within each jurisdiction. The average number of households in sampled wards ranged from 41 to 151. The electorate registers maintained by the Election Commission for the Constituent Assembly Election 2007 served as the most up-to-date sampling frame, because they included names of all the household heads and family members aged 18 and over residing in the homes of each ward. We targeted 120 households within the jurisdictions of each CAMC (targeting roughly 10% of all households). Of the total targeted 720 households, we successfully surveyed 661 households (91.8% response rate). We surveyed between 89 and 124 households within the jurisdiction of each CAMC, capturing about 11.4% to 32.4% of the total households in each. We did not follow up with households that we missed at the first attempt, and no replacement samples were drawn.

The unit of analysis was the individual. We targeted household heads for one-on-one interviews in sample households. In their absence, any member aged 18 and over and willing to participate was interviewed. Face-to-face interviews were conducted in the Nepali language, typically lasting about 20 minutes each. Most of the questions were closed-ended. Two open-ended questions asked respondents what they perceived to be the advantages and disadvantages of having the CAMC in their villages. Open-ended comments were also

recorded when respondents gave reasons for choosing a particular item in closed-ended questions. These responses provided insights that aided in the interpretation of the quantitative data.

Confirmatory factor analysis

Confirmatory factor analysis was performed using LISREL version 8.8 (Student Edition) on the 10 observed variables hypothesized to measure the two latent variables, legitimacy and institutional resilience. Because all the indicator variables were measured on an ordinal scale, we used PRELIS2 to compute the polychoric correlation matrix. The polychoric correlation coefficients assess the degree of association between two ordinal variables, and it is the preferred LISREL input matrix for ordinal variables (Jöreskog and Sörbom 1996; Roykov and Marcoulides 2006). There was no pattern in missing data, so we used a listwise deletion procedure that resulted in an effective sample of 625 cases. The hypothesized two-factor model is presented in Figure 1 where ovals represent latent variables and rectangles represent measured (indicator) variables. A one-way arrow signals that a variable at the end of the arrow is explained in the model by the variable at the beginning of the arrow. A two-way arrow signals covariance (shared variance) between two variables. The two latent variables were hypothesized to covary with one another.

Because the variables were measured on a 3-point ordinal scale, we used the generalized weighted least square (GWLS) estimator instead of maximum likelihood, as the latter assumes multivariate normality. GWLS estimates have the same properties as the maximum likelihood approach under a less stringent multivariate normality assumption and provide an

approximate chi-square test of model fit to the data (Schumacker and Lomax 2004). We used multiple criteria to assess the fit of the models, including the statistical insignificance of the chi-square test, the statistical significance of individual parameters, and the acceptable magnitude and direction of the parameter estimates (see Schumacker and Lomax 2004).

The first criterion is the non-statistical significance of the chi-square test. The test is used to test the null hypothesis that the specified model is a good fit to the data. Thus, a small chi-square value with a correspondingly large p-value is desirable for this statistic. The second criterion is the statistical significance of individual parameter estimates for the paths in the model. The critical values are computed by dividing the parameter estimates by their respective standard errors. The critical value is comparable to a t-value, and any value greater than 1.96 is considered statistically significant at the .05 probability level. The third criterion considers the standardized magnitude and the direction of the parameter estimates. We evaluated whether the parameter estimates were within the acceptable range of standardized values (-1 to +1) and whether a positive or a negative coefficient made sense for the parameter estimate.

To further validate the model, we also looked at additional model fit indices. The root mean square error of approximation (RMSEA) follows the logic of comparing a proposed model with the null model, which assumes no relationships between the variables. This is somewhat different than testing the conventional null hypothesis that a proposed model perfectly fits the population covariance matrix. Rather, it is used to evaluate the extent to which the model fails to fit the data. A RMSEA value less than or equal to .05 is considered acceptable. The

goodness-of-fit index (GFI) can be loosely considered a measure of the proportion of variance and covariance that a given model is able to explain (analogous to R^2 in regression). The normed fit index (NFI) compares a proposed model to a null model with no interrelationships between variables based on the differences of their chi-square values. The comparative fix index (CFI) also compares a proposed model with a null model and is a measure of improvement in the model fit when moving from the null to a proposed model. The GFI, NFI and CFI are descriptive fit indices, and their values greater than .95 are acceptable (a value of 1 signifies a perfect fit).

Multiple regression

We built a multiple regression model by taking the legitimacy factor score, computed by LISREL in the final confirmatory factor analysis model, as a response (dependent) variable. The five explanatory variables were selected based on the theories summarized in the theoretical framework section above. In this study, we hypothesized that greater degrees of villagers' participation in CAMCs' activities, more positive assessments of the CAMCs' performance, perceptions of greater benefits derived from CAMC presence, perceptions of a greater proportion of peers with favorable attitudes toward the CAMCs, and greater feelings of personal empowerment in CAMC decisions would lead to greater perceptions of CAMC legitimacy. After building the regression model, we ran additional tests to assess its robustness (fit).

Results

Sample characteristics

Of 661 respondents, 64.1% were men and 35.9% women. The age of respondents ranged from 18 to 88 years with the mean age of 47.9 ± 14.5 years. More than one quarter of respondents (29.2%) were illiterate (who could not read and write), and the literate (70.8%) had 5.5 ± 3.7 years of formal schooling on average. We assigned the respondents' economic status based on the dimensions of their houses, which is a reasonable proxy of the economic status in rural areas of Nepal (Baral and Stern 2010). Among respondents, we estimated that 27.2% were poor, 53.4% middle class and 19.4% wealthy. Most respondents belonged to four major ethno-religious groups: Magar (26.6%), Gurung (18.2%), Brahman/Chhetri (28.7%) and lower caste (23.3%). Only 7.4% of respondents had migrated into the study area from elsewhere.

Advantages vs. disadvantages

Local villagers reported several advantages and disadvantages of having the CAMC in their village. The villagers' responses were coded and tallied; the results are summarized in Figures 2 and 3. The benefits on average far outweighed the disadvantages, with the most commonly reported benefits reflecting elements of conservation and development. The 'conservation' category in Figure 2 was created by pooling the 263 villagers' responses falling within the three conservation sub-types: forest conservation (71.5%), wildlife conservation (15.2%) and nature conservation (13.3%).

The measurement models

The summary statistics of the measured variables included in confirmatory factor analysis models are given in Tables 1 and 2. We did not find support for the hypothesized model: the chi-square value was 59.13 for 34 degrees of freedom, which was significant at the .05 probability level (Figure 1). Although the alternative fit indices were within the acceptable range (RMSEA = .034, GFI = .99, NFI = .99 and CFI = 1.0), there was a need to explore better fitting models in order to meet the overall model fit criterion (i.e. an insignificant chi-square value). The post hoc model modification indices signaled three modification options: (i) an error covariance between the indicators LM2 and LM5 (χ^2_{33}= 50.24, p < .01, RMSEA = .029), (ii) an error covariance between the indicators LM2 and IR4 (χ^2_{32}= 42.49, p = .10, RMSEA = .023), and (iii) a path from the latent variable 'Resilien' to the indicator LM5 (χ^2_{31}= 42.49, p = .46, RMSEA = .021). The indicator LM5 loaded significantly on both the latent variables. This violated our assumption that each indicator loads on only one latent variable. We therefore decided to remove the indicator LM5 and re-run the model. In re-running the model without LM5, post hoc model modification indices did not signal a need for additional changes.

The resulting model had nine indicator variables, and each loaded on only one latent variable (Figure 4). The chi-square value was 30.47 with 26 degrees of freedom and the p-value was insignificant (.25). The alternative model fit indices (RMSEA = .017, GFI = 1.0, NFI = .99 and CFI = 1.0) gave additional support for the final model. All the parameter estimates had the correct sign, had an expected range of standardized values, and were statistically significant (t-values > 2.0). The standardized loadings represent the correlation between each

observed variable and the corresponding latent factor. R^2 values can be calculated by squaring the standardized factor loadings. The R^2 values measure the extent of variance in an observed variable explained a latent factor. The latent factor legitimacy could explain 30% (for LM4) to 71% (for LM2) of the variance in the observed variables. The latent resilience factor could explain 46% (for IR3) to 96% (for IR2) of the variance in the observed variables.

Our analyses address both the content and criterion validity of the scales. Content validity is the degree to which an instrument assesses the relevant aspects of the concept it is intended to measure, and can be evaluated by the confirmatory factor analysis results. The acceptable goodness-of-fit indices (Chi-square and RMSEA) in the confirmatory factor analysis provided evidence in support of the instrument's content validity. One measure of criterion validity, also known as predictive validity, is to evaluate the accuracy of an instrument in predicting the outcomes. We used one-way analysis of variance (ANOVA) to explore whether the mean of the institutional resilience score differed among the three groups of CAMCs (high, medium and low resilience) for predictive validity. There was a significant difference in means of the institutional resilience score among high, medium and low resilience CAMCs ($F_{2, 623} = 161.43$, $p < .001$). The post hoc Bonferroni multiple comparisons showed that all three CAMC groups significantly differed with each other in the institutional resilience score ($p < .05$).

Cronbach's alpha measurements were .74 for the legitimacy scale and .89 for the institutional resilience scale. Alpha values greater than .70 are indicative of an acceptable scale to measure latent concepts.

Predictors of legitimacy

The summary statistics of the explanatory variables included in the regression model are given in Table 3. All five variables included in the model were significant predictors of the legitimacy score (Table 4). The results of the ordinary least squares estimator suggest that our regression model is a reasonable fit for the data, as we rejected the null hypothesis that all coefficients in the model were zero ($F_{5, 619} = 63.84$, $p < .001$). The standardized residuals were normally distributed, further suggesting the robustness of the model. The independent variables in the model explained approximately 34% of the variance in the legitimacy dependent variable. Based on the standardized beta coefficients, performance assessments were the strongest predictors of legitimacy, followed by measures of social norms, empowerment, perceived costs and benefits, and levels of participation, respectively.

Relationship between legitimacy and institutional resilience

Factor scores of institutional resilience ranged from 1.04 to 3.11 with a mean and standard deviation of 1.88 ± 0.71. The legitimacy and institutional resilience factors showed a significant positive linear relationship ($r = .34$, $p < .001$). We cannot, however, establish the direction of any causal path, because both concepts were measured at the same time rather than longitudinally.

Discussion

The results suggest that the nine indicators used in the final confirmatory factor analysis model are reasonable measures of the concepts of legitimacy and institutional resilience in CBC. Five observed variables were reliable indicators for measuring legitimacy while four

indicators measured the institutional resilience concept. These scales could be further refined with additional cases covering a wider array of contexts.

A growing body of literature suggests that perceptions of legitimacy of authorities are linked to the fairness of the procedures by which they exercise authority (see Tyler 2006). Our research suggests that there are also other factors linked to perceptions of legitimacy. Organizations can accrue legitimacy by ensuring consistent performance, garnering favorable attitudes of wider constituencies, empowering local constituencies, offering instrumental benefits and providing opportunities to participate. These factors have been noted by others as well (Suchman 1995, Diamond 1999, Agrawal 2001, Wells and McShane 2004, Gilley 2006, Gearey and Jeffrey 2006, Viteri and Chavez 2007, Stern 2008a). Managers may be able to directly address these factors in order to garner legitimacy for CBC programs. A decision regarding which strategies to adopt may very from context to context.

Reference group theory (Merton 1968) can help to explain the some of the social components linked to the prevalence of positive perceptions of legitimacy throughout our sample. Perceptions regarding legitimacy tend to be largely based on the degree of accord with a person's values, beliefs and relationships. Individuals relate or aspire to relate themselves with reference groups, or relevant groups of other people they consider important, to help develop their own values, attitudes, and appraisals regarding various situations (Merton 1968).

In ACA, both the governed and governing are local villagers. Our results suggest that the more they interact in meaningful ways, the more likely locals are to view the CAMCs as legitimate. It appears that members of the CAMCs considered to be most legitimate have either have always been, based on their identities as locals, or have become, based on their styles of governance, members of relevant reference groups for local people. As such, conservation values held by these CAMC members are reflected in other local people as well, promoting perceptions of legitimacy for the CAMCs. In other words, common identities, frequent interaction, and receptiveness to local input may have combined to enhance views of legitimacy and voluntary compliance. As such, they may also be tightly linked to the resilience of the CBC institution in ACA. Stern (2008b) has demonstrated similar findings elsewhere. Others have also shown that local people are more likely to support conservation programs if the personal relationships between the governed and governing are amicable (Fiallo and Jacobson 1995, Ite 1996, Badola 1998).

Perceptions of performance were also strongly linked to legitimacy and resilience. Other conservation programs have failed, because power has been devolved to local communities without sufficient capacity-building (Wainwright and Wehrmeyer 1998). The CAMCs largely maintained their performance even during the turbulent times of the Maoist insurgency. This may attributed to over a decade of deliberate capacity-building in the region by external agents in the hope that CAMCs would some day be able to manage the area independent of external support (Baral and Stern 2010). Stern (2008b) also found that local perceptions of effective performance of park officials were a strong predictor of perceptions of legitimacy of park authorities.

Since the inception of ACA, local people have benefited in various ways from conservation programs (Baral et al. 2007; Spiteri and Nepal 2008). Prior research has shown the importance of instrumental benefits for garnering favorable attitudes towards nature conservation in general in ACA (Mehta and Heinen 2001). In this research, villagers reported greater advantages than disadvantages of the CAMCs. While these perceptions were linked to more positive perceptions of legitimacy, they explained less variance than perceptions of performance, social norms and villager's empowerment. This mirrors the findings of other research that reveal that while the provision of instrumental benefits is important, it may be insufficient on its own in building perceptions of legitimacy (Stern 2008a).

In the academic literature, it is argued that legitimacy may lead to resilient organizations, because constituencies are most likely to support organizations that appear just, proper or appropriate (Suchman 1995; Hamilton 2006). We could not, however, test this causal link due to limitations in the research design. We measured perceptions of legitimacy after the period of disturbance. Therefore, it is possible that the covariance could just as easily be explained by the CAMCs' resilience through the Maoist insurgency leading to perceptions of their legitimacy as it could by perceptions of legitimacy contributing to their resilience. We can only establish that these two concepts covary with one another in CBC. Future research could potentially establish the causal link between these two critical concepts by measuring them in a time-ordered sequence.

Conclusions

Our results contribute to the greater body of knowledge of CBC in three ways. First, we provide reliable and valid measures of the concepts of legitimacy and institutional resilience in CBC. We suggest that future research could adapt or directly use these measures as indexes, equally weighting the component variables, or by scaling the components through further factor analysis. Second, we uncovered some key predictors of legitimacy in ACA that further validate others' theoretical propositions and empirical findings. Those predictors included perceptions of performance, social norms, villagers' empowerment, instrumental benefits, and participation in CAMC activities. Third, we observed a significant correlation between legitimacy and institutional resilience in ACA. We recommend two major avenues for future research: (i) testing the scales in similar contexts to cross-validate the results to refine their measurement, and (ii) exploring the causal links between legitimacy and institutional resilience. Based on this research, we argue that the legitimacy and institutional resilience concepts can open new grounds for assessing the resilience of CBC against disturbances.

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Table 1: Summary statistics of the six scale items hypothesized to measure the latent variable legitimacy. * This item is measured on a 4-point scale: 4 = always, 3 = usually, 2 = rarely and 1 = never. It loaded on both the latent variables so it was removed in the final measurement model. All other items are measured on a 3-point scale: 3 = yes, 2 = sometimes and 1 = no for LM1, LM2 and LM3; 3 = yes, 2 = maybe and 1 = no for LM4; and 3 = yes, 2 = mostly and 1 = no for LM6. The Cronbach's alpha (α) measuring the scale reliability of the five indicators was .74

Variable Code	Scale items measuring legitimacy (Legitima)	4	3	2	1	Mean ± SD	Corrected Item-Total Correlation
LM1	Do you trust CAMC members to work on behalf of all villagers' interests?		66.9%	28.2%	5.0%	2.61 ± 0.58	.562
LM2	Do you trust that the CAMC members treat all villagers equally?		66.6%	23.0%	10.4%	2.56 ± 0.68	.582
LM3	Do you trust that the CAMC members are honest?		65.0%	27.5%	7.5%	2.57 ± 0.63	.592
LM4	In your opinion, is CAMC the right authority to manage natural resources?		86.7%	11.2%	2.1%	2.84 ± 0.41	.363
LM5*	Do you think most villagers abide by CAMC's rules?	38.1%	44.3%	16.6%	1.0%	3.19 ± 0.74	.428
LM6	Do you think that the decisions made by the CAMC should be obeyed?		88.2%	10.9%	1.0%	2.87 ± 0.36	.431

Table 2: Summary statistics of the four scale items measuring the latent variable institutional resilience. All the items are measured on a 3-point scale: 3 = very active, 2 = somewhat active and 1 = inactive for IR1; 3 = good, 2 = fair and 1 = poor for IR2; 3 = yes, 2 = somewhat and 1 = no for IR3; and 3 = very important, 2 = somewhat important and 1 = not important for IR4. The Cronbach's alpha (α) measuring the scale reliability was .89

Variable Code	Scale items measuring institutional resilience (Resilien)	3	2	1	Mean ± SD	Corrected Item-Total Correlation
IR1	How active was your CAMC during the Maoist insurgency?	19.2%	41.4%	39.4%	1.78 ± 0.74	.842
IR2	How do you assess the overall performance of your CAMC during the insurgency?	18.9%	44.0%	37.1%	1.80 ± 0.73	.844
IR3	Do you feel that conservation was happening in your village during the insurgency?	24.5%	53.8%	21.8%	2.02 ± 0.67	.564
IR4	How important was the CAMC's role for making the conservation happen during the insurgency?	19.7%	41.8%	38.6%	1.80 ± 0.74	.790

Table 3: Description and summary statistics of the exploratory variables used for predicting legitimacy (the response variable). a, b: The two indicators measuring empowerment were significantly correlated ($r = 0.61$, $p < 0.001$); therefore, they were summed arithmetically to compute a score for empowerment. All the explanatory variables were measured on a 3-point scale: 3 = often, 2 = rarely and 1 = never for participation; 3 = good, 2 = fair and 1 = poor for performance; 3 = the benefits outweigh any disadvantages, 2 = the benefits and disadvantages are about equal and 1 = the disadvantages outweigh the benefits for benefits vs. costs; 3 = most, 2 = some and 1 = almost none for norms; 3 = a lot, 2 = some and 1 = not at all for empowerment (a); and 3 = often, 2 = rarely and 1 = never for empowerment (b)

Variables	Operationalization of the explanatory variables	3	2	1	Mean ± SD
Legitimacy	Factor score computed by the LISREL program in the final confirmatory factor analysis model.				3.24 ± 0.55
Participation	How often have you participated in programs organized by the CAMC?	35.5%	50.4%	14.1%	2.21 ± 0.67
Performance	How do you judge the CAMC's overall performance?	52.6%	43.4%	4.0%	2.49 ± 0.57
Benefits vs. costs	Do you think the benefits of having the CAMC outweigh the disadvantages?	72.5%	26.2%	1.3%	2.71 ± 0.48
Norms	How many of your friends and relatives have favorable attitudes towards CAMC?	34.4%	55.8%	9.8%	2.25 ± 0.62
Empowerment	Index reflected the sum of the following two indicators a and b:				4.04 ± 1.24
a	How much influence do you think people like yourself can have in CAMC activities?	18.1%	51.4%	30.5%	1.88 ± 0.69
b	How often have the CAMC members listened to your suggestions, concerns or problems?	33.3%	48.6%	18.0%	2.15 ± 0.71

Table 4: Predictors of legitimacy, their regression coefficients (both unstandardized and standardized), t-statistics and their associated p-values. The model fit statistics are $F_{5, 619} = 63.84$, $p < .001$, $R^2 = .340$ and adjusted $R^2 = .335$

Variables	Unstandardized β	Std. Error	Standardized β	t -statistics	p- values
Participation	0.078	0.028	.096	2.83	.005
Performance	0.287	0.034	.302	8.34	<.001
Benefits vs. costs	0.124	0.042	.109	2.96	.003
Norms	0.188	0.034	.213	5.48	<.001
Empowerment	0.056	0.017	.128	3.40	.001
Constant	1.369	0.119		11.51	.001

Figure 1: Hypothesized measurement model for legitimacy and institutional resilience. The path coefficients are standardized loadings. The two latent variables are legitimacy (Legitima) and institutional resilience (Resilien)

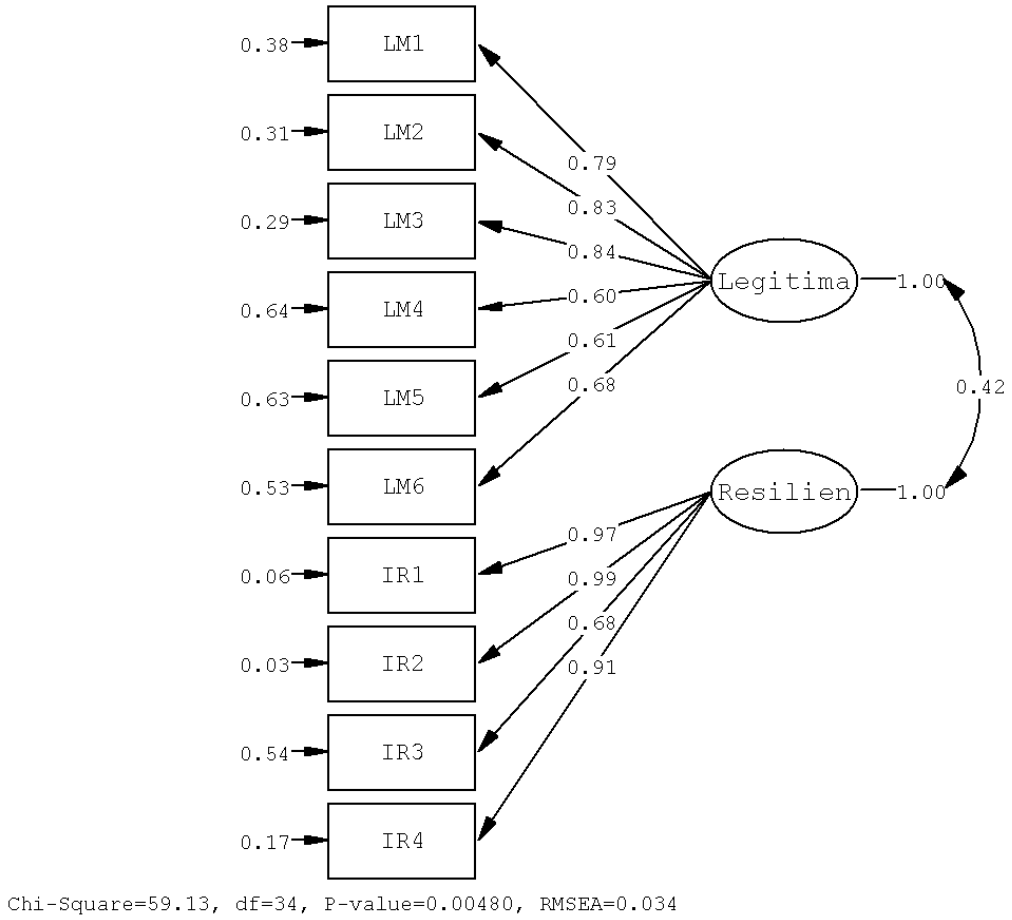


Figure 2: Most commonly reported advantages of having the CAMC in a village by local villagers in ACA. The frequency is calculated by dividing the total number of responses in each category by the total sample size (N = 661)

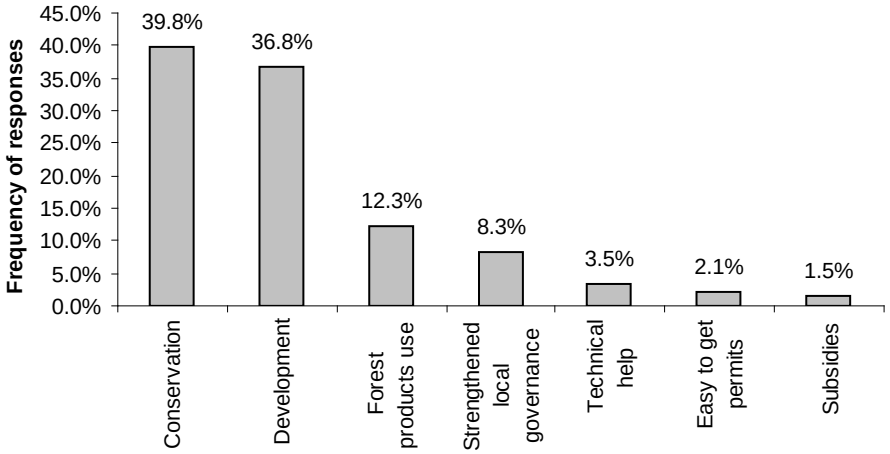


Figure 3: Most commonly reported disadvantages of having the CAMC in a village by local villagers in ACA. The frequency is calculated by dividing the total number of responses in each category by the total sample size (N = 661)

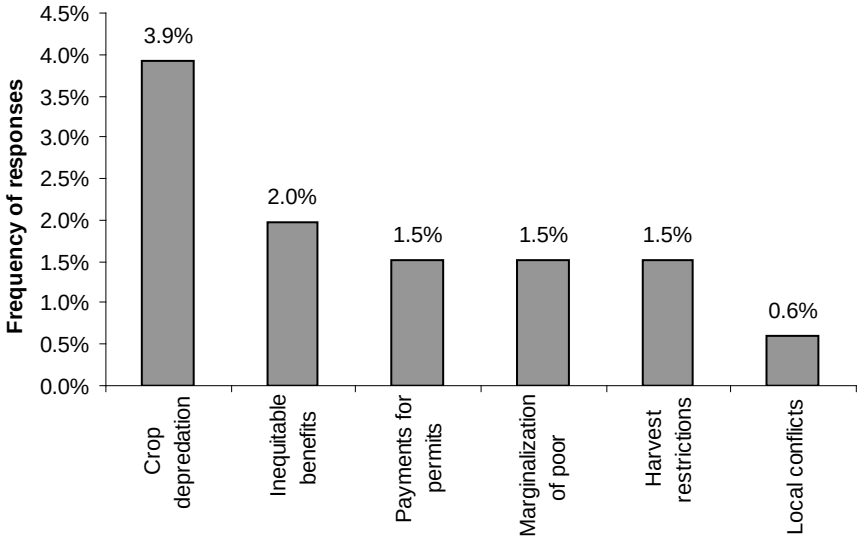
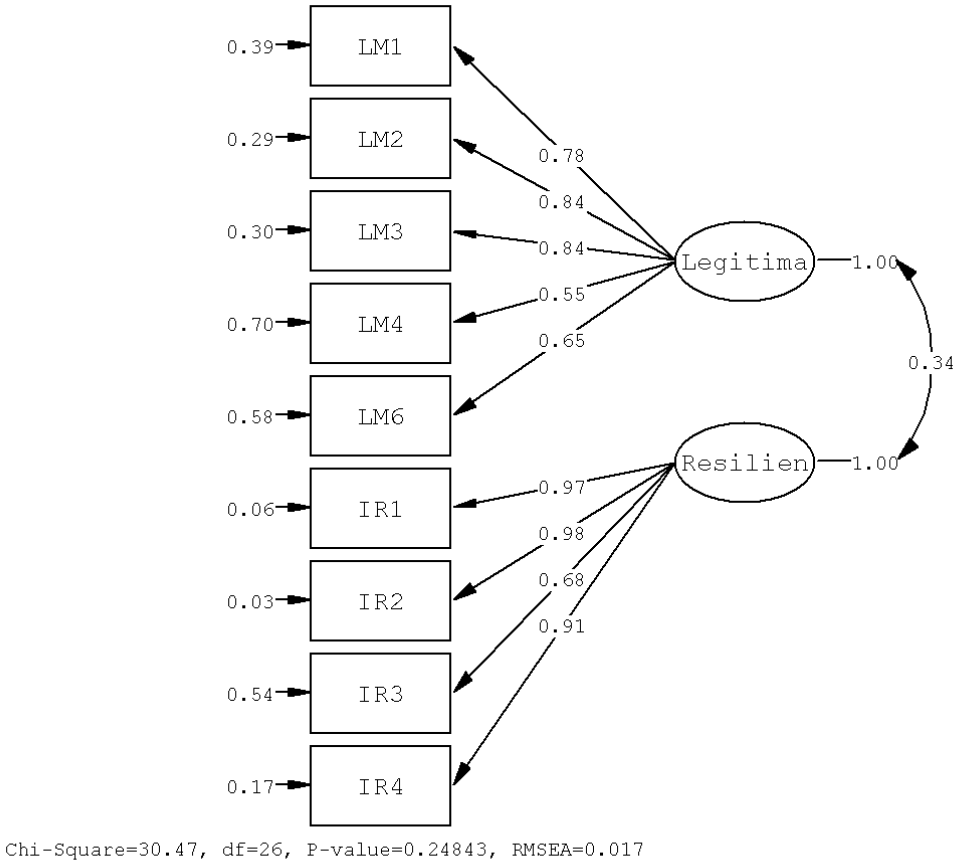


Figure 4: Final measurement model for legitimacy and institutional resilience. The path coefficients are standardized loadings. The two latent variables are legitimacy (Legitima) and institutional resilience (Resilien)



CHAPTER FIVE

Growth, Collapse and Reorganization of the Annapurna Conservation Area, Nepal: An Analysis of Institutional Resilience

Nabin Baral, Marc J. Stern and Joel T. Heinen, article submitted for review

Abstract

Community-based conservation institutions can be conceptualized as complex adaptive systems that pass through a cycle of growth, maturation, collapse and reorganization. Here we test the applicability of this four-phase adaptive cycle in the institutional context of the Annapurna Conservation Area (ACA), Nepal. We use the adaptive cycle to assess changes in structures and processes and to explore the past, present and possible future trends in ACA. We focus on the crisis brought about by the Maoist insurgency and changes that took place in ACA during and after this period. The conservation institution passed through one and a half forms of the adaptive cycle in five major historical periods in the Annapurna region since 1960. It appears to have been resilient to the insurgency, as the system maintained its identity throughout, avoided alternative undesirable states, and entered into the reorganization phase following collapse. All forms of capital and institutional performance decreased to some extent during collapse but institutional memory, available capital and some structural changes facilitated reorganization. The institutional system is reorganizing along the original regime, but it has also developed an alternative pathway that will transform it in the near term. We evaluate the usefulness, strengths and weaknesses of the adaptive cycle analogy in this application.

Key Words: Annapurna; adaptive cycle; community-based conservation; protected areas management; resilience; social-ecological system; sustainability science

Introduction

Modern community-based conservation institutions are representative of social-ecological systems in which humans are an integral part of ecosystems and an emphasis is given to a systems view of nature (Berkes and Folke 1998; Berkes 2004). They can be conceptualized as complex adaptive systems, because they are composed of interacting agents, have emergent properties resulting from agent interactions, can interact with and self-organize to find the best fit with the environment, and have processes that tend to be non-linear and unpredictable (Levin 1999; Gunderson and Holling 2002). Forward-looking and reflexive behaviors of human agents add complexity into these systems.

These characteristics have implications in the management and sustainability of community-based conservation. Over the past three decades, some community-based conservation initiatives have achieved a reasonable amount of success while others have not (West and Brechin 1991; Wells et al. 1992; Western et al. 1994; Ghimire and Pimbert 1997; Terborgh et al. 2002; McShane and Wells 2004). This phenomenon cannot be explained by simple rules of cause and effect, because ecological processes are interlinked with social processes (Berkes and Folke 1998). This requires complex systems thinking. A critical question with regard to successful models is how they adapt to change. This warrants the assessment of their resilience: the capacity to endure disturbances and recover. Building resilience within community-based conservation institutions can suppress negative feedback between

ecological and social systems (World Resources Institute 2008) and, with increased resilience, institutions may be better-prepared to accommodate environmental and social disruption.

Holling's (1987) adaptive cycle framework hypothesizes that resilience of an ecosystem changes as its structures and processes follow a four-phase cycle of exploitation, conservation, release, and renewal (Figure 1). The exploitation (r) phase is dominated by fast growing species adapted to dealing with stress that capitalize on disturbed environments. As structures and connections increase within the system, more energy and resources are required to maintain them. Thus, in the conservation (K) phase, a slow accumulation and storage of materials and energy (or capital) occurs. The r and K phases constitute the "fore loop," which is slow, predictable and analogous to ecological succession. Disturbances trigger the release (Ω) phase in which bound capital is suddenly released and accumulated structures collapse. Novelty can lead to the reorganization (α) phase in which released materials are mobilized to start another exploitation phase in a new cycle. The Ω and α phases are together known as the "back loop," which is fast, unpredictable and critical to determine the system's fate.

The adaptive cycle has three dimensions that capture dynamic changes in ecosystems: capital, connectedness, and resilience. Capital is the amount of available resources that determines the range of options possible for change. Connectedness is the degree of internal control of a system over external variability (i.e. its flexibility), and resilience is a measure of the system's vulnerability to disturbance. During the r phase, pioneer species grow and

accumulate capital. Because of accumulated capital and the system's high flexibility, resilience remains high. In the K phase, capital is bound within existing structures, preventing other competitors from utilizing it. System connectedness increases, becoming increasingly rigid. As a result, resilience decreases. Bound capital becomes increasingly fragile until released by disturbance. The system enters into the Ω phase and tight organization is lost, as is capital. As the system lacks flexibility and capital, resilience is low. In the α phase, the processes within the system minimize capital loss and reorganize remaining capitals to make them available for the next phase of exploitation. There is a higher degree of flexibility for the system to change and adapt, so resilience is high. In this phase, innovation and restructuring take place. During the slow sequence of the fore loop, connectedness and stability increase and capital is slowly accumulated. Accumulated capital tends to deplete during the release and reorganization phases. Any stock retained in the back loop influences the system's resilience.

The adaptive cycle dynamics at any scale are influenced by the dynamics of linked systems at both finer and broader scales. Panarchy refers to the hierarchical structure in which these various systems are interlinked (Gunderson and Holling 2002). In panarchy, each level operates at its own pace, protected from above by slower, larger cycles storing memory, but invigorated from below by faster, smaller cycles of innovation. Panarchy theory explains the evolving nature of complex adaptive systems as a nested set of adaptive cycles (Holling 2001). Thus, the sustainability of any system is determined by the functioning of adaptive cycles at each level and the communication between them.

To our knowledge, there is no study in which the adaptive cycle framework has been applied to the institutional context of community-based protected area management. We apply this concept to Annapurna Conservation Area (ACA), Nepal. ACA is an IUCN Category VI protected area managed by the Annapurna Conservation Area Project (ACAP) and local Conservation Area Management Committees (CAMCs). We define institution as the set of rules, regulations and processes that influence decision-making within ACAP and CAMCs. As such, the institution represents the primary processes governing conservation in the area (Ostrom 1990). We define institutional resilience as the capacity of the conservation institution to continue to perform; maintain its identity; and to adapt and reorganize during and following the decade-long Maoist insurgency in Nepal (Carpenter et al. 2001; Folke and Gunderson 2006). Our aim is to assess the usefulness of the framework in understanding the growth, collapse and reorganization of ACA since its inception. We describe historical events leading to ACA establishment, how is it governed, what contributed to its success, what made it vulnerable to disturbance, how it responded, and under which development paths it is reorganizing. By doing so, we also address the resilience of the conservation institution.

The Study Area

The Annapurna Himalayas includes ecosystems ranging from sub-tropical forests to trans-Himalayan cold deserts. The region was legally gazetted as a Conservation Area of 7,629 sq km in 1992 (Heinen and Shrestha 2006). A pioneer experiment of integrating natural and social systems into Nepalese protected areas management has been carried out here since its establishment. In the past, low human population densities belonging to various ethnic groups engaged primarily in subsistence agriculture, resource extraction and semi-

transhumance livestock herding. At present, about 120,000 people belonging to various ethnic groups of Tibetan and Indo-European origin reside inside the area. Major economic activities include subsistence agriculture, recruitment in security forces (mainly the Indian and British Army), small businesses, seasonal migration to cities, and tourism. ACA is a representative example of a social-ecological system because local extractive uses of resources are an integral part of the area's ecology.

The National Parks and Wildlife Conservation Act defines conservation areas as those reserves managed for integrated conservation and development, in which local communities participate in management, some extractive uses are permitted, and tourism is promoted. The primary goal of ACA is to foster conservation through rural development (Heinen and Mehta 1999). At the local level, communities organized into 56 CAMCs manage ACA. All CAMCs are similar in that they operate under the same legal framework, work to fulfill legitimate local demands for resources, and integrate traditional resource management into protected area management. They differ in ethnic composition, socio-economic indicators, and ecological settings.

Research Approach and Methods

We draw upon a series of cross-sectional studies and integrate both insider and outsider perspectives into this research. The first author worked for ACAP in 2001 and 2002 in the capacity of Conservation Officer, and participated in policy and management designs. Since then he has closely followed developments in the area. The first author undertook one month of field research in 2004, two months in 2006, four months in 2007, and four months in 2008

for this study. This roughly spanned three important time periods in the area: pre- Maoist insurgency, during the insurgency and post-insurgency.

During the summer of 2007, we conducted semi-structured interviews with 190 executive members of 30 representative CAMCs and 13 ACAP staff. We also solicited villager perceptions of the trustworthiness of CAMC members and the legitimacy of CAMCs through quota sampling of 207 households lying within four management units. In the fall of 2008, we interviewed 661 households in six CAMC management units selected by stratified random sampling. As a follow-up, we interviewed 22 executive members (both new and old) of 12 CAMCs and six ACAP officials to gather information about what changes had occurred during the previous year (Baral and Stern 2010, Baral and Stern in review).

We also drew upon qualitative methods such as document reviews, key informant interviews and direct observation. All interviews were recorded and transcribed in Nepali. English translation was done for information deemed highly relevant to the main question. We reviewed scholarly articles, reports, official records, legal Acts and financial documents related to ACA, and we had access to meeting minutes books for 11 CAMCs and other records at ACAP headquarters in Pokhara.

Given the area's history, about two decades (1986 to 2008) is a reasonable time scale to assess institutional resilience. Specifying time scale is critical because the adaptive cycle distinguishes between fast and slow variables (Walker and Abel 2002; Light et al. 1995). The classification of system components as fast and slow variables depends upon turnover time

and the type of the system under investigation (Carpenter et al. 2001). Financial and physical capitals are fast variables, while human and social capitals are slow and it typically takes many years to build trust. Human skills and experience develop over similarly long periods of time. Carpenter and others (2001) argue that system resilience is more powerfully dictated by slow variables than by fast variables.

Resilience is difficult to measure due to its abstract, multidimensional nature; however, it can be operationalized as the ability of a system to maintain its identity (Cumming et al. 2005). In our case, the institution's primary identity is that of a functioning conservation area. We operationalize this identity by focusing on several managerial attributes including the intentional management of the area through conservation planning undertaken in CAMC meetings and the maintenance of key conservation functions, such as a permitting system for resource harvest, restrictions on livestock grazing, controlling hunting, and maintaining the overall quality of natural resources in the area.

We built an historical profile for the region by summarizing the events taking place at the national and local levels from 1951 to 2008 to depict the system's development pathway (Table 1). The focal scale was the organizational units of ACAP and CAMCs, and we link changes at the national level to this focal level. Furthermore, we quantified structural changes in CAMCs during and following the insurgency and computed an ethnic diversity index of CAMC members using Shannon's diversity index (Krebs 1989).

The Establishment of ACA

The Forest Nationalization Act 1957 allowed the Nepalese government to assume ownership of all private and communal forests (Acharya 2002). As a consequence local communities were no longer permitted to manage forests under the common property regime of the past. Centralization of authority made forest resources de-facto open access, because the government could not enforce rules at the local level and local communities were alienated from management. Consequently, forest resources were depleted rapidly (Agrawal and Ostrom 2001), and corruption by government officials exacerbated the problem. Many older CAMC members tell of the need to bribe government officials (i.e. Forestry Department) to get a permit to fell trees.

Nepal formally opened to the outside world in the 1960s, and the Annapurna region witnessed an influx of international visitors due to its scenic attractions, rich culture and challenging landscapes. As the number of visitors increased, negative environmental impacts of tourism emerged. Deforestation increased as forests were cleared to build hotels and meet new energy demands. An older CAMC member's statement aptly summarized the situation: "We had to walk more than an hour to collect firewood, because forests surrounding the village were all gone." Tourism became a driver of change. Many scholars highlighted the problems and prospects of the Annapurna, arguing for protected status given the fragile nature of its mountain ecosystems and its high cultural and natural value (Sherpa et al. 1986; Stevens 1997). Concurrently, local leaders also became aware of the deteriorating environment. The concept of nature conservation thus appealed to many.

The Nepalese monarchy ushered in the era of modern conservation and played a crucial role in the establishment of protected areas (Bhatt 2003). In 1985, then King Birendra issued a directive to protect the area by striking a balance between development and conservation, and providing maximum benefits from tourism to local people (Sherpa et al. 1986). The King Mahendra Trust for Nature Conservation (KMTNC) – a national nongovernmental organization spearheaded by the monarchy and established by legislative act in 1982 – took charge of implementing the Royal directive. A three-member study team commissioned by the Trust, which consulted with local leaders and villagers, recommended the creation of a Conservation Area in the region, fearing that the more restrictive national park status would cause resentment among local people. In 1986, the government approved the pilot operational plan, and KMTNC officially launched ACAP in an 800 sq km area around Ghandruk village in the same year. The failure of government institutions, rapid environmental degradation, concern of outside scholars, support by local leaders, and interests and involvement of the Royal Family were all critical factors that led to the establishment of ACA.

Governance Structures and Processes

A basic tenet in ACA management is that the area should be administered by, and not for, the community (Bunting et al. 1991). Grassroots CAMCs have been involved in management since inception. In 1992, the Nepalese government gave KMTNC/ACAP the legal authority for ACA's management for 10 years. The enactment of the 1996 Conservation Area Management Regulation legally recognized CAMCs as local managers of ACA and secured the participation of local communities in decision making. Per the Regulation, a CAMC is

formed within each village development committee (VDC). A CAMC consists of nine locally-elected members, five members nominated by ACAP staff, and the VDC chair. The tenure of CAMCs is five years. Within the jurisdictions of each CAMC, specific subgroups (e.g. tourism management, forest management, women's or youth clubs) can be formed. Most decisions are by consensus; 90.0% of members we interviewed reported that they never disagreed with CAMC decisions. In some cases, decisions are made by simple majority vote.

Power is distributed between ACAP and the CAMCs. When asked about the allocation of power, 53.2% of CAMC members stated that their present power is adequate while 46.8% wished for more. About 87% of CAMC members felt that ACAP staff consult with them regularly, and all ACAP staff we interviewed stated that they take input from CAMCs while making decisions. These measurements were taken immediately following the Maoist insurgency in 2007. The Regulation allows ACAP to delegate authority to CAMCs, which in turn can devolve authority to subcommittees. ACAP and CAMCs share managerial responsibilities for ACA. ACAP collects tourist fees, allocates resources to CAMCs, prepares overall management plans, complies with national legislation and coordinates with the central government. CAMCs manage natural resources within their jurisdictions, collect revenues from harvest permits, implement conservation and development programs, mobilize local groups, and monitor all activities. The working modality of CAMCs capitalizes on local knowledge accrued through past practices. Thus, both traditional and modern knowledge systems guide management. This integration can also facilitate learning between the two organizations.

The cross-scale interplay of institutions is necessary to address governance at various levels. This requires linking institutions horizontally across space and vertically across levels of organization (Ostrom et al. 2002; Young 2002). In ACA, horizontal linkages include networks of CAMCs, subgroups and local NGOs. Appointing VDC chairs as de-facto CAMC members also facilitates horizontal linkage. ACAP takes the lead in building vertical linkages with higher-level actors such as the central government, national and international donors, and the regulating organizations of international conservation accords. Subcommittees and groups are at the lowest level. Above them are CAMCs, all of which are under the organization of ACAP. They have a reasonable degree of autonomy and form a hierarchy through nested governance structures. This sort of governance arrangement generally facilitates smoother navigation of the adaptive cycle's back loop (Ω and α phases). An ACAP official gave the following reason for success: "Governance of ACA has been efficient due to the involvement of actors from the village head to the state head."

Growth and Building of Capital

Success of the pilot project in Ghandruk led to the successive two-stage expansion of ACA from 800 to 7629 sq km, suggesting the entrance of the system into the rapid growth (r) phase. The legal mandate for ACAP to manage ACA for 10 years secured proprietorship of communities over natural resources. This has garnered local support for conservation as expressed by one member: "With the establishment of ACA, the government legally returned our usurped rights over natural resources. Now, we are the manager and owner of the resources of our area." ACAP implemented various integrated conservation and development projects (ICDPs) with themes including resource conservation, alternative energy, tourism,

rural development, education and extension, sustainable agriculture, cultural conservation, and women's empowerment. In the r phase, the expansion and implementation of programs are facilitated by competent ACAP staff, of whom about half are from the area (Heinen and Kattel 1992; Bajracharya 2003).

Nepal's ACA experiment coincided with the international conservation movement that advocated the integration of social and natural systems and became instrumental to the emergence of ICDPs (McKinnon et al. 1986; Wells et al. 1992). This made it easier for ACAP to attract international donors, and, in the first five year budget ($2.5 million), 75.0% was supplied by international sources (Stevens 1997). Subsequently, tourist fees provided a regular source for project finances. The number of tourists rapidly increased from 25,000 in 1984 to a high of 75,278 in 2000 (Figure 2). The collection of tourist entry fees was made possible only because of Royal patronage. Tourism provided financial resources, empowered local communities and reduced environmental impacts to some extent (Nyaupane and Thapa 2004; Baral et al. 2008).

The emphasis in ACA has been on institutional strengthening and local capacity building, and the diversity of local institutions has increased since inception. As of 2000, there were 75 forestry committees, 10 endangered wildlife committees, 27 tourism committees, 13 hydroelectric committees, 13 monastery committees, 18 saving and credit groups, and 290 women's groups (ACAP 2001). ACAP had also provided 4,467 villagers with specialized trainings. During the same period, 7,267 villagers participated in adult literacy classes, and

489 girls received scholarships to attend school (ACAP 2001), all of which contributed to the development of local human capital.

Trust between villagers, CAMC members and ACAP staff has also developed over the years. About 87% of members stated that they trust villagers in general and villagers conferred substantial degrees of trust to CAMCs (Baral and Stern, in review a). Internal trust within CAMCs has also developed: on average, one member trusts 88.6% (between 12 and 13) of the other 14 committee members in general. The levels of trust building between CAMCs and ACAP are summarized in Table 2. The local origin of and frequent interactions with ACAP staff has helped to build trust for them among CAMC members and local people. About half (50.5%) of the CAMC members stated that they interact with staff at least once a month, and more than two thirds (71.1%) reported that staff understand local cultures well. CAMCs regularly organize collective actions to manage resources and implement sustainable development programs. Building trust and undertaking collective actions are closely related to investments in social capital.

After the establishment of multi-party democracy in Nepal in 1990, democratic governments embraced the broader concept of local participation in conservation, and local NGOs became prominent actors. The democratic governments passed regulations that were favorable to ACA operations. Almost all CAMC members (97.9%) mentioned that the conservation area is appropriate for their region. Members also estimated on average that 85.3% of villagers had positive attitudes towards ACAP.

ACA achieved reasonable success in averting a 'tragedy of the commons' with secured property rights and active local management. This is supported by the fact that 87.4% of CAMC members reported that the status of natural resources had improved over the past decade. Furthermore, the stocks of other capital (human, social and financial) have accumulated over the years. Available capital, competent ACAP staff, secured property rights, and local support had all triggered the rapid growth of institutions within ACA.

Conservation Success and Efficiency

After a decade of intervention, many first generation problems of the region had been addressed, further reflecting the entrance of a relatively stable conservation (K) phase. Negative impacts of tourism had been reasonably contained, and dependency on forest resources was reduced through plantations and alternative energy programs. Both ACAP staff and CAMC members stated that afforestation programs were likely to be phased out soon because most barren land had already been planted. One member described his observations of changes in resource use: "In the past, there were many pastoralists who overgrazed pastures, but now there are so few that we are afraid of losing them all."

As a conservation institution, ACAP has achieved efficiency in implementing its policies. CAMC members favorably rated all four indicators used to assess the efficiency of the institution (Table 3). ACAP and the CAMCs have each received several international and national awards in recognition of their contributions to conservation and sustainable development. Independent evaluation by scholars also supports the claim that conservation programs are successful in ACA (Bajracharya et al. 2005; Heinen and Shrestha 2006; Baral

et al. 2007). When asked to rate success of conservation programs on a 5-point scale, 50.5% of members ranked them 'highly successful' while 42.6% ranked them 'successful.' One member succinctly put how increasing efficiency gave ACAP an edge over potential competitors, "Many NGOs do not venture to work within ACA just because of the fear of being in the shadow of ACAP and losing the competition."

Local villagers considered the conservation institution to be legitimate. When asked, "is the CAMC the right authority to manage natural resources?" 92.2% of villagers said yes. In addition, 77.3% agreed that most villagers abide by CAMC rules. About 76% of members mentioned that the CAMCs are highly representative of local people, and 82.6% of members believed the distribution of conservation benefits to be equitable.

An increase in forest cover has led to increased populations of wildlife, which has led to more crop and livestock depredation. No compensation measures are yet in place. Most villagers we surveyed stated that this is the biggest disadvantage of ACA. Also, spatial inequality in tourism, resource allocation, and development within and among CAMCs has largely remained unresolved. The failure of the institution to solve these problems may be due to increasing rigidity typical of the conservation (K) phase of the adaptive cycle. The institution also failed to act proactively to avert some expected consequences of the Maoist insurgency. ACAP staff and CAMC members stated that they perceived threats of the insurgency at a personal level but failed to devise strategies proactively at the organizational level, which may have made the organization more vulnerable to this major disturbance.

The Maoist Insurgency and Collapse

A series of events happening at the national level from 2001 to 2006, including the Royal Palace massacre, the declaration of a state of emergency, and the coup by King Gyanendra, were instrumental in increasing the vulnerability of ACA. The Maoist's main goal was to topple the monarchy and establish a republic. The rebels began attacking ACAP and CAMC offices (Baral and Heinen 2006). In response to our question about why rebels attacked ACAP, a local Maoist leader said, "ACAP was established and operated under the monarchy's leadership. The only reason we attacked it was its ties with the monarchy." Royal patronage – one of the critical factors for ACA's success – became a liability during the insurgency. ACAP and the CAMCs also failed to address some other issues such as the low degree of female and low caste participation. In some CAMCs, persons of lower castes, those who tend to be poor, did not have access to resources and only a handful of wealthy people benefited from tourism (Baral et al. 2008). Maoists exploited these shortcomings to garner some local support and used them as a pretext for their attacks.

The government declared a state of emergency in 2001 and deployed the Royal Nepali Army to contain the insurgency. The army then banned all group gatherings. The result was regular CAMC meetings nearly ceased. Security forces harassed CAMC members and arrested some on the pretext that they supported rebels. CAMC members also felt threatened by the rebels and programs such as forest patrols that required mass participation were temporarily abandoned for fear of encounters with either the army or rebels.

At first, Maoists extorted donations from ACAP staff members. They later forcibly evicted staff from field bases that fell within areas of their influence. Rebels bombed ACAP headquarters at Pokhara and destroyed four regional headquarters and four rural offices. Rebels also vandalized three CAMC offices and intimidated, coerced and even killed local leaders who supported ACAP (Baral and Heinen 2006). Of 190 interviewed CAMC members, 17.9% stated that they were intimidated by rebels into not serving on the committee, yet no member formally resigned. Rebels killed three local conservation leaders who opposed them. Some CAMC members and villagers migrated to urban areas for security when the insurgency escalated. Of 30 surveyed CAMCs, eight reported cases of villager displacement by insurgents. The highest number of households abandoning one area was 38 in Ghandruk, the village of ACA's origin. CAMC members reported that there were incidents of resource plundering (poaching for meat by the rebels and cutting of trees by some locals), but not at a large scale. The lack of law and order both at the national and local levels during the peak of the insurgency took a toll on the number of visitors in ACA: entries decreased from 75,278 in 2000 to 37,901 in 2006. This translated into deficits for several years, and, of 242 staff members, 70 were laid off.

We define the collapse (Ω) phase as that in which all forms of capital declined and the performance of both organizations (ACAP and CAMCs) was compromised due to the insurgency. Layoffs of staff, displacement of villagers, and slaying of local leaders decreased human capital and resulted in the loss of institutional memory. Calling off regular meetings and collective action prevented new social capital formation. The destruction of

infrastructure decreased physical capital. ACAP and the CAMCs could not function to their potential. The collapse, however, was not complete.

When ACAP offices were displaced, CAMCs managed to work independently in spite of this. Their performance, however, varied. Based on staff assessments and field research, there were 9 ‘high’, 12 ‘medium’ and 9 ‘low’ performing CAMCs during this period. High performers initiated actions independently and often accomplished their goals despite the insurgency. Medium performers had capabilities to work independently, but their performance depended upon ACAP inputs and the intensity of the insurgency in their area. Low performers were more dependent upon ACAP and often failed to accomplish goals in its absence (Baral and Stern 2010). ACAP supported CAMCs from Pokhara, and local staff maintained contact with members and followed project activities informally. In some CAMCs, members gave authority to chairs and secretaries to make decisions on behalf of the committee. In others, they devolved authority to local subcommittees or groups. All this suggests the survival of the conservation institution during the insurgency (NTNC 2008). While committee meetings decreased in some cases and some felt that illegal hunting increased, more than 80% suggested that the status of natural resources in ACA did not diminish during the insurgency (Tables 4 and 5). These findings support the claim that ACA largely maintained its identity as a functional conservation area during the insurgency.

Renewal and Looking Forward

The Maoist insurgency officially ended in November 2006 following the relinquishment of absolute power by the King. KMTNC was renamed the National Trust for Nature

Conservation (NTNC) and brought under the patronage of the Prime Minister and the ministry in charge of the protected areas, which was headed by a Maoist at that time. These events helped to reorganize CAMCs and ACAP, and to garner support of the former rebels. At the time of the 2007 field study, CAMCs were reinitiating regular meetings and inducting new members into vacant posts. In some, former rebels became committee members. ACAP staff members returned to field bases in September 2007, and the four regional headquarters of the southern sectors were re-established. Regarding their return to field bases, one staff member said, “We received warm welcome from the villagers. I was glad to see that even the Maoists came forward to welcome us.”

All 56 CAMCs were reformed in 2008 when their 5-year term expired and will hold office until 2013. According to interviewed staff, villagers enthusiastically participated in CAMC reformation. Surveyed villagers reported that Maoists actively participated in reformation and won a key post (chair or secretary) in many CAMCs. ACAP staff and newly elected CAMC members mentioned that their first priority was to reform sub-committees and groups whose terms had expired. No external support was required for reorganization. The number of visitors gradually increased from 37,901 in 2006 to 68,541 in 2008 and entry fees provided much financial capital. CAMC members had on average of 6.7 ± 3.5 years of experience serving on the committee. While reforming CAMCs, 18.1% members of past committees served new terms. On average, each CAMC had 2.5 experienced members who were the source of institutional memory.

Some other structural changes took place during reorganization. The ethnic diversity index for the newly formed committees (0.80 ± 0.33) was significantly higher than previous committees (0.63 ± 0.36; $t = -4.29$, $p < .001$, $df = 29$), as was the average number of women members (3.07 ± 0.87 compared to 1.93 ± 0.91; $t = 5.46$, $p < .001$, $df = 29$). Similarly, the average number of lower caste members (1.80 ± 1.52) was significantly higher than before (1.07 ± 0.74; $t = 3.61$, $p = .001$, $df = 29$).

A new governance model has been proposed for ACA, which is one characteristic of the renewal phase. Members have argued for the formation of an overarching council from all 56 CAMCs to manage ACA when the current contract with ACAP expires in 2012. Many feel that the local council and CAMCs may suffer less from disturbances in the future, with less government affiliation. Although this idea started in 2001, it gained momentum during the peak of the insurgency. Many CAMCs worked independently during the insurgency and gained confidence that they could manage the area (Baral and Stern 2010). Newly elected leaders whom we interviewed stated that their main priority was to form the new council before 2012, and ACAP staff were optimistic that it could be formed within this timeframe. Such a council would likely transform all governance arrangements within the conservation area.

Discussion

Our results show that institutions governing ACA were reasonably resilient to the Maoist insurgency. The conservation institution persisted through and following the insurgency, and ACA was able to maintain its identity as a functioning conservation area. The system

successfully avoided alternative undesirable states including the loss of local control, delisting from protected area status, and unsustainable resource use. The system followed a cyclical path and entered into the reorganization phase following collapse. Although the system is reorganizing along the original regime, it has developed an alternative plan to transform in the near term; thus, it has shown both adaptive and transformative resilience (Gunderson et al. 2006). Four factors appear to be critical in building institutional resilience in ACA: flexible nested governance structures; stocks of capital; retention of institutional memory; and perceptions of institutional legitimacy among constituencies.

We contend that one and a half adaptive cycles have occurred since 1960 in ACA. The first incomplete cycle started at the back loop and covered the time period between the nationalization of forests in the late 1950s and the conception of a new institution marked by the local collapse of the centralized government institution in the 1980s. The nationalization of forests and subsequent resource degradation can be termed as Ω events, and the search for a new institution as an α event. Scholars, local leaders and The Royal Nepali Family brought ideas and other resources while local people contributed memory of traditional resource management regimes to transform the system following collapse. This reorganization led to a complete cycle starting at the r phase and culminating at the α phase. Rapid growth was possible due to Royal patronage; local, national and international support; available capital and local participation. By mobilizing competent staff and utilizing capital, the institution became efficient in solving many problems. With the increase in efficiency, the system became more vulnerable to disturbances due to rigidity. The Maoist insurgency was a gradual Ω event originating outside the system that brought about collapse. Reorganization has been

brought about by retaining institutional memory, preventing major leakages of capital, and undergoing structural change.

Excessive subsidization from higher panarchies tends to increase dependency that can reduce capacity to self-organize (Abel et al. 2006). There were few external subsidies to maintain ACA. It successfully mobilized internal capital to sustain itself. Tourist entry fees provided much of the financial capital required during the insurgency. One level of governance (local) remained active when the other (regional) became inactive. CAMCs supplanted ACAP responsibilities, and sub-committees supplanted CAMC activities, when each could not function. This played a central role in absorbing disturbance and spreading risks. The development of trust between ACAP and CAMCs facilitated coordination between the two. Capacity-building of CAMC members was crucial to develop the confidence to manage the area independently. Institutional memory of members and staff also facilitated the reformation of CAMCs. The α phase may provide opportunities to transform the institution to address emerging challenges, such as crop damage and road construction. Innovation will be critical here (Gunderson and Holling 2002).

The research supports claims that system resilience is more dependent upon slow variables than fast variables. Carpenter and colleagues (2001) argue that while humans tend to respond to fast variables quickly, changes in slow variables are often overlooked. In ACA, resilience was built by responding to slow variables, in particular human and social capital development, since inception.

The adaptive cycle prescribes different policies for the back loop and the fore loop. Emphasis is given to production efficiency in the fore loop, and to retention of capital in the back loop (Abel et al. 2006). Assimilating information about slow variables and implementing appropriate policies depending upon the system's phase are critical for resilience. Accordingly, complex systems can respond to a crisis by focusing on renewal and novelty or by buffering themselves against change. Both were observed in ACA.

Adaptive cycle theory predicts that systems tend to be in the late K phase before collapse (Holling 1987), but this was not apparent in ACA. Although there were some indicators of increasing rigidity, we can not rule out the possibility of the system entering into the collapse immediately following the r or early K phase. The adaptive cycle suggests that changes in natural ecosystems are commonly due to internal disturbances (i.e. intrinsic cyclicity). Disturbance was external in ACA. Cascades can be initiated by a sufficiently large external disturbance at any phase (Abel et al. 2006). Our case study does not support the proposition that the four phases tend to be sequential, and similar exceptions have been recorded in other social-ecological systems (Walker et al. 2006).

One prescription for resilience management is to introduce small disturbances when the system enters the late K phase in order to prevent collapse and bring it back into the r phase (Holling 2001). If we don't know whether the system is in the late K phase (as in ACA), more emphasis must be given to devise strategies to navigate the back loop smoothly. It appears that 'creative destruction' (collapse) is inevitable in complex adaptive systems; therefore, policies must focus on how to minimize the extent of damage from a crisis, and

foster learning and reorganizing capabilities. This study also highlights the need for paying more attention to understanding and monitoring systems passing through the back loop (Walker et al. 2002).

There is subjectivity in applying the adaptive cycle analogy to institutions. The framework classifies ecosystem changes into four discrete phases while underlying processes of institutional change may overlap across phases. The adaptive cycle emerged from ecosystem science with the assumption of defined temporal and spatial boundaries. In institutions, spatial and temporal boundaries tend to be blurred, because they are embedded within large, porous socioeconomic systems. Testing the validity of the adaptive cycle in any social institution is difficult due to the difficulty in generating clearly testable hypotheses. None-the-less, as we have shown, it has some utility, at least by analogy, in explaining the cyclical history and reorganization of ACA after major disturbance.

Conclusions

The ACA case study suggests that institutional resilience can be measured by some attributes of disturbance and renewal. The conservation institution in ACA has demonstrated the capacity to self-organize and reorganize following the collapse brought about by the Maoist insurgency in Nepal. It has generally followed through the phases of the adaptive cycle and maintained its identity. Reorganization followed along the lines of the original regime and developed an alternative pathway to transformation (i.e. a new governance model) in the near term, although enabling legislation will be needed to transform the regime successfully. The study has shown theories associated with the adaptive cycle framework, particularly those

emphasizing the importance of slow-changing variables, are useful for understanding how historical system dynamics have shaped the current system and institutional resilience of ACA.

In complex institutional systems, collapse may be inevitable because the suppression of disturbance also precludes opportunities for renewal. It is therefore important to focus on developing practices that shorten the duration of collapse and facilitate reorganization. Retention of institutional memory, prevention of capital loss, creation of flexible governance, capacity-building and devolution of responsibility to local governance structures, and building institutional legitimacy all warrant attention while designing policies for resilient community-based conservation institutions.

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Table 1: Historical profile for the Annapurna region summarizing major events occurring at the national (▲) and local (●) levels from 1951 to 2008. The four phases of the adaptive cycle are shown as follows: growth = r, conservation = K, collapse = Ω and reorganization = α

Year	Phase	Level	Events
1951		▲	Beginning of modernization in Nepal
1957	**Ω**	▲	The Government nationalized all forests managed by local communities, and assumed the absolute authority over them
1960		▲	Nepal opened its doors to the outside world; an influx of international tourists
1961		▲	The King took over the executive power, and established a political order of an absolute monarchy
1982	**α**	▲	KMTNC was established by the legislation
1986		●	ACAP started a pilot project in the Ghandruk village
1990		▲	Re-establishment of multiparty democracy and constitutional monarchy political order
1991		▲/●	ACAP received the Tourism for Tomorrow Award
1992		▲/●	ACA was legally gazetted as a protected area and the KMTNC secured its management authority for 10 years
	r	▲	The Ghandruk CAMC received the Paul Getty Wildlife Conservation Award
1994		▲/●	The Ghandruk CAMC received the UNEP's Global 500 Award
1996		▲/●	The Conservation Area Management Regulation and Directive were passed
		▲	The Maoist insurgency began
		▲	King Birendra was killed in the Royal Palace Massacre in June
2001		▲	Government declared a state of emergency in November
	K	●	The Maoist rebels attacked the ACAP headquarters and field offices in Lwang, Sikles and Bhujung
2002		▲/●	Government extended the management authority of the KMTNC to manage ACA until 2012
		●	The Maoists destroyed the ACAP Ghandruk office
2003		●	ACAP staff of four regional headquarters were evicted from the field bases and moved to ACAP headquarters in Pokhara
2005	**Ω**	▲	King Gyanendra took the executive power and imposed absolute monarchy
2006		▲	King Gyanendra relinquished the absolute power; severed ties with KMTNC/ACAP; and KMTNC renamed NTNC
		▲	The Maoists signed a comprehensive peace pact with the government declaring the official end of the insurgency

2007	**α**	●	Evicted ACAP staff returned to field bases; CAMCs' reinitiated to organize regular committee meetings
2008		▲	The newly elected Constituent Assembly abolished the monarchy and declared Nepal a federal democratic republic
		●	All 56 CAMCs were reformed

Table 2: Summary results of the three indicators used to measure the levels of trust building between CAMCs and ACAP. CAMC members rated the following statements on a 5-point scale: always = 5, most often = 4, neutral = 3, rarely = 2 and never = 1

Statements	Always	Most often	Neutral	Rarely	Never	Mean ± SD
Do you trust that the ACAP staff to be honest with local residents	49.5%	22.6%	26.3%	1.6%	-	4.20 ± 0.89
Do you trust that the ACAP staff are competent in their work	55.8%	21.1%	20.5%	2.6%	-	4.30 ± 0.88
Do you trust that ACAP is predictable and keep up its promises	38.4%	45.8%	10.0%	5.8%	-	4.17 ± 0.83

Table 3: Summary results of the four indicators used for measuring the efficiency of the conservation institution in ACA. CAMC members were asked to rate on a 5-point scale if the following things are better or worse now than they used to be 10 years ago: much better =5, somewhat better = 4, no change = 3, somewhat worse = 2 and much worse = 1

Statement	Much Better	Somewhat Better	No Change	Somewhat Worse	Much Worse	Mean ± SD
People can get permits to harvest natural resources easily	59.5%	21.6%	13.7%	5.3%	-	4.35 ± 0.91
Ordinary people can influence conservation and development issues in the village	44.2%	48.4%	7.4%	-	-	4.37 ± 0.62
People have an adequate standard of living	35.8%	49.5%	13.7%	1.1%	-	4.20 ± 0.71
Conservation efforts are effective	31.6%	58.9%	6.3%	3.2%	-	4.19 ± 0.69

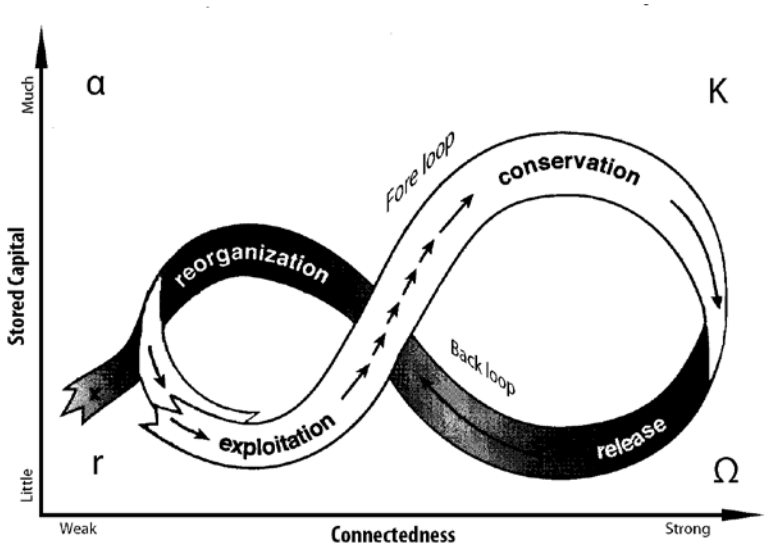
Table 4: Summary results of the four indicators used to measure the changes in the identity of the conservation institution. We asked CAMC members about whether the following activities increased, decreased or remained the same during the insurgency. They rated each statement on a 3-point scale: increased = 3, remained the same = 2 and decreased = 1

Attributes assessing the identity of the functional conservation area	Increased	Remained the same	Decreased	Mean ± SD
Meeting of committee members	7.9%	52.1%	40.0%	1.68 ± 0.61
Collecting natural resources without a permit	12.1%	82.1%	5.8%	2.06 ± 0.42
Grazing livestock in restricted areas	6.8%	81.1%	12.1%	1.93 ± 0.43
Illegal hunting of wildlife	28.9%	35.8%	35.3%	1.94 ± 0.80

Table 5: Perceptions of CAMC members regarding the status of natural resources within ACA over the two time periods measured on a 3-point scale: improved = 3, remained the same = 2 and diminished = 1

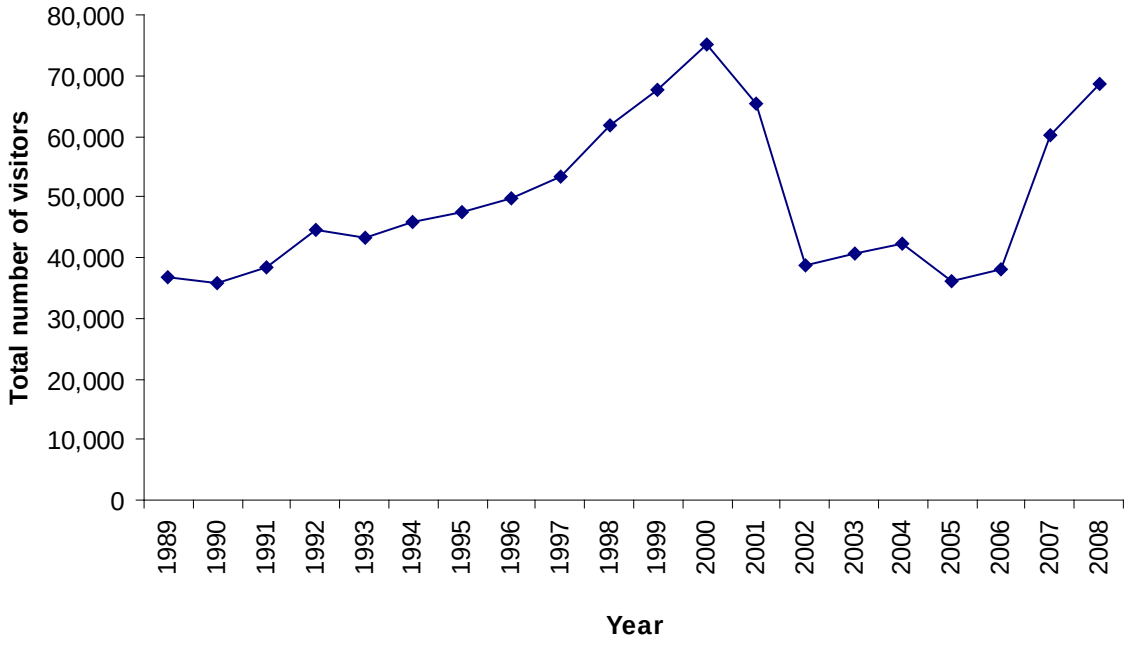
Statement	Improved	Remained the same	Diminished	Mean ± SD
Compared to 10 years ago, the status of natural resources in your area has:	87.4%	6.3%	6.3%	2.81 ± 0.53
In the last five years (during the insurgency), the status of natural resources in your area has:	3.7%	83.2%	13.2%	1.91 ± 0.40

Figure 1: The two dimensional representation of the adaptive cycle. The Y-axis reflects the changes in the amount of accumulated capital stored in dominant keystone variables while the X- axis depicts the degree of connectedness among variables. Following collapse, the system can reorganize and repeat the previous cycle (following a white path) or transform into another system configuration (following a black path)



Source: Adapted from Holling 1987.

Figure 2: International tourist arrivals in ACA over the past two decades



Data source: Raw data provided by the ACAP Headquarters at Pokhara, 2009.

CHAPTER SIX

Synthesis and Conclusions

This research highlights the utility of incorporating the resilience concept into the planning and management of community-based conservation and protected areas. The conventional paradigm of protected areas management, based largely on the national park model established in the United States, gears management toward maintaining a desired steady state and does not explicitly acknowledge the broader social, political, or even ecological systems in which protected areas exist. As such, parks can be viewed as islands for protecting pristine nature independent from local social and economic concerns in which success is measured by the effectiveness of strict enforcement of the park boundaries (Schwartzman et al. 2000, Terborgh et al. 2002). This approach to natural resource management can be very efficient in times of stability, but it can generate undesirable consequences in times of turbulence. Because it does not take into account important ecosystem characteristics such as nonlinearity and irreversibility, or consider local constituencies as partners for conservation (Holling and Meffe 1996, Schwartzman et al. 2000), protected areas managed solely under this paradigm may be more vulnerable to collapse following a disturbance. Complex systems such as protected areas are dynamic and need to be responsive to external events. Therefore, a focus on maximum efficiency or a utopian vision of a steady state environment is insufficient. Rather, managers should seek to maintain the capacity of a system to absorb disturbances and adapt to changing conditions.

The resilience approach treats both human and non-human components as interlinked parts of social-ecological systems. It fosters systems' capacity to retain the structure of prior regimes

or to transform into other desirable states without changing the fundamental functions of the systems after disturbances (e.g. Gunderson and Pritchard 2002). By acknowledging disturbances as a part of system dynamics, there are no delusions about stability and perpetuity in an ever-changing world.

The political, economic and social contexts in which protected areas operate can change abruptly. The critical question is how protected areas handle such changes and adapt to them. Three properties of a system, connectedness, potential and resilience, shape a dynamic of change (Gunderson and Holling 2002). Connectedness is the strength of internal connections of system's components that regulate internal processes and mediate external variability (i.e. its flexibility). Potential is the amount of available resources, or capitals, which determines the range of options possible for change. Resilience is a measure of the system's vulnerability to disturbance. This research has explored these properties of the conservation institution in ACA.

In the institutional context, governance arrangements can be one measure of a system's flexibility. In the case of ACA, decision-making power is shared among various stakeholders. Some level of governance remained active to certain degrees while others became less active, or even inactive, during the insurgency. CAMCs supplanted ACAP responsibilities, and sub-committees supplanted CAMCs activities when each could not function. This played a central role in absorbing the disturbance and spreading risks associated with continued performance. In this way, the CAMCs and their associated conservation functions largely survived the Maoist insurgency, although their quality of

performance may have varied. Most CAMC members reported their confidence in managing the conservation area without external support in the near future, have a clear sense of their organizational mission, and have garnered considerable local support.

In ACA, the accumulation of capital stocks (physical, financial, natural, social and human capital) has been a focus of the conservation management institution since its inception. The available capitals played a critical role in response to the Maoist insurgency. The research findings suggest that natural, social and human capitals, in particular, were important to the organizational resilience of the CAMCs. Both social and human capitals had a positive linear relationship with organizational resilience while natural capital had a parabolic relationship, suggesting the medium geographic scales best linked with organizational resilience.

Legitimacy and institutional resilience are widely considered as critical theoretical constructs influencing the sustainability of community-based conservation. This effort constructed reliable scales for measuring both legitimacy and institutional resilience. Legitimacy is conceptualized as collective perceptions of CAMCs as just, appropriate and trustworthy institution. The legitimacy scale was made up of villagers' perceptions of whether they (i) trust CAMC members to work on behalf of villagers' interests, (ii) trust that CAMC members treat all villagers equally, (iii) trust CAMC members to be honest, (iv) think that CAMCs are the right authority to manage natural resources, and (v) think that the decisions made by CAMCs should be obeyed. Institutional resilience is conceptualized as the capacity of the CBC institution to continue to support nature conservation during the Maoist insurgency. The institutional resilience scale consisted of four indicators measuring the

following perceptions of villagers about the CAMCs during the time of the Maoist insurgency: (i) how active the CAMCs were during the insurgency, (ii) their quality of their overall performance during that time, (iii) whether conservation was happening in a village, and (iv) the CAMC's role in making conservation happen during the insurgency.

The results of this study show that five variables significantly predicted villagers' perceptions of legitimacy: performance assessments of CAMCs, social norms as measured by perceptions of peers' attitudes towards CAMCs, empowerment as measured by villagers' perceived personal influence in the CAMCs' decision making processes, perceived benefits and costs associated with having the CAMC in a village, and reported levels of personal participation in CAMCs' activities. The legitimacy and institutional resilience scales showed a significant positive correlation with each other, though no causal inference could be drawn because of the lack of longitudinal data.

The adaptive cycle results from interactions among three system properties: connectedness, potential and resilience (Gunderson and Holling 2002). The application of the adaptive cycle framework to understanding ACA's history suggests that the conservation institution has passed through a cycle of growth, maturation, collapse and reorganization. The conservation institution in ACA has demonstrated the capacity to self-organize and reorganize following the collapse brought about by the Maoist insurgency in Nepal. It has maintained its identity as a functional conservation area throughout the four phases of the adaptive cycle. Reorganization followed along the lines of the original regime and developed an alternative pathway to transformation in the near term. The anticipated transformation is in the

governance model that will institute a new regime with more power in the hands of the CAMCs.

While ACA and the particular disturbance examined in this study are unique in many ways, the research findings may have meaningful implications for the practice of community-based conservation in other contexts as well. Before highlighting these lessons, I first lay out the themes that set ACA apart from other protected in areas in Nepal and elsewhere, so an interested reader can make educated judgments about transferring the lessons from this study to other contexts. Unlike other government-run protected areas in Nepal where the Nepal Army enforces the conservation regulations, there is no armed force to patrol ACA. The budgets of other Nepali protected areas allocate about 70% of their budgets to the Army. This is not the case in ACA, because most of its revenue is spent directly for nature conservation and sustainable development. Because ACA is one of the most visited parks in Nepal and has a system for collecting entry fees, it is in better financial shape than most other Nepali protected areas. These fees alone have covered operating costs in times of peace (Baral et al. 2008). The governance arrangement of sharing the authority between local communities and a non-governmental organization to manage ACA through CAMCs is also a somewhat unique arrangement. Though similar institutions exist elsewhere, specific arrangements vary. In order to truly assess the generalizability of the lessons shared below, one would have to apply the theories to other contexts through empirical research. I share below the lessons most worthy of such testing (or direct application) in other contexts.

Effective governance systems require the development and maintenance of capital stocks, particularly of human and social capital, to sustain the adaptive capacity to self-organize, or reorganize, while maintaining identity and function. In other words, resilient systems are those that maintain the capacity for adaptive collective action through the continued development of human skills and trusting social relationships.

The concept of shared governance may appear messy in comparison to the top-down management approach. Because power is shared among various stakeholders, it may not be especially efficient for decision-making. However, the very act of power-sharing can distribute risks and help in absorbing disturbances. Thus, higher levels of resiliency can be achieved at some costs of efficiency. Variable contexts will inevitably demand different governance arrangements. In ACA, a shared vision of the importance of the conservation institution has emerged among key factors.

Maintaining or enhancing the stocks of social, natural and human capitals can pay dividends in turbulent times. If international agencies, governments and NGOs successfully aid the development of social and human capital, then community-based organizations may be expected to show a higher degree of resilience to political instabilities in the developing world. These capitals are typically slow to develop (Carpenter et al. 2001); it may require decades to build them to a critical level to enhance system resilience. International conservation communities, which typically revolve around short granting cycles, may need to rethink their policies regarding conservation funding to the developing world.

While there can be no standardized pre-defined pathways for social capital formation (Brechin et al. 2003), organizing collective action and providing opportunities to build networks may help to stem its depletion in times of crisis. This study suggests that opportunities for experiential learning (as evidenced by the importance of time spent on CAMCs) may also enhance human capital formation. The study also raises a question regarding the most appropriate scales for community-based natural resource governance. While our hypothesis was supported that moderate stores of natural capital, in the form of land area containing important natural resources, would be linked with organizational resilience, the coarse-grained measure of this construct limits our ability to speculate on its origins.

The understanding of stages in the adaptive cycle is critical for forming policies. A system tends be more stable when it passes through the growth and conservation phases (also called the foreloop). When it passes through the collapse and reorganization phases (also called the backloop), the system is unstable. Thus, effective foreloop and backloop policies for supporting conservation should differ. In the foreloop, emphases on increasing efficiency and productivity are appropriate, for example, the development of financial, physical, human, and social capitals. In the backloop, a focus on flexibility and innovation are preferable. Here, managers need to implement flexible policies to prevent capital losses so that the system retains some critical threshold of capital stocks to reorganize or to transform. If not, the system will be dependent upon external subsidies that can reduce the system's resilience. The backloop may also be a suitable phase to experiment new policies, because the costs of failures are minimal. Managers can bring in innovative ideas to transform the system or

shorten the reorganization phase. This study highlights the need for paying more attention to understanding and monitoring systems passing through the backloop (Walker et al. 2002). In complex institutional systems, collapse may be inevitable because the suppression of disturbance can also preclude opportunities for renewal. It is therefore important to focus on developing practices that shorten the duration of collapse and facilitate reorganization.

Managers of protected areas might consider three steps in planning for building resilience into a system: setting a goal for a desirable state, anticipating what disturbance(s) the system is expected to endure, and building different scenarios and devising strategies accordingly. All these processes can vary to a large extent in the real world situations. Case studies can enhance our knowledge, and we can learn from them regarding the application of the resilience concept. The results of this study can be useful in devising strategies for building resilience in community-based conservation and protected areas management.

The study contributes to the greater body of knowledge of community-based conservation, protected areas management and resilience. Measuring resilience is often fraught with difficulties in empirical research. The study breaks new ground by operationalizing organizational resilience, as sustained goal achievement in the face of disturbance, and institutional resilience, as the maintenance of identity and function of the conservation institution. The scales developed to measure each concept are reliable and have construct and criterion validity. They can be used for empirical research in similar contexts. The study uncovered some key predictors of legitimacy in ACA that further validate others' theoretical propositions and empirical findings. My review of the literature revealed no other empirical

studies that have established a relationship between perceptions of legitimacy and empirically-measured institutional resilience in the community-based conservation context. These scales and their linkage to each other can open new grounds for assessing the sustainability and resilience of community-based conservation against disturbances.

The study also suggests avenues for future research. Longitudinal studies would further our understanding of the relationship between changing capital stocks and organizational resilience. More empirical research is needed to explore whether physical and financial capitals correlate with resilience in other contexts. The scales developed to measure legitimacy and institutional resilience can be tested in similar contexts to cross-validate our findings and to refine their measurement. Future research exploring the causal links between legitimacy and institutional resilience could further enhance future strategies for the shared governance of natural resources.

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APPENDICES

Appendix A: Sample interview scripts for the CAMC members in ACA

Name of the committee: Respondent code #:

Time interview initiated: Date:

Greetings! My name is Nabin Baral and I am conducting this research for my Ph.D. degree. I am here conducting interviews to better understand how conservation works in Annapurna. With your permission, I'd like to interview you. Every committee member has had an equal chance of being included in this study, and you have been randomly selected. Your responses will be completely anonymous, confidential and the findings will never discuss individual responses. They will be put together with over 300 other people I am interviewing, to get an overall picture. It will be impossible to pick you out from what you say, so please feel free to tell me what you think. Your participation in this study is voluntary. You do not have to answer any question you do not want to, and you can discontinue at any time without consequences. The results of the study will help to design better conservation projects, both here and abroad – especially those that empower local people.

I expect the interview to take about 30 minutes. Would you be willing to participate?

Benefits:

Please tell me about your role on the CAMC?

Why did you join the CAMC?

Why do you think others have joined?

Do you feel that you personally benefit in any way by being a CAMC member?
[1] yes [0] no

If 'yes,' what kinds of benefits do you get?

Do you think that by belonging to the CAMC have you acquired new skills or learned something valuable? [1] yes [0] no

What have you learned?

Are there any disadvantages? [1] yes [0] no. If 'yes,' please mention

Do you think that the benefits of being a member outweigh the costs? [1] yes [0] no

In your view, what are the advantages and disadvantages of working with the ACAP?

Advantages	**Disadvantages**

Do you think that the advantages of working with the ACAP outweigh disadvantages or vice-versa? If so, how strongly?

Advantage outweighs	5. Strongly 4. Barely	**3. About equal**	**Disadvantage outweighs**	2. Barely 1. Strongly

What role does the government play in nature conservation in your village?

Process:

How does the CAMC usually make decisions?

1	A chair decides and informs the members	2	A chair asks the members what they think and then decides
3	The members hold a discussion and decide together	4	The members hold a discussion, consult community members and decide together
5	Members vote and decision is made by a simple majority		

Have there been instances in which you have disagreed with the CAMC's decisions?
[1] yes [0] no

What do you do in those cases?

How often have they happened?

Do you feel that the ACAP consult the CAMC as often as it should? [1] yes [0] no

If 'no,' should it consult more? [1] yes [0] no

Attitudes:

I'd like to read you a series of statements and would like to know whether you agree or disagree with each statement. You can tell me you agree, strongly agree, disagree or strongly disagree. You can also tell me you have no opinion.

The concept of conservation area is appropriate in this place.

Appropriate	5. Strongly agree 4. Agree	**3. I don't know**	**Inappropriate**	2. Disagree 1. Strongly disagree

Why or why not? _____

I regard the conservation program in my village as successful.

Successful	5. Strongly agree	**3. I don't know**	**Unsuccessful**	2. Disagree
	4. Agree			1. Strongly disagree

What do you mean by successful?

The ACAP has been crucial for proper functioning of the CAMC.

Important	5. Very important	**3. I don't know**	**Unimportant**	2. Unimportant
	4. Important			1. Very unimportant

In what ways it has been crucial?

What proportion of the population do you think has a positive attitude towards the ACAP?
[1] almost none [2] less than half [3] about half [4] more than half [5] almost everyone

What is your overall assessment of the ACAP's performance?

Good	5. Very good	**3. I don't know**	**Bad**	2. Bad
	4. Good			1. Very bad

Trust:

I'd like to talk with you about who do people trust and why they trust in general. Would you please tell me your opinions regarding trust.

Would you say that most people can be trusted? [1] yes [0] no

Why or why not?

What are the important criteria for you to decide whether to trust or distrust others?

In general, do you trust CAMC members? [1] yes [0] no

If 'yes,' how many? ____
[5] everyone [4] more than half [3] about half [2] less than half [1] almost none

Do you trust that the ACAP staff to be honest with local residents? Would you say you trust/distrust them entirely or only somewhat?

Trust	5. Entirely	**3. Neither trust nor distrust**	**Distrust**	2. Somewhat
	4. Somewhat			1. Entirely

Why do you trust or distrust them?

The ACAP staff are competent in their work.

Yes	5. Always	**3. I don't know**	**No**	2. Rarely
	4. Most often			1. Never

ACAP is predictable and keep up its promises.

Yes	5. Always	**3. I don't know**	**No**	2. Rarely
	4. Most often			1. Never

Relationships:

Do you feel that the relationship between local residents and committee members has changed over time? How so? Please give specific events.

Has the insurgency had any impacts on the relationship? [1] yes [0] no

If 'yes,' please mention the impacts.

To your knowledge, have local people protested against any decisions the committee has made in the past?

Yes	5. Always	**3. I don't know**	**No**	2. Sometimes
	4. Often			1. Never

How many instances? _____ #.

Overall, how many household participate in the committee's activities?

Good	5. All households	**3. About half**	**Bad**	2. About one fourth
	4. About two third			1. Almost none

How often do you formally and informally interact with ACAP staff? (*Record actual response as well.*) _____

6	More than once a month	5	Once a month	4	Once in every 2 months
3	Once in every 3 months	2	Once in every 6 months	1	Once in a year

How do you rank the ACAP staff's understanding of your culture and local situation?

Understand	5. Very well	**3. To some extent**	**No**	2. A little
	4. Well			1. Not at all

History:

How long have you been on the committee? _____ years.

To your knowledge, have there been conflicts between the government and local people in the past? [1] yes [0] no. If 'yes,' please mention the events_____

Empowerment:

Have you received any training from the ACAP that has been helpful to run the office?
[1] yes [0] no. If 'yes,' please mention _____

How much power do you have to influence the decision making processes in the CAMC?
[1] none [2] very little [3] some [4] a lot

Do you think you should have more? [1] yes [0] no

Do you think local people have the power to influence the CAMC's decision?
[1] yes [0] no. If 'yes,' how?

Do some people have more power than others? Who?

How satisfied are you with the functioning of the CAMC?

Yes	5. Extremely satisfied	**3. Don't know**	**No**	2. Unsatisfied
	4. Satisfied			1. Extremely unsatisfied

How often do other CAMC members listen to your suggestions?

Listen	5. Always	**3. Sometimes**	**Don't**	2. A few times
	4. Most times		**care**	1. Not at all

How many members listen to your suggestions?_____ #.

Norms:

What proportion of your friends do you feel are in agreement with what the CAMC is doing?
[1] almost none [2] less than half [3] about half [4] more than half [5] almost everyone

Has that changed over time? [1] yes [0] no

Do some people benefit more from the conservation program than others? [1] yes [0] no

Who benefits most?

Are they on the CAMCs? [1] yes [0] no

What proportion of people who live here trust the ACAP?

Why do you think other people trust or distrust the ACAP?

How important is it for you to be on the committee?

Important	5. Very important	**3. Neither-**	**Unimportant**	2. Quite unimportant
	4. Quite important	**nor**		1. Very unimportant

Motivations:

Were you on the CAMC before? [1] yes [0] no. If 'yes,' how many times ____

Would you like to serve on the CAMC for another term?

Yes	5. Most likely	**3. Undecided**	**No**	2. Unlikely
	4. Likely			1. Very unlikely

Why or why not?_____

Social relations:

Has anybody suggested you to file a candidacy for the membership? [1] yes [0] no
If 'yes,' who? _____

Apart from you, is anybody from your household a member of any committee, group or organization? [1] yes [0] no. If 'yes,' how many_____

If the CAMC needs any help to complete a project, whom do you contact to get the help? Please mention all persons, organizations, agencies, etc._____

How many people within the CAMC have acquired the capability and qualities to be effective leaders? *(Please record the actual number _____.)*
[1] none (0) [2] few (1-3) [3] some (4-6) [4] many (> 6) [5] all

Do the leaders tend to come from a few groups or families that are always the same, or do the leaders represent a wider circle among the community?
[1] from few groups [2] from various groups within the community
[3] from almost all the groups within the community

Legitimacy:

Please say whether you agree or disagree with the statement. The CAMC has the right to make decisions that all villagers have to abide by, whether or not they agree with them.

Yes	5. Strongly agree	**3. Neutral**	**No**	2. Disagree
	4. Agree			1. Strongly disagree

Has your perception about the utility of the CAMC changed? Past three years vs. before the insurgency.

Institutional arrangements:

How long has your CAMC been in the place? _____ years

How well do you think various ethnic groups are represented in your CAMC? [4] highly representative [3] somewhat representative [2] slightly representative [1] not representative at all

What is the mission of your CAMC?

Overall, how effective is the committee's leadership?
[3] very effective [2] somewhat effective [1] not effective at all

What do you consider to be the biggest challenges the ACA is facing today?

Resource status:
Would you please tell me whether the status of natural resources has improved, remained the same or worsened during the following time periods?

Statement	Improved (3)	Remained the same (2)	Worsened (1)
Compared to 10 years ago, the status of natural resources in your area has:			
In the last five years (after the insurgency), the status of natural resources in your area has:			

Environmental values:

Do you think protecting this park is important? [1] yes [0] no. Why? _____

There could be many reasons that motivate you to conserve this area. Would you please tell me how important to you is each of the following reasons?

Reason	Very important (3)	Important (2)	Not important (1)
To meet my natural resource needs			
To protect animals and plants			
To help others meet their needs			
To maintain ecological balance			

Institutional resilience:

In your opinion, have the following activities increased, decreased or remained the same during the insurgency?

Activity	Increased	Remained the same	Decreased
Meeting of committee members			
Collecting natural resources without a permit			
Grazing livestock in restricted areas			
Hunting wildlife			

We are going to assess the outcomes of the present management regime. Please tell me if the following things are better or worse now then they used to be 10 years ago.

Statement	Much better	Somewhat better	No change	Somewhat worse	Much worse
People can get permits to harvest natural resources easily					
Ordinary people can influence conservation and development issues in the village					
People have an adequate standard of living					
Conservation efforts are effective					

Have you received any threat against you as a CAMC member? [1] yes [0] no

If 'yes,' why did not you resign? _____

Have you lost anything as a result of the insurgency?

Have you learned anything new as a result of the insurgency?

What strategies have you adopted to cope with the insurgency?

Collective action, conflict and information:

In the past year, how often did the CAMC organize collective actions?
[0] never (0) [1] occasionally (1-5 times) [2] frequently (6-10 times) [3] always (> 10 times)

Compared with other villages, is there more or less conflict in your village?
[1] more [2] the same [3] less

What are your three most important information sources about what the government is doing (such as conservation programs, development activities, agricultural subsidies, etc.)?
1. _____ 2. _____ 3. _____

Did people migrate from your village due to the insurgency? [1] yes [0] no. If 'yes,' how many?

Can CAMCs manage the ACA on their own? [1] yes [0] no

Why or why not?

If the government decides to hand over the ACA to CAMCs, how long do you think your committee needs to take the responsibility solely?
[5] < a year [4] 1-2 years [3] 3-4 years [2] 5-6 years [1] > 6 years

Socio-demographic:

Please check one: [1] male [0] female Ethnicity: _____

What is your age? _____ years

How many people including you live in your household?

Have you migrated to this place? [1] yes [0] no. If 'yes,' which year _____
From where? _____

How much education have you had?

What is your main occupation?

What statement best describes your total annual household income (from all sources and before taxes)?

1	Less than NRs. 30,000	2	NRs. 30-60,000	3	NRs. 60-90,000
4	NRs. 90-120,000	5	more than NRs. 120,000		

Thank you very much for your cooperation.

Time interview terminated:

Appendix B: Sample questions for the local villagers in ACA

Respondent code #: Place: Date:

Socioeconomic status: Gender: [1] Male [0] Female

Namaste! I am _____ and I am here to learn about nature conservation in your village. I will be doing surveys of villagers to know their opinions about the CAMC's performance and conservation programs. Your responses will be completely confidential, and the findings will never discuss individual responses. It will be impossible to pick you out from what you say, so please feel free to tell me what you think. Will you take a little while to participate in this survey?

1. How often have you participated in programs organized by the CAMC?
[3] often [2] rarely [1] never

2. Do you trust CAMC members to work on behalf of all villagers' interests?
[3] yes [2] sometimes [1] no

3. Do you trust that the CAMC members treat all villagers equally?
[3] yes [2] sometimes [1] no

4. Do you trust that the CAMC members are honest?
[3] yes [2] sometimes [1] no

5. In your opinion, is CAMC the right authority to manage natural resources?
[3] yes [2] maybe [1] no

6. Do you think most villagers abide by CAMC's rules?
[4] always [3] usually [2] rarely [1] never

7. Do you think that the decisions made by the CAMC should be obeyed?
[3] yes [2] mostly [1] no

8. How do you judge the CAMC's overall performance?
[3] good [2] fair [1] poor

9. Are there any advantages of having the CAMC in your village? [1] yes [0] no. If 'yes', please mention: _____

10. Are there any disadvantages of having the CAMC in your village? [1] yes [0] no. If 'yes', please mention: _____

11. Do you think the benefits of having the CAMC outweigh the disadvantages?
    [3] yes, the benefits outweigh any disadvantages
    [1] no, the disadvantages outweigh the benefits
    [2] the benefits and disadvantages are about equal

12. How many of your friends and relatives have favorable attitudes towards CAMC?
    [3] most [2] some [1] almost none

13. How much influence do you think people like yourself can have in CAMC activities?
    [3] a lot [2] some [1] not at all

14. How often have the CAMC members listened to your suggestions, concerns or problems?
    [3] often [2] rarely [1] never

Now, I would like to talk with you about ACAP and its staff.

15. What do you think about ACAP's job in your village?
    [3] good [2] fair [1] poor

16. Do you trust ACAP staff to work on behalf of all villagers' interests?
    [3] yes [2] mostly [1] no

17. Do you trust that the ACAP staff are honest?
    [3] yes [2] mostly [1] no

18. Do you feel that the ACAP brings any benefits to you or your family?
    [1] yes [0] no

19. Do you feel that the ACAP brings any disadvantages to you or your family?
    [1] yes [0] no

20. Do you feel that the benefits of living within the ACAP outweigh the disadvantages?
    [3] yes, the benefits outweigh any disadvantages
    [1] no, the disadvantages outweigh the benefits
    [2] the benefits and disadvantages are about equal

21. How successful do you feel the conservation programs are in your village?
    [3] very successful
    [2] somewhat successful
    [1] not successful

22. How do you assess the status of natural resources in your village?

Statement	Improved (3)	Remained the same (2)	Worsened (1)
a. Compared to the pre-ACAP era, the status of natural resources in your area has:			
b. Compared to 10 years ago, the status of natural resources in your area has:			
c. Compared to 5 years ago (during the insurgency), the status of natural resources in your area has:			

23. How active was your CAMC during the Maoist insurgency?
[3] very active [2] somewhat active [1] inactive

24. How do you assess the overall performance of your CAMC during the insurgency?
[3] good [2] fair [1] poor

25. Do you feel that conservation was happening in your village during the insurgency?
[3] yes [2] somewhat [1] no

26. How important was the CAMC's role for making the conservation happen during the insurgency?
[3] very important [2] somewhat important [1] not important

27. Would it be better not to have 'conservation area' here?
[3] not at all [2] maybe in some situations [1] of course yes

28. Have you migrated to this village? [1] yes [0] no. If "yes", when? _____ years ago.

29. Are you related to any CAMC members? [1] yes [0] no. If "yes", what is the relationship?

30. Socio-demographic characteristics of respondents:

Age: _____ years (please ask how old the respondent is).

Education: _____ (please record the level of education).

Ethnicity: _____ (please ask the respondent's full name).

Appendix C: Non-response statistics of the CAMC members

S.No.	Reasons	Number	Percent
	Chairs/Secretaries		
1	Out of village for official work	2	14.28%
2	Out in the pasture to collect Yarsa Gompa	3	21.43%
3	Gone to Kathmandu for personal work	3	21.43%
4	Migrated abroad	3	21.43%
5	Did not return home as promised (playing card)	2	14.28%
6	Declined due to spouse's critical health	1	7.14%
	Total	14	100.0%
	Other members		
1	Expired	6	31.58%
2	Bed ridden	2	10.53%
3	Migrated to other places permanently	3	15.79%
4	Moved overseas for jobs	6	31.58%
5	Did not understand Nepali language	2	10.53%
	Total	19	100.0%

Appendix D: A chronology of the Ph.D. research process

Date	Activities
August 2006	Started a Ph.D. program at Virginia Tech
December 2006	First committee meeting to discuss research ideas
May 2007	Second committee meeting to discuss research plans The Institutional Review Board at Virginia Tech approved the application for conducting research on human subjects (IRB Expedited Approval IRB # 07-269)
May to August, 2007	First field research season in ACA conducting scripted interviews, questionnaire surveys, field research and document reviews
November 2007	Passed qualifying exam
December 2007	Committee meeting to discuss first field season's results, data analysis, interpretations and next steps.
March 2008	The Graduate School approved the Program of Study
April 2008	Committee meeting to discuss research work plans, to perform yearly student evaluations, and to plan the preliminary exam
May 2008	The Institutional Review Board at Virginia Tech approved the IRB Expedited Continuation
August 2008	Passed preliminary exam
September to December, 2008	Second field research season in ACA and community forests in its periphery conducting scripted interviews, questionnaire surveys, field research and document reviews
April 2009	The Institutional Review Board at Virginia Tech approved the IRB Expedited Continuation 2
May 2009	Committee meeting to discuss results, analyses, and the dissertation format First manuscript submitted to Environmental Conservation Second manuscript submitted to Society and Natural Resources
August 2009	Third manuscript submitted to Ecology and Society
September 2009	The first and second manuscripts were accepted by the journals
October 2009	The third manuscript was conditionally accepted by the journal
November 2009	Successfully defended the Ph.D. dissertation The fourth manuscript submitted to Oryx
December 2009	Completion of all paperwork required for the Ph.D. degree and commencement