2019-01-01

Creating Spaces for Conversations on Conservation: A Case Study of Joint Forest Management in East Sikkim, India.

Paulami Banerjee
University of Texas at El Paso, paulami.banerjee@gmail.com

CREATING SPACES FOR CONVERSATIONS ON CONSERVATION:

A CASE STUDY OF JOINT FOREST MANAGEMENT IN

EAST SIKKIM, INDIA

PAULAMI BANERJEE

Doctoral Program in Environmental Science and Engineering

APPROVED:

Tarla Rai Peterson, Ph.D., Chair

William E. Grant, Ph.D.

Deana D. Pennington, Ph.D.

Stacey K. Sowards, Ph.D.

Craig E. Tweedie, Ph.D.

Charles Ambler, Ph.D.
Dean of the Graduate School

Dedication

Mummy, Baba, and Ada

Not a day goes by that I do not think of you…

I hold you close within my heart and there you will remain…to walk with me throughout my life

Until we meet again…

CREATING SPACES FOR CONVERSATIONS ON CONSERVATION: A CASE STUDY OF JOINT FOREST MANAGEMENT IN EAST SIKKIM, INDIA

by

PAULAMI BANERJEE

DISSERTATION

Presented to the Faculty of the Graduate School of
The University of Texas at El Paso
in Partial Fulfillment
of the Requirements
for the Degree of

DOCTOR OF PHILOSOPHY

Environmental Science and Engineering Program
THE UNIVERSITY OF TEXAS AT EL PASO
May 2019

Acknowledgements

"It always seems impossible until it's done" —Nelson Mandela

This PhD journey has been a journey of self-discovery and it would not have been possible without the unconditional support of my professors, mentors, family, and friends who became family. First, I would like to thank Dr. Tarla Rai Peterson, my PhD Chair, for mentoring and supporting me through the years. Thank you Dr. Peterson for believing in me before I believed in myself, for giving me the opportunity to stay in this country and pursue my dreams. You have given me the wings to fly, to come back, and reasons to stay. I would also like to take this opportunity to thank Dr. Markus J. Peterson for his unfailing support, advice, mentoring, and friendship. Thank you for always being patient with me and reminding me to "to accept the things I cannot change, the courage to change the things I can, and the wisdom to know the difference". Drs. Tarla and Markus Peterson, I shall forever remain your "T2F".

I would like to thank Dr. Stacey K. Sowards for being such an integral part of my life. Thank you for your constant advice, mentoring, and most importantly, your friendship. Thank you for being my sounding board— talking to you was sometimes all the therapy I needed to get through— everything. Thank you for bringing Violeta into my life. My life would have been incomplete without her. I would also like to take this opportunity to thank Dr. William E. Grant, Dr. Deana D. Pennington, and Dr. Craig E. Tweedie for their time, support, and encouragement. A special thank you to Dr. Tweedie for supporting my education and research at UTEP through the ESE Program. Dr. Grant, I have greatly enjoyed our brainstorming sessions over little Debbie's and DQ blizzards, and not to forget, the foosball matches. You made things— sweet. I would also like to thank Dr. Kathryn Henderson and Dr. Gerard T. Kyle at Texas A&M

University, College Station, for their support, advice, and mentoring. To Dr. Ashis Sarkar, thank you Sir for guiding and inspiring me do my best despite all odds. A special thank you to Ms. Lina Hamdan for her unfailing help, support, and encouragement. Lina, every time I walked into your office with a problem, I knew I would walk out with a solution. Thank you!

To my family—babu, nania, dadai, nanan, kumu didi, tokon, ruben, pupai, and khudi— thank your being the calm in the storm. Thank you for believing in me when no one else did. Our family is a circle of strength, founded on faith, and joined in love. To my friend Dr. Sumitrra Ganguli— over the past 30+ years of our friendship, you have taught me that anything is possible when you have the right people to support you. To quote Eleanor Roosevelt, "many people will walk in and out of your life, but only true friends will leave footprints in your heart" — you have been that friend to me. A special thank you to Pastor Joel Mathai and Nada Mathai. Your home has been my home away from home, your family— mine. Nada, thank you for being there for me, for picking me up every time I stumbled, for listening to me, and having hope in me. I am grateful for our friendship. I would also like to take this opportunity to thank Dr. Michael J. Liles for his support, help, and friendship. A special thank you to Dr. Nadarajah Sriskandarajah— thank you Sri for always listening to me, supporting me, and encouraging me to never settle for anything less that I can be. To Violeta— you have been one of the greatest gifts of my life. All my life's problems have just one simple solution— a hug from you. You may outgrow my lap but you will never my heart. I love you. Forever yours— "Taulami".

Finally, to mummy, baba, and ada—you have sacrificed a lot in your lives so that I would not have to sacrifice anything in mine. Thank you for showing me the right way to make my life more meaningful and beautiful. Sometimes, I just look up, smile and say, "*I know that was you*".

"There are no good-byes, wherever you are, you will always be in my heart"- Mahatma Gandhi.

Abstract

Successful community-based natural resource management should include both resource professionals and local communities. Recognizing this fact, my research seeks to encourage more locally adaptive and collaborative forest governance that facilitates sustainable development by enabling grassroots participation. Specifically, I explore opportunities for developing a more sustainable relationship between India's Joint Forest Management (JFM) program and rural forest-dependent communities in Sikkim—a remote, northeastern state of India bordering Nepal to the west, the Tibet Autonomous region of China to the north and northeast, and Bhutan to the southeast. As an instrument for sustainable forestry management, JFM seeks to develop partnerships between forest user groups and state forest department based on mutual trust and jointly defined roles and responsibilities regarding forest protection and management. Despite governmental claims of successful implementation of the program since its inception in 1998, JFM in Sikkim continues to face challenges. In response to various administrative, ecological, institutional, political, and technological barriers, JFM in Sikkim has been driven by external donors rather than by local communities, and has been oriented toward ecological targets to the near exclusion of social concerns.

In a world where limited socioeconomic, financial, and institutional capacities present an ever-increasing threat to global conservation, appropriately targeted efforts to synchronize conservation ideals with community priorities is of utmost importance. For developing countries with limited economic resources and high biodiversity threats, this becomes even more relevant. The objective of my study was to discover ways to enable natural resource professionals and natural resource dependent communities to jointly develop locally relevant and adaptive problem solving approaches to forest management and conservation. To accomplish this goal, I conducted

multi-sited ethnographic research, interviewing more than 250 members of rural, forest-dependent communities, natural resource professionals, members of local self-government institutions, NGOs, and other government officials between May 2014 and June 2016. While conducting fieldwork, I learned that JFM in Sikkim often has functioned as an agent of community destruction. The misalignment of state conservation strategies and the priorities of the human population resulted in exclusion of local human residents from conservation planning in the region. Excluding locals often escalated latent conflict and hampered desired conservation outcomes. Achieving just sustainability requires strategies that harmonize conservation priorities with diverse realities of local communities, particularly when local residents wield power to influence the success or failure of conservation initiatives. This requires moving beyond simply listening to local voices to actively incorporating local realities into conservation. Critical to this process, therefore, is the need for natural resource professionals to understand and deliberately foreground diverse stakeholder viewpoints, knowledge, needs, and preferences in natural resource management decisions.

Worldviews shape how individuals perceive and interpret reality. Social control frames, or preferences regarding how society should be managed are integral to worldviews. Understanding these frames, I posit, can guide natural resource professionals to management options that are more socially acceptable and effective. In this study, I hypothesize that key sociodemographic (i.e., age, gender, generations in region, household size and composition, and principal occupation) and spatial (i.e., elevation, distance of household from nearest accessible road and from nearest statutory forest boundary) variables may play an important role in shaping an individual's social control frames. Results of my study demonstrate that a better understanding of how key demographic and spatial factors influence prevailing social control

frames, can help resource professionals better understand what motivates individuals to accept or reject natural resource management programs, and bridge the schism between policy intent and action by developing more socially appropriate management strategies.

As a first step toward incorporating people's motivations and attitudes towards conservation efforts in East Sikkim, I conducted two workshops, the first of their kind in the region that provided a diverse group of stakeholders with a shared platform for interaction and constructive dialogue. Through soft system thinking exercises, the workshops promoted trust building and social learning, while encouraging participants to see themselves as active agents of a complex forest management process. This study provides a platform that encourages natural resource professionals and local community members to recognize and cultivate their mutual interdependence and appreciation through an iterative dialogue process. Through a dynamic collaborative learning process that recognizes plurality of stakeholder perspectives, it promises to open spaces previously held exclusively by resource professionals and introduce local forest-dependent communities as important contributors to participatory forest management in the region.

Together, the results of the study suggest important directions towards understanding and prioritizing people's motivations and attitudes towards community-based natural resource management efforts. This knowledge may serve as a valuable tool enabling natural resource professionals to bridge the schism between policy intent and action by formulating and implementing conservation plans that are both culturally appropriate and equipped to address the uncertainties of managing complex human-dominated systems across varied spatial and temporal scales.

Table of Contents

List of Tables

List of Figures

List of Illustrations

Chapter 1: Community conversations on conservation: A case study of Joint Forest Management in East Sikkim, India

ABSTRACT

The Joint Forest Management (JFM) program laid the foundations for decentralized, bottom-up approach to forest governance in India. As a participatory approach for developing partnerships between forest fringe communities and the Forest Department, JFM has been recognized as a powerful tool for sustainable forestry management in India. Based on the principles of "care and share", the primary objective of JFM is to provide local communities with active roles and meaningful opportunities in the management and protection of forests, and to share the benefits derived from these forests. Despite claims of successful implementation of the program since its inception in the early 1990s, JFM in India continues to face challenges. In response to various administrative, ecological, institutional, political, and technological barriers, JFM has been driven by external donors, rather than by local communities, and has been oriented toward ecological targets to the near exclusion of social concerns. By marginalizing the needs and desires of the human communities, JFM may be ensuring short-term success, but endangering program sustainability. Nestled in the Eastern Himalayas, Sikkim is one of India's richest states in forest resources and biodiversity, and home to several forest-dependent communities. Despite an increase in forest cover since its adoption in 1998, JFM in Sikkim has failed to achieve sustained community interest, and has done little to reduce conflicts between local communities and the government over forest conservation and management. In this chapter, I critically analyze how livelihoods and identity politics shape interactions between local communities and forests, focusing on implications for JFM in Sikkim, India. I further demonstrate how JFM in Sikkim has often functioned as an agent of community destruction, and

suggest that an iterative dialogue process may enable JFM proponents to alter this trajectory to modify JFM as a contributor to more sustainable communities.

Keywords: Joint Forest Management; community-based natural resource management; environmental conflict management; public participation; Sikkim, India.

1. INTRODUCTION

The Joint Forest Management (JFM) program in India is defined as a "concept of developing partnerships between fringe forest user groups and the Forest Department (FD) on the basis of mutual trust and jointly defined roles and responsibilities with regard to forest protection and development" (TERI, 1999, 1). Since its inception under the National Forest Policy 1988, JFM has increasingly been recognized as a powerful tool for sustainable forestry management in India. Based on the principles of "care and share" (WBFDCL, undated), the primary objective of JFM is to provide local communities with active roles and meaningful opportunities in the management and protection of forests, and to share the benefits derived from these forests. As of 2005, the total forest area under JFM was estimated to be around 214,300 km^2, with 99,000 Joint Forest Management Committees (JFMCs), involving over 13.8 million families across 28 states throughout India (Sudha and Ravindranath, 2004; Vemuri, 2008). Despite claims of successful implementation of the program since its inception in the early 1990s, JFM in India continues to face challenges. In response to various administrative, ecological, institutional, political, and technological barriers, JFM has been driven by external donors, rather than by local communities, and has been oriented toward ecological targets to the near exclusion of social concerns (Murali et al., 2000, 50). By marginalizing the needs and desires of the human communities, JFM may be ensuring short-term success, but endangering program sustainability.

In this chapter, I critically analyze how livelihoods and identity politics shape interactions between local communities and forests, focusing on implications for JFM in Sikkim, India. By "communities", I mean spatially connected groups of people sharing common interests. I further demonstrate how JFM in Sikkim has often functioned as an agent of community destruction, and suggest that an iterative dialogue process may enable JFM proponents to alter this trajectory to modify JFM as a contributor to more sustainable communities.

To provide a context for understanding and evaluating participatory forest in India and its implications on the socio-cultural context and nature of JFM in the state of Sikkim, I first summarize the evolution and performance of JFM in India, including the history of organized forestry management, and the adoption and functioning of the JFM program in Sikkim. I then describe the ethnographic research methods used in the study. Following which, I provide a detailed analysis of interviews and focus group discussions with forest fringe communities and forest department personnel to characterize the multiple symbolic meanings that nature and environment take on, and their implications on the functioning of JFM in the state. The results of the study demonstrate that participatory forest management outcomes are often undermined by, (1) differences of opinion between forest users and resource managers about the benefits derived from forest conservation and management; (2) failure of the state to understand how relations and structures of power influence and shape the politics of everyday life within the context of participatory forest management in Sikkim; and (3) lack of opportunities for residents of forest fringe communities to meaningfully participate in deliberations on JFM.

2. CONTEXT

2.1. JFM in India

The origins of community-based natural resource management (NRM) in India can be traced back to the Arabari Experiment, 1971, and the Sukhomajri Integrated Watershed Management Project, 1975. The Arabari experiment was undertaken by forest fringe communities of the Arabari Forest Range, Midnapore, West Bengal, to re-establish, manage, and protect degraded *Sal* (Shorea robusta) forests (Sudha and Ravindranath, 2004). This experiment was one of the earliest attempts by a state forest department to directly engage locals in the co-management and protection of forests. In exchange for their participation, the villagers were allowed to collect fuel wood and fodder from the forests at an ecologically sustainable rate, and had rights to 25 percent of the profits arising from timber sales. The Arabari experiment was successful in promoting greater transparency, accountability, and equitability in the forest management process, leading to mutual trust and better understanding between the state forest department and the local communities. The success of the Arabari experiment led to the implementation of the West Bengal Social Forestry Project in 1981 and, consequently, efforts were taken to organize forest-based communities into village forest protection committees (FPCs) in five districts of South West Bengal, India (Balooni, 2002; Harrison and Ghose, 2000; Roy, 1992; Sudha and Ravindranath, 2004).

Another successful attempt at community-based NRM in India during the 1970s was the Sukhomajri Project initiated in Sukhomajri, Haryana (Sudha and Ravindranath, 2004). The project was a collaborative endeavor between the villagers, the Chandigarh Forest Department, the Central Soil and Water Conservation Research and Training Institute (CSWCRTI), Chandigarh, and the Ford Foundation to promote rainwater harvesting and soil conservation

techniques alongside forest regeneration in catchment areas. With the active involvement of the villagers in every stage of the integrated watershed management program, the Sukhomajri project, over the course of the next two decades, became one of the most successful community-based NRM in India (Sudha and Ravindranath, 2004).

The success of the Arabari and the Sukhomajri projects as decentralized, bottom-up approaches to NRM ushered in a new era in India's forest management regime. The National Forest Policy, 1988, launched the JFM program in India, whereby, the state governments were directed by The Ministry of Environment & Forests (MoEF), Government of India, to create a "massive people's movement" through the active participation of village communities for re-establishment, management, and protection of degraded forests (Sudha and Ravindranath, 2004, p. 3). It was hoped that JFM as a people's project would empower local communities by making them an integral part of environmental decision-making processes, minimize conflicts between the locals and the forest department, and allow for the sharing of benefits derived from the co-management and protection of forests.

Since its adoption in the early 1990s, JFM in India has undergone progressive changes to make the program more inclusive of the sustenance and livelihood needs of local forest users, along with greater involvement of local communities, state forest departments, and environmental NGOs in the planning, implementation, and monitoring of the program (Sudha and Ravindranath, 2004). The JFM Guidelines published in 2000 and 2002 were regarded as positive steps towards institutionalizing and strengthening the JFM program in India. With the aim of strengthening community participation, the key focus of the JFM Guidelines 2000 were on the participation of women , the preparation of micro plans, giving legal status to JFMCs, setting up village forest communities (VFCs), conflict resolution committees, and the monitoring

and evaluation of the JFM program. The JFM Guidelines 2002 emphasized on further strengthening the role of local communities in JFM, building strong relationships with the *panchayats* or local self-government institutions, signing a memorandum of understanding (MOU) between JFMCs and the state forest department, and the inclusion of provisions for the collection of non-timber forest products (NTFPs) in the JFM working plans (Sudha and Ravindranath, 2004).

2.2. Brief evaluation of JFM in India

The JFM program in India has mostly been evaluated on its ecological, economic, and institutional impacts, with less emphasis given on supporting and encouraging interconnections between humans and other inhabitants of the forests. Evaluations on ecological impacts mostly dealt with JFM's impacts on biodiversity (Ravindranath and Hall, 1995), forest cover (Ostwald, 2000), production of NTFPs (Hill and Shields, 1998), biomass and density of trees (APFD, 2001; TERI, 1999), harvesting of plantations and forest fires (Gupta, 2003), forest regeneration and survival (PRIA and Samarthan, 2010; TERI, 1999). Research on economic impacts focused primarily on economic incentives for timber sales (KFD, undated), biomass productivity (Hill and Shields, 1998; TERI, 1999), production and marketing of NTFPs (TERI, 1999), and livelihoods (Gupta, 2003). Institutional assessments of JFM included the spread of JFM throughout the nation, the legal status of JFM, institutional structure and networks (APFD, 2001; Blunt et al., 1999; Gupta, 2003; Rao et al., 2004; TERI, 1999) functions of JFMCs (TERI, 1999), implementation of JFM policies in the states (TERI, 1999), and capacity building (PRIA and Samarthan, 2010). Despite claims of its widespread success, critics have expressed doubts about the effectiveness of JFM as a community-based forest management program, and question the ecological, economic, and institutional parameters used by government and donor agencies to

measure the success of JFM in the country. According to Rao et al. (2004), most of the JFM evaluations were undertaken by state forest departments, the MoEF, and donor agencies, and often neglected the perspectives of community members, thereby, presenting only a partial view of its overall performance.

Assessments of the ecological impacts of JFM revealed that most of the regenerated forests comprised exotic firewood species with a relatively low percentage of timber as well as non-timber species, resulting in the decline of biodiversity over the years (Murali et al., 2002a; Ravindranath and Hall, 1995). Higher species diversity was often reported in those forests managed outside the purview of JFMCs, particularly in community forestry systems managed by local residents using traditional forest management and silvicultural practices (Rai et al., 2000; Ravindranath et al., 2000). According to Murali et al. (2002a), for JFM to have any significant impact, there is a need to adopt an "integrated village ecosystem", where not just forests, but all land-use categories (including village common lands and private lands) are included and managed according to site-specific plans. According to Murali et al. (2002a, p. 527) site-specific plans would lead to "adaptive forest management", whereby, decisions on forest regeneration, biomass productivity, species varieties, and extraction strategies of forest products are made based on the subsistence and commercial needs of the local communities.

Assessments of the economic impacts of JFM on local livelihoods showed less than favorable outcomes. According to Sarin (1999), the failure of JFM to incorporate the subsistence needs of the rural poor increased the economic differences between the poor and their wealthier counterparts. Profits from collection and sales of NTFPs were mostly appropriated by middlemen, traders, and the rural elite groups, at the cost of the marginalized groups (Sarin, 1998, 1999; Vemuri, 2008).

JFM in India also has been widely criticized on institutional grounds. Kumar (2002) argued that JFM failed to adequately involve marginalized people, as membership to JFMCs was often restricted to elected members of the *gram panchayat* or village council, who mostly represented the views of the dominant class. The limited success of JFM has also been attributed to the failure of the government to devolve power and control at the desired levels. Ravindranath *et al*. (2000) point out that JFMCs failed to emerge as autonomous institutions, with decision-making authority remaining in the hands of the state forest departments. Most of the JFMCs registered under the forest departments had no legal identity. While villagers were entrusted with the duties of protecting the forests, forest departments retained control over the planning and implementation of working plans, revenue collection, allocation of funds, and other important management decisions. According to Kapoor (2001), organizational hierarchy within JFMCs hindered bottom-up participation, resulting in political and administrative barriers. Despite the modifications to the JFM policy in 2000 and 2002 mandating the inclusion of women and poor landless villagers in VFCs, very little changed in terms of overall implementation. Lack of opportunities to meaningfully participate in the management and protection of forests often compelled the marginalized villagers to engage in unlawful activities against the forest department (Vemuri, 2008).

For JFM to be successful as a bottom-up participatory forest management program, Rao et al. (2004) call for the adoption of a "multi-institutional approach" that considers the perspectives of all concerned stakeholders in the JFM process (p. 30). According to Khare *et al*. (2000), as orientations of forest policies change over time, one needs to take into account the competing claims and relative influences of the key stakeholder groups. They further argue that policy debates tend to stereotype people into apparently homogenous groups, failing to account

for the heterogeneity within these groups. The ultimate aim, therefore, should not only be to capture the authenticity of diverse viewpoints, but also to formulate and implement policies that recognize all viewpoints.

2.3. Conservation context: Sikkim

Nestled in the Eastern Himalayas, the state of Sikkim is surrounded by the Tibetan Plateau in the north, Bhutan in the east, West Bengal in the south, and Nepal in the west (Figure 1.1).The total forested area in Sikkim of 3,359 km^2, accounts for 47.3 percent of its geographical area (FEWMD, 2007). One of the most densely forested areas in the country, Sikkim is also the least populated state in India, with only 0.02 percent of the country's population (Government of India, 2011; JICA, 2009). The state's population is almost entirely rural (91percent), and many depend heavily on forests for their livelihoods. The Forest, Environment and Wildlife Management Department (FEWMD) of Sikkim, has administrative control over 81percent of the total geographical area of the state (FEWMD, 2015; JICA, 2009) (Figure 1.2).

As the greenest state in India (SikkimFirst.in, 2013), Sikkim boasts a historically sustainable natural resource conservation paradigm in conjunction with steady economic development. The state's success in the fields of NRM, wildlife protection, environmental sustainability, and economic development earned Sikkim the first and second positions (among low population density states in India) in the *States Sustainability Competitiveness Report 2011* (IFC, 2011) and *Environmental Sustainable Index 2009* (IFMR, 2009), respectively. Sikkim ranked highest in India's *Green Protection Index* (0.903) in 2004 (Sethi, 2015). The state was also recognized as the top performer in the country in *Performance in Land Use 2008* and *Conservation of Natural Resources 2009* (FEWMD, 2015), and is home to the "Greenest Chief Minister of India" whose conservation paradigm "not growth *versus* green but growth *with*

green" calls for a greener Sikkim through people's participation (FEWMD, 2009, 2015; Government of India, 2013).

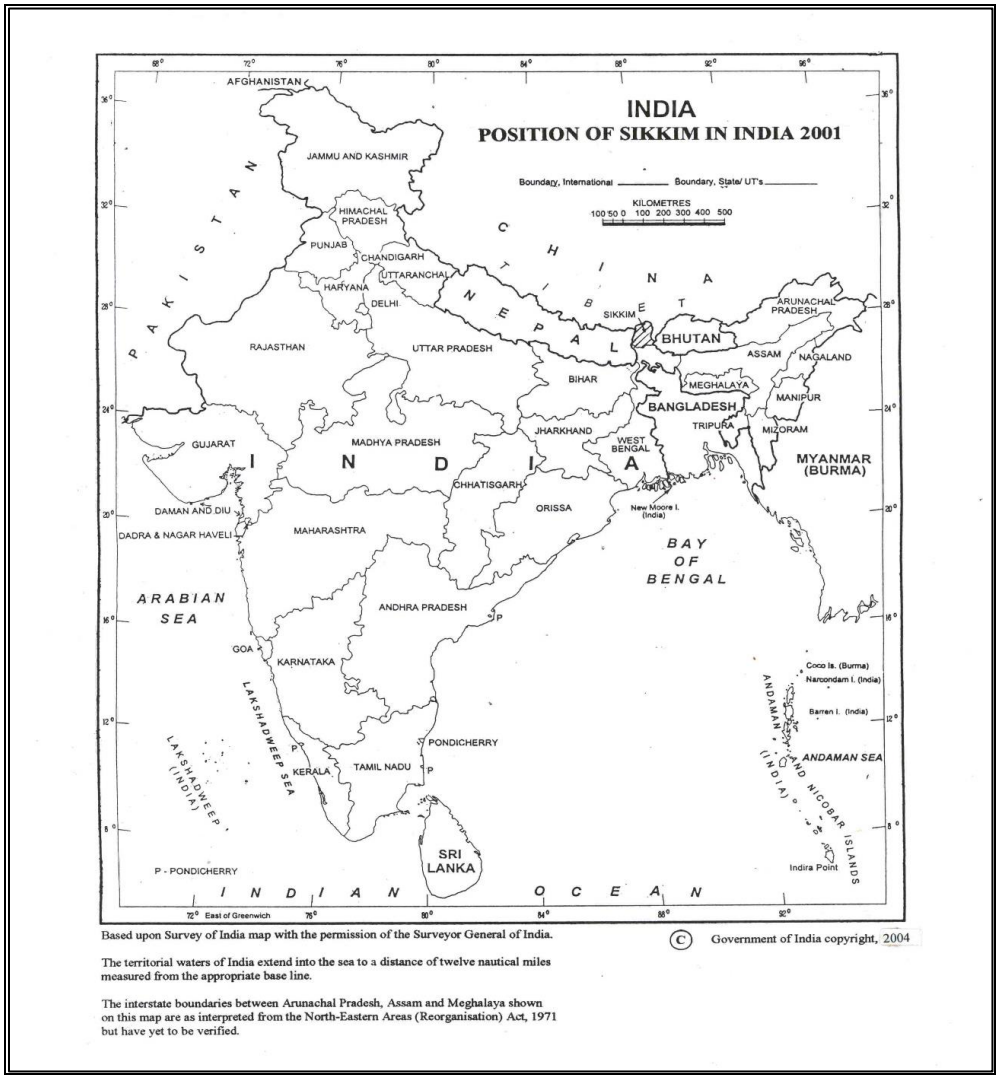


Figure 1.1. Location of Sikkim in India (source: Census of India 2001; District Census Handbook, Part XII-A & B; Series 12-Sikkim).

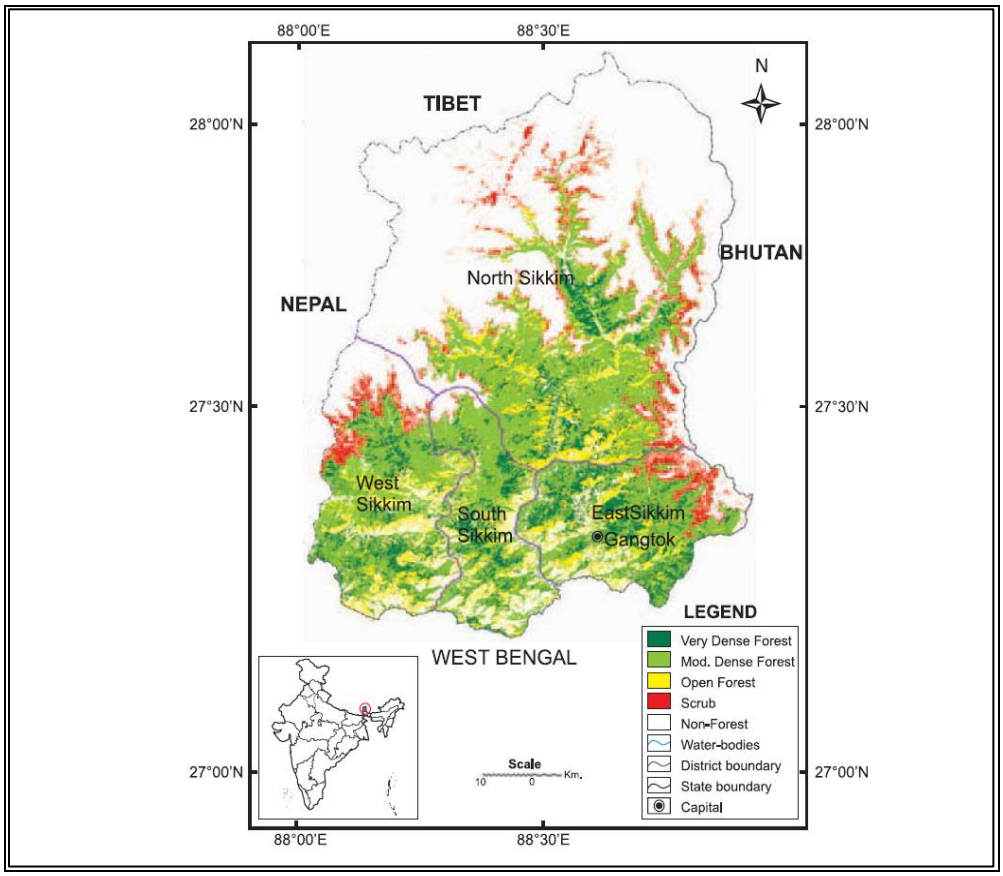


Figure 1.2. Forest cover map of Sikkim (source: India State of Forest Report 2009; Forest Survey of India; online, available at: http://sikenvis.nic.in/writereaddata/sd8.pdf).

2.4. Modern forest management in Sikkim

The origins of modern forestry management in Sikkim date back as far as 1909 under the ruler Sidkeong Tulku, the tenth Chogyal of Sikkim. Considered the "father of forestry" in Sikkim, Sidkeong Tulku was instrumental in bringing the forests of Sikkim under an organized body, and in undertaking the surveying and demarcation of forests on a scientific basis. As the kingdom of Sikkim was not directly under the British Colonial Administration, the administrative and managerial control of forests rested with the landlords directly under the Chogyal until 1947. The year 1905 saw the demarcation of "Reserve Forests", classified as forests not under human occupation and where "no rights and concessions exist". In 1911, isolated patches of forests within the villages, and forests along the fringes of reserved forests

and villages were delineated as "*Khasmal*" and "*Goucharan*" forests. *Khasmal* forests were those where people had rights to a free supply of timber and firewood after obtaining formal permission from the forest department, while *Goucharan* forests were demarcated as those where local people had rights to graze their cattle and collect firewood and fodder (FEWMD, 2009). A forest manual was adopted in 1914 that categorically stated the functions of the forest department regarding forest administration and management. In 1952, the first cadastral survey in Sikkim was undertaken to officially demarcate revenue and forest lands, in which, cultivated lands were recorded in the name of their owners, while lands not under the ownership of any individual were recorded as Reserved, *Khasmal*, and *Goucharan* forests. These pioneering steps towards organized forestry management under the Chogyals laid the foundations for modern day forest management in Sikkim (FEWMD, 2009).

Sikkim became a part of the Indian Union in 1975, and subsequently the Indian Wildlife Protection Act 1972 and Indian Forest Act 1927 were extended to Sikkim for the protection of its wildlife and forests respectively. Later, the Indian Forest Act 1927 was replaced by the Sikkim Forests, Water Courses and Roads Reserve (Preservation and Protection) Act in 1988. The Forest (Conservation) Act, 1980, was adopted in order to strike a balance between development and conservation, emphasizing on managing the diversion of forested lands for non-forest use (FEWMD, 2009). The year 1995 saw the adoption of "*Harit Kranti Dashak*" (Revolution for a Green Decade) for a "greener Sikkim through people's participation" (FEWMD, 2009).

2.5. JFM in Sikkim

The call for community participation in forest management and protection in Sikkim was further strengthened through the adoption of JFM in 1998. It was hoped that the JFMCs, and subsequently the Eco-Development Committees (EDCs), and *Pokhri Sanrakshan Samitis* (Lakes

and Wetlands Protection Committees or PSS) which were established as community-based NRM organizations, would promote greater transparency, accountability, and equity in forest governance through the decentralization of financial and administrative powers, and provide meaningful opportunities for rural residents to "enhance their livelihoods through forestry, ecotourism, and other income generation activities" (FEWMD, 2015, p. 23).

In 2006, the FEWMD, Sikkim, issued notification that each of the 907 village wards in the state were required to establish either a JFMC or EDC, which would be the "nodal agency for all programs related to forests, land use and environment, medicinal plants, watersheds, and wildlife and biodiversity" (JICA, 2009, p. 19). Each JFMC consists of a General Body (comprising one member from each household in the ward), and an elected Executive Committee (EC).The main duties of the JFMCs include the protection and maintenance of forests and plantations (with an emphasis on monitoring trespassing and grazing activities in JFMC areas), preventing forest theft, and helping forest officials prevent and control forest fires. JFMC activities are carried out under the provisions outlined in the National Afforestation Program (NAP). The NAP mandates the adoption of micro plans prepared with the involvement of local communities. The activities included in the micro plans are: (1) forest planation and regeneration; (2) entry point activities to help create community assets through small-scale assistance; (3) awareness programs; (4) soil conservation; (5) fencing; and (6) monitoring and evaluation of JFM. Funds are provided to JFMCs by MoEF, Government of India, through the appointed Forest Development Agency in the state (JICA, 2009).

In the years since its adoption, JFM in Sikkim has been proclaimed successful at integrating the livelihood needs of its forest-dependent communities along with the forest conservation and management goals of the state. As of 2009, there were 158 JFMCs established

in the state, with provisions for including additional ones in 90 newly created intervention villages, bringing another 3,600 ha of afforested land under the purview of JFMCs by 2015 (FEWMD, 2009, 2015). Despite these claims of success, critical evaluations call for a scrutiny of JFM in the state of Sikkim (Bhat et al., 2000; Kapoor, 2001; Murali et al., 2002b; Murali et al., 2000; Sarin, 1999).

3. METHODS

3.1. Selection of study sites

I conducted the study in the east district of Sikkim, one of the four administrative districts of the state (Figure 1.2). The east district has a population of more than 245,040 persons, with the rural population estimated at 78.4 percent. The geographical area of the district was estimated to be 954 km^2, of which, the area under forest cover was recorded to be 699 km^2 (73.27 percent) in 2011 (FEWMD, 2007; Government of India, 2013). The east district is also home to three wildlife sanctuaries: (1) Fambong Lho Wildlife Sanctuary; (2) Kyongnosla Alpine Sanctuary; and (3) Pangolakha Wildlife Sanctuary—a trans boundary protected area bordering Bhutan, China, and Neora Valley National Park (a UNESCO World Heritage site) in West Bengal, India. I focused of 13 JFMCs within the Rongli sub-division of east district, Sikkim. Of the 13 selected JFMCs, nine fall under the territorial jurisdiction of Rongli Range and four under the jurisdiction of Phadamchen Range (Table 1.1).

I selected the locales for study based on (1) how dependent the human populations were on forests, and (2) their inclusion under JFM in the east district of Sikkim. Approximately 80 percent of the population in the selected JFMC intervention villages depend either directly or indirectly on forest resources for their daily livelihoods. As of 2005, the population of the selected villages stood at 21,494 persons, with a total of 4,155 households (DESME, 2005).

Table 1.1. Joint Forest Management Committees (JFMCs) under Rongli and Phadamchen Ranges, Rongli sub-division, East District, Sikkim, India (Banerjee, 2016).

JFMCs–Rongli Range	JFMCs–Phadamchen Range
Aritar	Gnathang
Chujachen	Lingtam
Dalepchand	Phadamchen
Kopchey	Subaneydara
Lamaten	
North Regu	
South Regu	
Rolep	
Rongli	

3.2. Ethnographic fieldwork

I adopted a qualitative, naturalistic inquiry, based on ethnographic fieldwork. The project is grounded in qualitative research principles (Denzin and Lincoln, 2011) and governed by a desire to study material practices in their natural settings, given that my goal was to understand how people construct meanings for their social experiences and to delve deeper into the complexities of their "multiple constructed realities" (Marshall and Rossman, 2006, p. 53). In an attempt to understand the social contexts, I spent nine months in East Sikkim during 2010-2012 to identify key informants for interviews and focus groups and to engage in casual conversations with potential informants.

In 2014, I returned to East Sikkim to conduct multi-sited ethnographic research. I lived in East Sikkim that year, and recruited local field assistants to assist with data collection and analysis. Together, we conducted more than 200 interviews (including focus groups) with local residents and other key informants in the 13 selected JFMC intervention villages (see Appendix Table 1.2 for interview protocol). I conducted more than 50 additional interviews with *gram panchayat* members and officials from the FEWMD, Sikkim. Furthermore, I undertook participant observation during plantation activities and forest evaluation and monitoring activities organized by FEWMD, Rongli Sub-Division, East Sikkim, documenting my

experience with thick description field notes (Denzin, 1989). Additionally, we collected sociodemographic information from all participants (see Appendix Table 1.1 for participant demographic information sheet).

3.3. Data collection

My data collection was driven by the material conditions in these communities. Mostly, I walked the roads and paths of the selected areas, inviting residents I met to participate. Because forest professionals usually had offices equipped with telephones, I made advance appointments to talk with most of them. I adopted Patton's (1990) interview categories: (1) informal conversational interview; (2) general interview guide approach; and (3) open-ended interview for the study. Informal conversational interviews helped me to establish rapport with the selected participants, while open-ended questions enabled me to obtain detailed, uninhibited opinions and viewpoints of the respondents. Participants for the interviews and focus groups were purposively selected to provide variety in role, gender, caste, ethnicity, power, and position within the JFM process in East Sikkim. When recruiting, I affirmatively sought participation by women and members from racial or ethnic minority groups within the study area. Interviews were conducted in Nepali, Hindi, or English, depending on each participant's choice. Locations for interviews and focus groups were determined according to the convenience and preference of participants. The interviews and focus groups were audiotaped with the permission of the respondents, and transcribed and translated to English. I used triangulation and informant validation and verification to help identify and manage possible methodological biases and data inaccuracies. The research was conducted in accordance with the requirements of the Institutional Review Board at Texas A&M University (IRB Protocol No. 2012-0327) and The Human Subjects Protection Office at UTEP (IRB Protocol No. 841069-2). I obtained oral consent from all parties,

and removed names from interview transcripts, replacing them with Arabic numbers. When cited in the text, interview numbers are separated from utterance number by a full stop. For example, the third utterance in the twentieth interview would be designated as 20. 3. In addition to primary data collection, I obtained secondary data from both governmental and non-governmental sources.

3.4. Data analysis

Data analysis and interpretation was based on grounded theory (Glaser and Strauss, 1967). Following this approach, I derived analytic categories from the data itself that reflected the interaction between my informants and myself, leading to a deeper understanding of the participant's experience, both while participating in the study and in the broader context of their lives (Charmaz, 2001). I first read through all interview and discussion transcripts, and compared them with field notes taken during participant observation. After noting incongruities and congruities between the two types of data, I coded the interviews, searching for emergent themes. Categories established through line-by-line and focused coding helped identify and probe participants' individual perspectives and categorize them into themes.

4. FINDINGS

The three common themes that to emerge from the analysis of interviews and discussion transcripts were:

(1) Differences of opinion between local forest users and professional forest managers about the benefits derived from forest conservation and management.

(2) Failure of the state to understand how relations and structures of power in everyday life influence and shape the context of JFM in Sikkim.

(3) Lack of opportunities for residents of forest fringe communities to meaningfully participate in deliberations on JFM.

4.1. Forest conservation and management benefits

Owing to Sikkim's location, varied topography, and high annual precipitation, the state is home to more than 4,500 species of flowering plants, over 550 species of orchids, 36 species of rhododendrons, and over 400 species of medicinal plants, making it one of the "richest botanical treasures" of India (FEWMD, 2015). The physical remoteness of this tiny landlocked Himalayan state has created inseparable linkages between forests and people. For these rural, forest-dependent communities of Sikkim, not only are the forests their primary source of livelihoods, but are also inextricably linked to their social, cultural, spiritual, and emotional well-being (JICA, 2009). While the rich floral and faunal biodiversity has historically sustained the rural communities of Sikkim, who have in turn helped preserve and protect forests through accumulated location-specific ecological knowledge (Arora, 2004, 2006), environmental policies in the early 1990s led to the enclosure of forest areas for biodiversity conservation and the protection of natural resources. Elaborating on the impacts of enclosure on his daily livelihood, a villager despairingly commented:

> We have no access to forests…I have no land of my own, and now I cannot enter the forests. Where will I go now? Whatever little I used to earn by selling milk and curd is now gone. I have no means to buy grass to feed my cow, the only one that's left now. Most of us in this village owned cows as many as 10, 11, but now we have 1 or 2 at the most. (55. 9)

Prior to forest enclosure, this villager pastured his cows in the forest and, from his perspective; an increase in forest offers no immediate benefit. Further, by banning his entry into the forest, JFM has severed his existing connection with the forest. Another informant explained:

> We have derived no benefits from forests since the ban. On one hand we are not allowed to enter the forest to collect grass or firewood, while on the other, we do not get enough work. Yes, the forests are growing, and Sikkim is greener, but we the poor are becoming poorer. (74. 15)

Poverty, coupled with the lack of access to forest resources, often compelled the villagers to enter the forests illegally to collect firewood, fodder, and other minor forest produce. Some villagers admitted taking their cattle inside the reserved forests for grazing, while others admitted entering the forests to collect highly-valued medicinal plants and selling them illegally. Aware of the logistical impossibility of strict monitoring of forests by the state forest department, one villager stated:

> I know it is illegal to enter the forests, but what can I do? I need firewood, especially during winter. I sneak in, and so do others who live close to the forest boundary. It is risky, and if caught, we have to pay a hefty fine, but it is impossible for the department to catch offenders. This is a huge area, miles and miles of forests, and only a few forest guards. No one has yet been caught. (76. 7)

Admitting the lack of financial and human resources to effectively monitor illegal entries into forests, forest department personnel have shifted their focus from forest boundary policing to "social fencing", whereby locals are encouraged to collectively protect forests and grazing lands through optimal use and self-policing (Chaudhuri, 2013; Mishra and Sarin, 1988). Emphasizing the need to involve locals in the forest monitoring activities, a JFMC Executive Committee (EC) member stated:

> Physical fencing works no more. What we need is social fencing. People need to be more consciously involved if they want to save the forests. We can stop illegal activities in the forests only if we collectively come forward to help. You cannot just sit at home and expect the government to do everything for you. (80. 11)

In 2013, Sikkim became the only state in India to have recorded an increase in forest cover over the last two decades. The state forest cover grew from 43.95 percent in 1993 to 47.34

percent in 2013 (SikkimFirst.in, 2013). However, while secondary forest cover showed a steady increase, primary forests continued to be depleted due to numerous developmental activities in the state (FEWMD, 2009; Government of India, 2008; Lama, 2001). Studies show that JFM plantation schemes in East Sikkim have so far mostly been unsuccessful in the regeneration of primary oak forests due to a think undergrowth of quick growing exotic species (JICA, 2009). While the impacts of replacing primary forests with secondary forests of exotic species on Sikkim's biodiversity has not yet been widely researched, global studies show that secondary forests often fail to maintain species biodiversity and other crucial environmental services (Farley, 2007; Farley and Kelly, 2004; Murali et al., 2002a; Rao et al., 2002; Ravindranath and Hall, 1995; Robbins, 1998). One villager verified this when describing the forest plantations undertaken by JFMCs:

> Forests are not what they used to be 20-30 years ago. The species are not native to our area. The forest department brings saplings from just about anywhere. The survival rates of saplings are very low. You need to nurture them and undertake regular weeding, but the forest department cares less about these things. Most saplings die within weeks of planting, and those that survive will be of no value to us in the future. (104. 4)

Although secondary forests of exotic species held little value for this villager, a JFMC EC member stated secondary forests were important for their quick, regenerative capacities:

> This forest area was considered as degraded land eight years ago, and you would not find a single tree here; but look at this place now, trees all around. We have undertaken massive plantation projects over the years through our JFMC, and have been successful in afforesting Sikkim. (100. 7)

Planting of non-indigenous species has also resulted in increased threats from wild animals in the forest fringe areas. Forced to leave their natural habitats, animals have taken to foraging the villages, inconveniencing and endangering villagers. According to an irate informant:

> Animals like bears, deer, and porcupines do not feed on the non-native species that are being planted in the forests. Lack of food in the forests force the animals to enter our villages and destroy our crops. Porcupines are the worst menace. Twice in three years I have had my crops destroyed by porcupines, and I have not been compensated by the forest department. They ask me to bring a photograph of the animal as a proof. You tell me—is that possible? (103. 11)

While the state has invested more than ₹10 crore ($100 million) over the past eight years in planting indigenous species of trees, shrubs, fruits, medicinal plants, etc. under the State Green Mission (PTI, 2013), benefits are yet to be realized by the poor, forest fringe communities. As one villager stated categorically:

> I do not know about state policies. There are so many that I have stopped taking interest in them. The state can have as many missions as they want. We, the poor, have only one mission - to be able to feed our children. Do you know of any state policy that guarantees to benefit our children and protect our forests too? No, there are none. It is an option, and we the poor are more often on the receiving end of such forest conservation policies of the state. Our state is getting greener, but our stomachs are getting thinner. (83. 16)

To sum up, my informants indicate that does not always have positive outcomes and its benefits are unequally apportioned. While conservation goals focus on protecting nature from people who have been traditionally dependent on forests, local residents are unlikely to perceive significant benefits derived from forest conservation and management. They have seen neither benefits from increased revenue nor from conservation outcomes. From their perspective, JFM has done little to empower poor and marginalized residents of rural forest-dependent communities of Sikkim.

4.2. Community relations and power structures

The importance of understanding social dynamics in participatory NRM initiatives has gained increasing recognition worldwide. For Reed et al. (2009), claim that the failure of policy

makers to pay adequate attention to the interests and relationships among stakeholders often results in biased management decisions and marginalization of crucial groups, thereby endangering the viability of environmental policies in the long-term. According to Blaikie and Springate-Baginski (2007), forest policy processes cannot be understood without acknowledging the inherent political nature of all forest related issues.

Vemuri (2008) found that hierarchical bureaucracy, which was the quintessence of the exclusion-based forest regime in pre-independent India, India prevails in its post-colonial forest management practices, with decision-making authority remaining in the hands of the central and state governments. Sarin (1998) documented how the dominant groups (mostly rural non-poor) benefitted from the lack of formalized tenure laws and by appropriating control over forest management decisions, further marginalized the poor. Kapoor (2001) notes that attempts to decentralize the management of forests have been severely compromised by administrative complexity and corruption. One informant expressed his displeasure at how JFMCs are constituted and function in Sikkim:

> JFMC EC members should be elected every five years. This is not taking place. The villagers are never involved in the process of selecting committee members. It is an undemocratic process. The current members have been in position since the existence of the JFMC—some for eight to ten years, or even longer. If they are unable to serve the committee, their family members automatically, get selected. I say this is wrong. I want to know what happens behind those closed door JFMC meetings. (88. 22)

On the other hand, one JFMC member justified his stint as a JFMC President for over 11 years as a matter of expediency:

> This is a high altitude border area, a restricted area, and we have to obtain authorizations from the central government to undertake any activities in the forests. By God's grace, I have good rapport with the central government defence and military officers here. We have to work with them in order to preserve and protect the forests. We ask the villagers

> every 5 years to elect an EC member for the JFMC. People decide who gets elected, and we have to abide by their decisions. They say that we will elect those who can help us get benefits through the JFMC. Now, because of my rapport with the military officers, people have re-elected me. This is my second term as the JFMC President. I tell my people I am getting old, elect someone else, but they want me as the president. (84. 19)

Limited accountability and a lack of transparency in the forest management process have further limited the effectiveness of JFM in Sikkim. A villager described the lack of transparency in the allocation and use of JFM funds:

> I have heard from a reliable source that this year the JFMC has received funds to undertake plantations in our village. The year is almost coming to an end now, but where are the plantations? I ask where did all the money go? Vanished into thin air? Will I be allowed to check their bank accounts? No, never! It is none of my business, they would say. The EC members complain that they are not paid for their jobs. I say, who needs a salary from the government when you can make more money this way? I do not trust the committee. I will neither get involved in their activities, nor will allow any of my family members to do so. Who wants to get into this mess after knowing everything? (41. 16)

A JFMC EC member mentioned his awareness that accusations of financial misappropriations were circulating throughout the area, along with an alleged lack of transparency in JFMC activities, but argued they were not correct:

> These allegations are baseless. No money has been sanctioned for plantation activities this year. Check our JFMC account. You will find no discrepancies. Who am I to decide what to do with the funds when they are released from the department? I just follow orders from above. People think we make a lot of money as elected members of the JFMC. In reality, we do not. I want to make one thing clear. We are not paid by the department to do this job. No remuneration. This is a thankless job. (35. 14)

Lack of accountability within the JFM process has also compromised its popularity and success among forest-dependent communities. As one villager disappointedly stated:

> What we say hardly matters because we cannot hold anyone accountable in the forest management committee. I do not think the EC is either answerable or can be held accountable by those right above them, for example, the Range Officer or the Assistant Conservator of Forests.

This individual qualified her remarks by stating that, "the problem is in the system itself". She suggested that, "good examples should be set by those higher up in the ladder, and only then can the followers walk in the right direction". She connected JFM problems with engrained power relationships, noting that, "I sometimes feel bad for the committee people. They may want to do the right thing, but can they ever go against the wishes of the department? Their hands are tied" (65. 22).

Expressing his frustration at the State Forest Department's underlying organizational bureaucracy, JFMC EC member commented:

> It is disheartening to see that JFM has not been very successful in our area. Through our JFMC we try our best to bring in necessary funds for plantations and other related activities into our village so that people can get some employment. But a lot is still needed to make JFM a grand success. Our knowledge is limited, and with this limited knowledge we cannot do a lot. People need to understand this. We need the forest department to train us on how to better manage our JFMCs. We do not have the necessary skills or knowledge to maintain accurate records. Also, we do not have the basic resources like calculators, record books, receipt books, etc., to facilitate these tasks. Time and again our requests for much needed training programs and funds have fallen on deaf ears. If we go to the RO, he says he cannot do anything, for the powers rest with the officers posted in Gangtok. There have been several occasions where I have procured stationaries for our JFMC out of my own pocket. I have not asked for reimbursement. But I am a poor man and I cannot continue to incur such expenses out of pocket on a regular basis. (90. 26)

Although some studies have attributed the limited success of JFM to the failure of the government to adequately devolve power and control (Behera, 2006), the devolution of decision-

making authority does not necessarily mean that decision-makers will seek to empower local resource users, especially those who are already marginalized by characteristics such as gender, caste, or ethnicity. My informants believed that the government, including JFM personnel, does not understand the importance of ordinary interactions and existing community patterns and power relationships, and that, this lack of understanding limits the potential success of JFM in Sikkim.

4.3. Participation in deliberations on JFM

Through decentralized community-based management, JFM seeks increased popular participation as a means to resolve disputes emanating from conflicting forest management priorities (Kant and Cooke, 1999). It was hoped that the implementation of JFM through various training programs, seminars, workshops, and meetings would open up avenues for better communication between villagers and foresters, reducing the mutual mistrust that has plagued forest departments and forest-dependent communities in the past. While official sources claim that JFM in Sikkim has been successful in integrating the livelihood needs of its rural forest-dependent communities with the conservation and management goals of the state (FEWMD, 2009, 2015), little has been achieved in terms of providing meaningful opportunities for the local communities to participate in JFM decision-making processes. According to an informant, lack of access to relevant information about upcoming JFMC meetings has prevented him from participating:

> We never know when or where the meetings are held. If I know in advance I will definitely attend the meetings. I am interested in knowing what is going on in the village, about the funds that have been allocated for plantations, and the projects and schemes sanctioned by the government. But often I hear about the meetings after they have taken place. What is the use of holding such meetings then? I think the committee does this on

> purpose; if no one is present they can do whatever they want. No one will ever come to know where the funds have gone. (98. 19)

A JFMC President vehemently protested that:

> Such claims are utterly baseless. How can anyone say that we do not provide them with accurate information about the JFM meetings on a regular basis? Every year we hold at least two General Body (GB) meetings where all villagers, being members of the GB, are invited and requested to actively participate. We have an information officer who is responsible for informing the *gram panchayat* and the villagers about the meetings. The *panchayat* too informs people. Meetings are almost always held in places that are easily accessible by most. (91. 23)

Another JFMC president commented on the importance of engaging the villagers in JFMC decision-making processes:

> It is necessary to engage the locals in all our activities. All decisions concerning our forests should be made jointly with the people. I cannot decide on my own what needs to be done in order to protect our forests. The villagers have a lot of experience and local knowledge too. Together we can protect our forests. (91. 19)

While several JFMCs claim to have instituted awareness programs to encourage active local participation, awareness is only a first step in gaining the trust and confidence of the residents of forest fringe communities. Although many villagers mentioned their inability to attend JFMC because they lacked information, a lack of trust in JFM officials is another contributor to low levels of participation. As one villager stated:

> What is the use of attending these meetings if what we say never matters? The officials note down our concerns in a copy, and then forget about it altogether. They say they will take necessary actions but they never do. Perhaps, if I were someone influential and important, my problems would have been solved by now. But I am not. Initially, I used to take active interest in the meetings as I thought it was a platform to express my concerns and problems to the authorities, but now I know better. I have stopped attending these meetings altogether. (87. 15)

As this informant explained, participation opportunities must be seen as a meaningful part of decision-making regarding how forests will be managed, rather than an empty signifier.

Limitations on participation in decision-making processes on forest management among residents of these forest fringe communities include a lack of awareness, high costs of participation (relative resident's resources), and a lack of incentives. When coupled with generations of mutual mistrust between forest fringe dwellers and forestry professionals employed by the state, it should not be surprising that JFM has remained far removed from its policy goals of garnering sustained community support for and involvement in the co-management of forests in Sikkim. In this social and political milieu, collaborative NRM is unlikely to be achieved.

5. WORKING TOWARDS MORE COLLABORATIVE MANAGEMENT OF FORESTS IN SIKKIM AND BEYOND

The responses from my informants suggest that, in the case of JFM in Sikkim, the immediate needs are to integrate the plurality of perspectives into policy dialogue and to recognize the ongoing challenges imposed by the differential power dynamics among the residents of these communities. Residents of these communities described a failure of JFM in Sikkim to incorporate meaningful participation of local forest resource users. To construct a community that include both forest fringe dwellers and forest professionals, the JFM program must take into account a holistic mechanism that recognizes and responds to both the long-term and short-term resource needs of the forest-dependent communities, as well as the individuals who make up these communities. The likelihood of success for a collaborative resource management program may be enhanced by recognizing and building upon the differing viewpoints as well as including dynamic collaborative management as a process of

understanding the needs, goals, and interests of all community members. Through joint and collaborative learning initiatives that encourage and respect interdependence and mutual appreciation among different stakeholders, the JFM program can work toward its desired conservation outcomes, while also contributing to the livelihoods of those communities dependent on such natural resources.

Achieving JFM's goals as a community-based forest management program in Sikkim necessitates the recognition of forest-based communities as co-owners and equal partners in forest conservation and management. No collaborative NRM effort can be successful unless trust is established and sustained. Through an ongoing dialogue between different individuals and groups within these communities, there is a greater possibility for the voices of the previously unheard to be heard and respected by others. This would lead to a better understanding and respect for each other's perspectives, and recognition of the interdependency among the diverse groups that care about forests. Recognizing and cultivating this interdependency may contribute to an environment conducive to joint learning and working together towards the realization of common goals.

6. LESSONS LEARNED

In a growing effort to address the conflicts and challenges arising out of traditional mechanisms for citizen participation in environmental decision making, several strategies have been designed and implemented in order to promote collaborative planning and decision-making (Buck et al., 2001; Gray, 1989; Purnomo et al., 2004; Western et al., 1994; Yaffee and Wondolleck, 2000). Walker (2004) suggested collaborative decision-making, which involves constructive, open dialogue, with an emphasis on learning and sharing of power between stakeholder groups. Consistent with collaborative management as a dynamic, ongoing process of

understanding the needs, goals, and interests of each actor group, Buck et al. (2001), emphasized social learning, or the encouragement of diverse stakeholder groups to recognize and understand the importance of interdependency and joint working towards common goals and ends. This mutual learning encourages participants to arrive at decisions through interactive, iterative, and reflective processes. Highlighting the importance of stakeholder interdependence in collaborations, Gray (1989), pointed out that increased awareness of interdependence often sparks those who are participating in conflict to seek opportunities that benefit all parties.

All of this research suggests that for collaboration to succeed, there is a need to build trust among key stakeholder groups and to provide them with the opportunities and resources necessary to come together on a common platform and engage in active interaction and constructive dialogue related to their concerns. Trust, which forms the core of any collaboration, plays a critical role through promoting information sharing, open communication, and building relationships through reciprocation (MacKenzie, 2008). By adopting a problem-solving approach that works toward establishing trust and favors discussions, conversations, information sharing and learning, groups can arrive at consensually agreed upon recommendations or workable solutions for their concerns (Daniels and Walker, 2001). The importance of public engagement in the production of substantively and procedurally legitimate natural resource policies is further emphasized by Peterson (2003), who notes that policies that lack social acceptability and broad legitimacy are more difficult to implement, and are rarely sustainable.

One key to understanding the complex nature of participatory governance is to assess the level of participation vis-à-vis the inclusivity and the intensiveness of participation. Inclusive participation, according to Malena (2009), is not exemplified by making every individual participate in every policy making decision, but rather, by ensuring that there is equitable

representation of the interests of disadvantaged and marginalized groups. Over time, higher representations from marginalized groups and improved sharing of relevant information between government officials and citizens may evolve into mutual trust and understanding, which leads to more meaningful, intensive, and effective forms of public participation.

The degree to which participation may be inclusive and intensive is a complex interplay of varied institutional, organizational, relational, and societal-level factors contingent upon context and circumstance. For an in depth analysis of how participatory governance works under specific context and circumstance, it is important to understand that governance practices involve many actors (both state and non-state), each with their own interests, rights, and responsibilities. While the literature on participatory governance tends to focus on two primary sets of actors: (1) the state or government and (2) civil society actors, Malena (2009), points out that these spheres are not homogenous, monolithic entities, but, rather, represent a motley collection of actors and their interests. Further, amidst the state and civil society actors, there is a third set of actors that bridges across government and civil society.

There is an increasing consensus among scholars and practitioners that participatory governance is most effective when state and civil society actors jointly participate in mutually negotiated and agreed upon initiatives, rather than when such linkages and ties are weak or absent. Greater participation by both civil society actors and state actors leads to more accountable, transparent and effective governance processes. Citizen participation may generate quality information based on the needs of marginalized sections of society, which leads to a more informed and appropriate decision-making and policy implementation process. Broadly based participatory governance leads to the empowerment of citizens, and "legitimacy, effectiveness, popularity, resources, and political stability for government actors" (Malena, 2009, p. 14).

Recognizing that ongoing natural resource conservation and management processes include both professional resource managers and residents of local communities, collaborative approaches that encourage forest department personnel and local community members to recognize and cultivate their mutual interdependence through an iterative dialogue process can help open up spaces previously controlled exclusively by resource managers to local communities. At the same time, when local community members become regular and respected occupants, political spaces that previously lacked public legitimacy may become legitimate venues for engaging in difficult discussions and reaching policy decisions. Collaborative decision-making opportunities, while not a panacea, can help not only validate public participation, but also transform it from a pro-forma exercise for defending predetermined policy decisions, to one where citizens' inputs and questions influence forest management decisions (Martin, 2007; Peterson, 1997; Senecah, 2004; Walker, 2004). This shift can help construct sustainable communities among JFM areas of Sikkim, as well as other regions throughout the world that struggle to develop inclusive conservation communities.

ACKNOWLEDGEMENTS

I thank the anonymous reviewers and the editor for their useful suggestions and comments on earlier drafts of this chapter. I would like to express my sincere gratitude to all the participants of the study and to those who helped me with fieldwork logistics and data collection in East Sikkim, India. I thank my friends and colleagues for inspiration and constant support during various stages of the study. The research was conducted in accordance with the requirements of the Institutional Review Board at Texas A&M University (IRB Protocol No. 2012-0327) and The Human Subjects Protection Office at UTEP (IRB Protocol No. 841069-2).

Chapter 2: Framing conservation: How key demographic and spatial variables influence stakeholders' social control frames regarding natural resource management in East Sikkim, India

ABSTRACT

Public participation in environmental decision-making is integral to democratic governance. If designed and implemented appropriately, such processes produce policies that are more broadly informed and have robust social acceptance. Although adaptability has been the cornerstone of successful stakeholder engagement, it has his own set of challenges. One of the more difficult challenges to overcome is the tendency to stereotype stakeholders into homogenous and functionally integrated groups. Policies that disregard the diverse and often internally conflicting stakeholder perspectives may undermine conservation outcomes. Critical to any stakeholder engagement, therefore, is the need for resource professionals to understand and deliberately foreground diverse stakeholder viewpoints, knowledge, needs, and preferences. Worldviews shape how individuals perceive and interpret reality. *Social control frames*, or preferences regarding how society should be managed are integral to worldviews. Understanding these frames can guide natural resource professionals to management options that are more socially acceptable and effective. In this paper, I hypothesize that key sociodemographic (i.e., age, gender, generations in region, household size and composition, and principal occupation) and spatial (i.e., elevation, distance of household from nearest accessible road and from nearest statutory forest boundary) variables may play an important role in shaping an individual's social control frames. This knowledge, I posit, can serve as a valuable tool enabling resource professionals to formulate and implement conservation plans that are both culturally appropriate and equipped to address the uncertainties of managing complex human-dominated systems. In

this paper, I (1) describe a questionnaire administered to identify participant's social control frames; (2) employ logistic regression to examine the probability of association among key sociodemographic variables, spatial variables, and social control frames; and (3) discuss the implications of reported associations for natural resource management outcomes. The study demonstrates that a better understanding of how key demographic and spatial factors influence prevailing social control frames, can help resource professionals understand what motivates individuals to accept or reject natural resource management programs, and bridge the schism between policy intent and action by developing more socially appropriate management strategies.

Keywords: Joint Forest Management, public participation, community-based natural resource management, social control frames, sociodemographic and spatial variables, Sikkim, India

1. INTRODUCTION

Public participation in environmental decision-making has long been recognized as integral to democratic governance (Brown, 2013; Callister, 2013; Endres et al., 2009; Hazer Sancar, 1993; Sowards et al., 2017). By engaging the citizenry in decision-making processes, public participation helps enrich democracy by building public confidence in democratic institutions, and promotes social legitimacy through trust building (Dietz and Stern, 2008; Lafont, 2015; Reed, 2008; Shirk et al., 2012). Public participation also may contribute to good governance by promoting transparency, accountability, and equity (Butler and Adamowski, 2015; Martin, 2007; Wagenet and Pfeffer, 2007). If designed and implemented appropriately, such processes produce policies that are more broadly informed, relevant, and have robust social acceptance (Caves et al., 2013; Knapp et al., 2014; Peterson and Feldpausch-Parker, 2013; Zinia and McShane, 2018). Thus, the *ways* people make environmental decisions have direct

implications for the outcomes of those decisions (Acey, 2016; Koontz and Thomas, 2006; Maguire and Lind, 2003). As public engagement in environmental decision-making evolved to become a political social requisite (Parikh, 2017), resource professionals are increasingly expected to engage in policy dialogues that integrate natural science with citizen perspectives (Ferguson et al., 2017; Hollow et al., 2015; Knapp et al., 2014; Scolobig and Lilliestam, 2016).

Although adaptability has been the cornerstone of successful stakeholder engagement, often leading to "better decision-making increased social learning, and clearer communication between scientists, managers, and the public" (Talley et al., 2016, p. 8), stakeholder engagement comes with its own set of challenges. One of the more difficult challenges to overcome is the tendency to stereotype stakeholders into static, homogenous, and functionally integrated groups (Agrawal and Gibson, 1999; Briggs and Sharp, 2004; Carr, 2015; Dewan et al., 2014). I follow Grimble and Wellard's (1997) definition of stakeholders as "any group of people, organized or unorganized, who share a common interest or stake in a particular issue or system" (p. 70). Policies that disregard diverse, heterogeneous, and often internally conflicting stakeholder perspectives undermine natural resource management outcomes (Agarwal, 2001; Anderson et al., 2017; Kabeer and Subrahmanian, 1996; Sultana, 2009). Similarly, failure to acknowledge the power differences and inequalities among stakeholders often undermines collaborative decision-making outcomes (Acey, 2016; Barnaud and Van Paassen, 2013; Brandt et al., 2018). Critical to any stakeholder engagement, therefore, is the need for resource professionals to understand and deliberately foreground diverse stakeholder viewpoints, knowledge, needs, and preferences (Bohnet and Smith, 2007; Cundill et al., 2013; Hoshino et al., 2017; Moorman et al., 2013; Peterson et al., 2006; Tengö et al., 2017).

Worldviews, as culturally valid structures of beliefs, shape how individuals choose to perceive and interpret reality (Dake, 1992; Douglas and Wildavsky, 1982; Wildavsky and Dake, 1990). *Social control frames*, or preferences regarding how society should be managed or controlled, are integral to worldviews. Understanding these frames can guide natural resource professionals to management options that are more socially acceptable and effective (Peterson, 2003). Using a framework formed by the interaction between *interdependence*—how connected individuals view themselves with others, and *voice*—the level of personal responsibility and involvement individuals believe they and others should assume, Peterson (2003) identifies four social control frames—*hierarchist*, *individualist*, *egalitarian*, and *fatalist* (Table 2.1). *Hierarchists* demonstrate high interdependence along with low voice, and express a preference for control by technical experts. *Individualists*, with low interdependence but high voice, generally express preferences to make their own management decisions without outside restrictions. *Egalitarians*, who value high interdependence and high voice, maintain that management decisions should rest with the community rather than individuals. *Fatalists* demonstrating both low interdependence and low voice believe they have little or no control over events, and hence, play insignificant roles in management decisions.

Table 2.1. Social control frames (after Peterson, 2003).

	Low interdependence	High interdependence
High voice	Individualist	Egalitarian
Low voice	Fatalist	Hierarchist

Studies of several cases have documented the existence of social control frames, and suggest that understanding these frames may help natural resource professionals choose management options that encourage wider participation and collaboration (Bryan and Wondolleck, 2003; Gray, 2003; Gray and Putnam, 2003; Putnam and Peterson, 2003). There is a

dearth of such research in the global south, however. Further, these studies have not analyzed the potential influence of sociodemographic and spatial variables on social control frames.

To this end, I hypothesize that key sociodemographic (i.e., age, gender, generations in region, household size, proportion of females in a household, and principal occupation) and spatial (i.e., elevation, distance of household from nearest accessible road, and distance of household from nearest statutory forest boundary) variables may play an important role in shaping an individual's social control frames. This knowledge, I suggest, may serve as a valuable tool enabling policy makers and natural resource professionals to formulate and implement conservation plans that are both culturally appropriate and equipped to address the uncertainties of managing complex human-dominated systems across varied spatial and temporal scales (Aguilar and Kelly, 2019; Biggs et al., 2015; Caves et al., 2013; Fischer, 2018). In this paper, I (1) describe a questionnaire administered to identify participant's social control frames; (2) employ logistic regression to examine the probability of association among key sociodemographic variables, spatial variables, and social control frames; and (3) discuss the implications of reported associations for natural resource management outcomes across local, national, and global environmental contexts.

2. METHODS

2.1. Study area

I chose Sikkim, the small, mountainous, and landlocked northeastern state of India for my case study (Figure 2.1). Located in the foothills of the Eastern Himalayas bordering Nepal to the west, Tibet Autonomous region of China to the north and northeast, and Bhutan to the southeast (https://www.britannica.com/place/Sikkim), Sikkim is one of India's richest states in forest resources, and part of the Indo-Burma global biodiversity hotspot (Arrawatia and Tambe, 2011;

Myers et al., 2000). With elevations ranging from 300 to 8,583 m above mean sea level, Sikkim experiences a wide range of climatic diversity ranging from subtropical humid (<1,500 m), temperate (2,000–3,000 m), to arctic (>6,000 m) (Choudhury, 2006). Vegetation composition

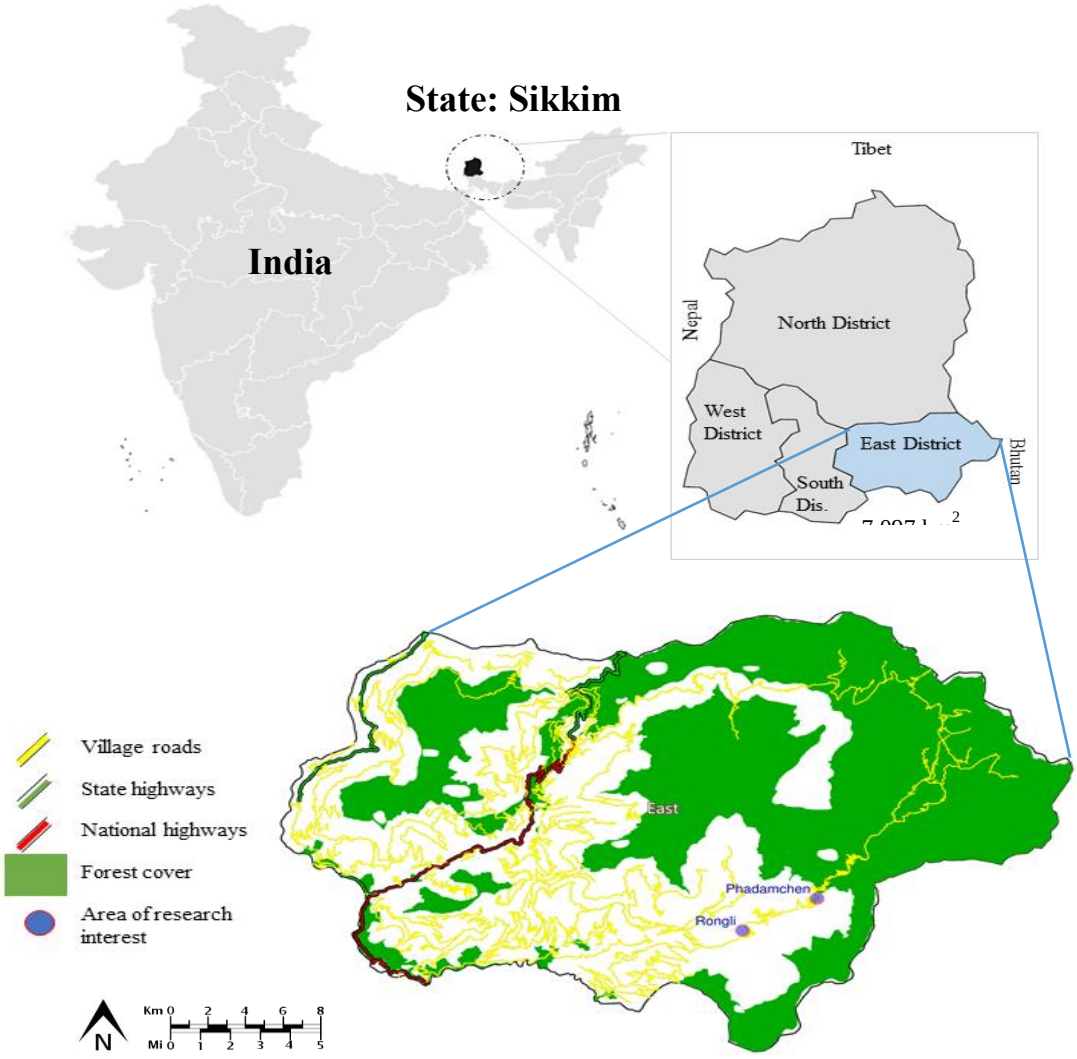


Figure 2.1. Location of study sites at Rongli and Phadamchen Territorial Forest Ranges within East district of Sikkim, India (source: http://www.nedrp.gov.in/eastsikkim/eastsikkim.phtml and https://gramener.com/map/).

ranges from tropical dry deciduous forests in the lower valleys to alpine scrub grassland vegetation in the high altitudes (ENVIS, 2011). Although it is the second smallest Indian state, covering only 0.2% (7,096 km^2) of the geographical area of the country, Sikkim includes one of

the largest forested areas of India with 47.1% (3,344 km^2) of its geographical area under forest cover (ENVIS, 2011). Of the forest cover, 32% (1,081 km^2) was classified as very dense, 47% (1,575 km^2) as moderately dense, and 21% (688 km^2) as open forest in 2011 (ENVIS, 2011). Reserved and Protected Forests occupied 93.4 and 6.7% of the total forested area of Sikkim, respectively (ENVIS, 2011). Currently, there are eight other Protected Areas, comprising one National Park and seven Wildlife Sanctuaries, covering 31.0% of the geographical area of the state. The State Forest Department has administrative control over 82.3% of the total geographical area of Sikkim (FEWMD, 2010).

Sikkim is the least populated state in India, with only 0.1% of the nation's population estimated at 610,577 in 2011 (Directorate of Census Operations, 2011). While Sikkim's decennial population growth was 12.9% in 2011, the average population density estimated at 86 persons/km^2 was substantially lower than the national average of 382 persons/km^2 (Government of Sikkim, 2015). The state's population is 75.85% rural, with heavy dependency on forest resources for livelihoods and income generation (FEWMD, 2007; Government of Sikkim, 2014).

I conducted the study in the East District of Sikkim, one of four administrative districts of the state, and home to the state capital, Gangtok. Occupying the southeast corner of the state, East Sikkim is bounded by China and Bhutan in the east, the state of West Bengal, India, in the south, and the North and South Districts of Sikkim in the north and west, respectively (Figure 2.1). As of 2011, the East District had an estimated human population of 283,583, with a decennial population growth of 15.7% (Census Organization of India, 2015). The average density of population was estimated at 297 persons/km^2 in 2011, 345% higher than the state average (Census Organization of India, 2015). As of 2011, 56.8% of the population was recorded as rural (Census Organization of India, 2015). Mean literacy rates in the urban and rural

areas were 88.9 and 80.0%, respectively in 2011 (Census Organization of India, 2015). Of the total working population of 139,678 in 2011, 79.5% were classified as *main workers* or workers with employment for ≥6 months per year, while 20.5% were classified as *marginal workers* or workers with employment for <6 months a year (Office of the Registrar General & Census Commissioner, 2001). Main workers included cultivators (20.1%), agricultural laborers (4.6%), household industry workers (1.3%), and other workers (73.9%) (Census Organization of India, 2015).

For administrative purposes, the East District of Sikkim is divided into three subdivisions: Gangtok (the state capital), Pakyong, and Rongli subdivisions, which are further divided into *gram panchayat units* (GPUs) or village administrative units comprising of *gram panchayat wards* (GPW). A *panch* or ward member elected by villagers represents each GPW. As of 2015, the East District comprised 52 GPUs and 290 GPWs (Government of Sikkim, 2016). Of the district's geographical area (954 km^2), forest cover was 73.3% (699 km^2) in 2013 (Forest Survey of India, 2013). Of the forest cover, 23% (162 km^2) was classified as very dense, 59% (411 km^2) as moderately dense, and 18% (126 km^2) as open forest in 2013 (Open Government Data (OGD) Platform India, 2016). The East District also is home to three wildlife sanctuaries: (1) Fambong Lho Wildlife Sanctuary; (2) Kyongnosla Alpine Sanctuary; and (3) Pangolakha Wildlife Sanctuary—a trans-boundary protected area bordering Bhutan, China, and the Neora Valley National Park in West Bengal, India (ENVIS, 2019)

2.1.1. Study sites

I selected 13 Joint Forest Management Committees (JFMCs) within Rongli and Phadamchen Territorial Forest Ranges for the study (Figure 2.1; Table 1.1). JFMCs are classified as village-based committees created for the purpose of conservation and management of forests

and biodiversity under the jurisdiction of State Forest Departments, and guided by local byelaws and micro plans (MOEF, undated). I selected the GPWs within each JFMC based on their dependency on forest resources. Approximately 81% of the population in the selected GPWs were dependent either directly or indirectly on forests for their daily livelihoods and income generation (SDMO, 2014). As of 2005, the estimated human population of the selected GPWs was 21,494, comprising 4,436 households (DESME, 2005). The annual per capita income of 89% of selected households in the selected GPWs was <INR₹60,000 (US$884), 32% lower than the state average annual per capita income (DESME, 2005; Government of Sikkim, 2014).

2.2. Survey protocol

I used in-person interviews to assess individual worldviews regarding how forests should be managed, and who should make forest conservation decisions (Miles et al., 2014) (see Appendix Table 2.1 for social control frames survey protocol). I chose personal interviews to minimize nonresponse and to ensure high-quality data. To test the reliability and validity of the survey questions, I pretested the questionnaire with a convenience-based sample of residents of the Rongli (n=15) and Phadamchen (n=15) Territorial Forest Ranges. I recruited interested villagers and forest management professionals from nine JFMCs under Rongli, and four JFMCs under Phadamchen Territorial Forest Ranges to participate in the study. I recruited by word of mouth at the village level, and contacted forest management professionals through emails, phone calls, and face-to-face interactions. I trained two interviewers (one local resident and Banerjee) with a strict interview protocol to ensure data comparability and consistency (see Appendix Table 1.2 for interview protocol). Together, we interviewed 200 residents (one resident per household) of the selected JFMC intervention villages between March 2014 and February 2015. I purposively selected the participants to provide variety in role, gender, caste, ethnicity, power

and position within the JFM process in the region. We georeferenced the location of each household using a handheld global positioning system (GPS) receiver (eTrex, Garmin International, Olathe, KS, USA).

We conducted interviews in Nepali, Hindi, Bengali, or English depending on each participant's choice. Interviews lasted 20–30 minutes each, and were recorded with consent of participants. An initial comparison of survey results reflected no substantive differences in response content between interviewers, and both the interviewers achieved 100% survey response and completion rates. We transcribed all interviews verbatim, and then translated them into English where the source language was different. Subsequently, we undertook back translations of all interviews both by the interviewers and independently through commercial translation services to ensure accuracy. As a member check, I sent a set of transcribed interviews to study participants for additional clarifications, feedback, and validation (Thomas, 2017).

2.2.1. Social control frames

To identify the respondents' social control frames, we asked them to indicate their forest management preferences based on a five-point Likert style scale (1 = strongly agree; 3 = neither agree or disagree; 5 = strongly disagree). We coded each of the four management choices into a social control frame (Table 2.1). We coded the statement, "Joint Forest Management decisions are best made by technical experts; and I am willing to comply with the resulting regulations and expect the same from others" as *hierarchist*. We coded the statement, "Joint Forest Management decisions are best made by individuals; and each individual should be allowed to make his or her own decisions" as *individualist*, while we coded the statement, "Joint Forest Management decisions are best made by communities; and all stakeholders should have a voice in the decision-making process" as *egalitarian*. Last, we coded the statement, "People have no control

over natural resources; and it does not really matter what I think about how natural resources should be managed" as *fatalist.* After every question, we encouraged participants to expand upon their responses in order to gain a better understanding of their attitudes and rationale for decision-making. I identify quotations from interview transcripts by respondent's unique identifying number. For example, a quotation identified as (R001) indicates the quotation came from respondent number 1. We supplemented our data with hand written notes taken during interviews. Additionally, we collected sociodemographic information from all participants (see Appendix Table 1.1 for participant demographic information sheet).

2.2.2. Sociodemographic variables

I considered age, gender, generations in region, household size, proportion of females in household, principal occupation, household income, level of education, and religion and ethnicity as potentially key sociodemographic variables because research suggests associations among preferences for management of natural resources and age (Muyengwa, 2015; Tindall et al., 2003), gender (Agarwal, 2001; Hunter et al., 2004; Naz et al., 2018), occupation (Chen et al., 2011; Cinner and Bodin, 2010), income (Aguilar and Kelly, 2019; Sterner and Coria, 2012), education (Veisten et al., 2004), and religion and ethnicity (Arbuckle and Konisky, 2015; Hazer Sancar, 1993; Hope and Jones, 2014). Further, associations among household size and gender composition (Damon et al., 2015; Longhi, 2013), generations residing in a region (Fabricius et al., 2004; Peterson and Liu, 2008) and environmental attitudes have been widely established.

During the survey pretest, I obtained 100% response rates for all sociodemographic variables except household income, level of education, and religion and ethnicity. Approximately half of the respondents refrained from answering these questions, and their responses to subsequent questions became both brief and vague. A few explained that such information was

sensitive. Consequently, I excluded these three variables from the final survey questionnaire, both to respect privacy concerns, and to maximize the amount of data I could collect regarding other variables.

2.2.3. Spatial variables

I selected elevation, distance of household from nearest accessible road, and distance of household from nearest statutory forest boundary as key spatial variables for the study. Building from previous studies that demonstrate the importance of individual household-level information in natural resource management (Bandyopadhyay and Tembo, 2010; Riehl et al., 2015; Suich, 2013), I obtained location-specific information at the household level to examine possible relationships between these spatial variables and individual social control frames. I selected these spatial variables because previous research suggests relationships among successful community-based natural resource management outcomes and elevation (Riehl et al., 2015), distance to road (Riehl et al., 2015), and nearness to natural resources (DeGeorges and Reilly, 2009).

Within the context of Sikkim, India, Banerjee (2016) found that household location in relation to accessible forest resources played an important role in determining people's attitudes towards conservation in East Sikkim. For example, Banerjee (2016) documented how increasing the size of statutory forests in rural East Sikkim affected local communities' access to forests, and caused a shift to more negative conservation ideologies. Conversely, the study found that forest managers described conservation in strongly positive terms.

2.3. Data analysis

For spatial analysis, I used ArcMap 10.4 (Esri, Redlands, CA, USA) to calculate the distance from each household to the nearest road and to the nearest Reserved Forest boundary that did not adjoin the border with Bhutan. I identified and digitized public and private roads

from Landsat images in Google Earth Pro 7.1.7.2606 (Google Inc., Mountain View, CA, USA). Because electronic spatial data were unavailable for Reserved Forest cover, I scanned the East District portion of the Wild Life and Wetlands map (1:400,000 scale) from the Natural Resources Atlas of Sikkim (NATMO, 2007), which included Reserved Forest cover, and georeferenced the image using 11 control points. I then traced the Reserved Forest boundary to create polygons from which to calculate distances.

I employed nominal logistic regression to examine the probability of association among the independent sociodemographic and spatial variables (Table 2.2) and the categories of responses (i.e., strongly agree, agree, neither agree or disagree, disagree, and strongly disagree) encapsulated in each of the four social control frames (i.e., hierarchist, individualist, egalitarian, and fatalist; Table 2.1). I followed the convention of using a minimum of 10 cases per independent variable for nominal logistic regression (Schwab, 2002). For this reason, I combined 3 and 2 strongly agree with 33 and 28 agree responses for the hierarchist and individualist models, respectively (Table 2.3). To identify departures from normality, I evaluated the continuous sociodemographic and spatial variables using normal probability plots. I transformed variables as needed to ensure these data approximated a normal distribution (see Table 2.3 for transformations used). I explored potential multicollinearity among the continuous spatial and sociodemographic independent variables using a correlation matrix. I found that only ‘distance of household from nearest forest boundary’ and ‘elevation’ were correlated (r = -0.661); however, these variables did not appear together in any of the four selected models (Table 2.3).

Table 2.2. Definitions of sociodemographic and spatial variables used in the social survey conducted in Sikkim, India, 2014–2015.

Variables	Definition
Sociodemographic variables	
Age[a]	Number of completed years that have elapsed since birth of individual.
Gender	Female or male as reported.
Generations in region	Number of generations family has lived in the area.
Household	Group of persons who normally live together and take their meals from a common kitchen unless the exigencies of work prevent any of them from doing so.
Composition	Proportion of females to males in a household.
Size	Total number of persons (including minors) residing in a household.
Principal occupation	A person's usual or principal work or business, especially as a means of earning a living.
Educator	A person in the teaching profession or a student.
Farmer	A person employed in the cultivation of land and/or breeding of plants and animals.
Government employee—forest management	An employee of the Forest Environment and Wildlife Management Department (FEWMD), Government of Sikkim.
Government employee—non-forest management	An employee of Sikkim State Government other than employees of FEWMD.
Housewife	Someone who manages a home and family instead of earning money from employment.
Elected local conservation committee member	An elected member of Joint Forest Management (JFM) Committee, or Eco-Development Committee (EDC).
Laborer	A laborer contracted by the Indian Army or the Gati Infrastructure Power Generation Group.
Elected Panchayat leader	An elected member of the local Panchayat (village council) or Zila Panchayat (panchayats at apex or district level in Panchayat Raj Institutions (PRIs).
Private business person	A person running his/her own business or employed in private business run by others.
Spatial Variables	
Elevation	Location of household relative to its height above mean sea level in meters.
Distance of household from nearest accessible road	Location of household relative to its distance from nearest accessible road in meters.
Distance of household from nearest forest boundary	Location of household relative to the nearest statutory forest boundary in meters.

[a] Office of the Registrar General & Census Commissioner (2001).

I used log likelihood ratio tests to select variables to retain in the nominal logistic regression models. I used a rejection range of $p > 0.1$ rather than $p > 0.05$ in order to protect against type II statistical errors, as my objective was to ensure the models included all key spatial and sociodemographic variables collected given the limited sample size ($n = 200$ respondents). I evaluated model performance using the-area-under-the-curve (AUC) of the receiver operating characteristic (ROC) plot to evaluate the performance of each model (Hosmer et al., 2013). I considered AUC ranges of 0.5–0.7, 0.7–0.8, 0.8–0.9, and > 0.9 as poor, acceptable, excellent, and outstanding agreement between predictions and observations, respectively (Hosmer et al., 2013; Swets, 1988). I conducted all analyses using the JMP© 14.2.0 platform (SAS Institute Inc. Cary, NC, USA).

Table 2.3. Nominal logistic regression results for four social control frames, and sociodemographic and spatial variables associated with each model found significant ($p < 0.1$) using likelihood ratio tests, for responses to the social survey conducted in Sikkim, India, 2014–2015. I used the area under the receiver operating characteristic (ROC) curve to evaluate the performance of each model.

Social control frame				Area under ROC curve				
Independent variables	χ^2	df	*p*	Strongly agree (*n*)	Agree (*n*)	Neutral (*n*)	Disagree (*n*)	Strongly disagree (*n*)
Hierarchist	68.55	36	0.0009	(3)	0.697[a] (33)	0.780 (19)	0.709 (119)	0.824 (26)
Gender	12.87	3	0.0056					
Generations in region[b]	9.04	3	0.0288					
Distance to nearest road[c]	8.78	3	0.0324					
Elevation[c]	8.39	3	0.0387					
Principal occupation	35.59	24	0.0602					
Individualist	59.04	21	<0.0001	(2)	0.770[d] (28)	0.700 (14)	0.690 (135)	0.832 (21)
Generations in region[b]	19.19	3	0.0003					
Elevation[c]	13.70	3	0.0034					
Distance to nearest road[c]	9.04	3	0.0288					
Age (cat.)	19.19	12	0.0839					
Egalitarian	27.51	9	0.0012	0.716 (48)	0.716 (152)	(0)	(0)	(0)
Generations in region[b]	12.19	1	0.0005					
Principal occupation	14.38	8	0.0724					
Fatalist	94.27	45	<0.0001	(0)	0.848 (12)	0.903(13)	0.848 (149)	0.821 (26)
Principal occupation	44.13	16	0.0002					
Distance to forest border[e]	16.23	3	0.0010					
Proportion of household female	10.00	3	0.0186					
Age (cat.)	20.72	11	0.0364					
Generations in region[b]	7.52	3	0.0571					

[a] Includes 3 ‘strongly agree’ and 33 ‘agree’ responses.
[b] Square root transformed.
[c] Log transformed.
[d] Includes 2 ‘strongly agree’ and 28 ‘agree’ responses.
[e] Square transformed.

3. RESULTS

The sample included 80 (40%) and 120 (60%) adult females and males, respectively, from 200 households (4.5% of the estimated households in selected GPWs). The age of respondents ranged from 18 to 88, with a mean of 45.0 (±14.09; 1 SD). The average household size was 5.6 (±2.21), while the mean proportion of females in a household was 0.52 (±0.156). The mean number of generations respondents lived in the region was 3.7 (±1.30), with 8.5% living in the region for less than four generations, 68.5% for four to five generations, and 23.0% for six to nine generations. Among the surveyed individuals, 47% reported their principal occupation as farming, with each of the other eight principal occupations accounting for 2.5–11.0% of the respondents (Table 2.4), broadly corresponding with statewide occupational distribution trends (Directorate of Census Operations, 2011). Mean elevation of households was 1,473.7 m (±599.03) above mean sea level, with elevation ranging between 765 to 3,732 m, with 85.5% of households <1,750 m above mean sea level. The mean distance of households to nearest accessible road was 151.1 m (±251.52), with distances ranging from 0.2 to 1,713 m and 90% of household within 336.0 m of nearest road. For households outside the Reserved and Protected Forest (n = 180), mean distance to the nearest forest boundary was 1,498.4 m (±679.39 m), with distance ranging from 30.7 to 2,929.5 m. In contrast, households within the statutory forest occurred either 6.9–392.0 or 7,090.6–7,201.4 m from the nearest forest boundary (n = 11 and 9, respectively).

All logistic regression models were statistically significant ($p \leq 0.0012$); and model performance per response category ranged from near acceptable to outstanding (AUC 0.690–0.903; Table 2.3). The use of a rejection range of 0.1 rather than 0.05 resulted in one additional independent variable per model.

Table 2.4. Distribution of principal occupations of social survey respondents, Sikkim, India, 2014–2015 (see Table 2.2 for definitions).

Principal occupation	Number	Percentage
Education	12	6.0
Elected member of Joint Forest Management Committee or Eco-Development Committee	22	11.0
Elected member of local Panchayat (village council) or Zila Panchayat (panchayats at apex or district level in Panchayat Raj Institutions	20	10.0
Farmer	94	47.0
Housewife	12	6.0
Laborer contracted by the Indian Army or the Gati Infrastructure Power Generation Group	8	4.0
Private business	15	7.5
Sikkim Forest Environment and Wildlife Management Department (FEWMD)	5	2.5
Sikkim State Government excluding FEWMD	12	6.0
Total	200	100

Most participants (72.5%, $n = 145$) disagreed with the statement, "Joint Forest Management decisions are best made by technical experts; and I am willing to comply with the resulting regulations and expect the same from others" (Table 2.3). For this hierarchist social control frame, selected independent variables included gender, generations in region, distance of household from nearest accessible road, elevation, and principal occupation (listed in decreasing order of significance). Although respondent gender was important for those expressing the hierarchist perspective toward natural resource management decisions, this variable was not selected by any of the other three models of social control frames. At the other extreme, all four models included the number of generations a respondent's family had lived in the region.

Similarly, most respondents (78.0%, $n = 156$) disagreed with the statement, "Joint Forest Management decisions are best made by individuals; and each individual should be allowed to make his or her own decisions" (Table 2.3). Selected independent variables for this individualist social control frame included generations in region, elevation, distance of household from nearest accessible road, and age (listed in decreasing order of significance). None of these

variables was unique to those expressing the individualist perspective toward environmental decision-making.

Conversely, all respondents either agreed (76%, n = 152) or strongly agreed (24%, n = 48) with the statement, "Joint Forest Management decisions are best made by communities; and all stakeholders should have a voice in the decision-making process" (Table 2.3). Generations in region and principal occupation were the selected independent variables for those expressing an egalitarian perspective toward natural resource management; these sociodemographic variables also were commonly included in models of the other three social control frames.

Finally, most respondents (87.5%, n = 175) disagreed with the statement, "People have no control over natural resources; and it does not really matter what I think about how natural resources should be managed" (Table 2.3). No respondents strongly agreed with this statement. For this fatalist social control frame, selected independent variables included occupation, distance of household from nearest forest boundary, proportion of females in a household, age, and generations in region (listed in decreasing order of significance). Distance of respondent's household from nearest forest boundary and the proportion of their household members that were female were unique to those expressing the fatalist perspective toward environmental decision-making.

4. DISCUSSION

The results support the hypothesis that key sociodemographic and spatial variables influence prevailing social control frames, or the ways the respondents believe natural resource management decisions should be made in East Sikkim, as well as their preferences for who should be involved in those decisions. The discussion first tracks the sociodemographic and then

spatial variables that best explain respondents' social control frames. I finish by discussing the broader implications of the work.

4.1. Sociodemographic variables

4.1.1. Generations in region

Generations in region was the only independent variable occurring in all four models, making it more consistently predictive of respondents' social control frames than any other sociodemographic or spatial variable (Table 2.3). This suggests a strong association between familial tenure in the region and how respondents thought about natural resource management decisions. Regardless of the number of generations respondent's families had lived in the area, all either agreed or strongly agreed with collaborative approaches to environmental planning. For example, as one respondent indicated, "forest management is an important issue, any single person should not make decisions…they have to ask the public to attend the meetings, discuss the issue and then take decisions…we should all be involved (R155). This strong preference for egalitarian management, especially among those whose families had lived in these communities for multiple generations, is consistent with research that has found associations between long-term residency in a particular location and attitudes toward community-based or other collaborative forms of governance (Fabricius et al., 2004; Peterson and Liu, 2008; Peterson et al., 2013).

Generations in the region was the most significant independent variable for both the individualist and fatalist frames, and most respondents disagreed with these perspectives. However, although both individualist and fatalist social control frames remained a minority position, the model enabled me to isolate some interesting differences. 29.4% (n = 5 of 17) of respondents whose families had lived in the region one to two generations agreed with the

individualist approach to environmental planning, whereas only 15.2% (*n* = 25 of 164) of those whose families had lived in the region three to five generations agreed with this approach. No respondents whose family tenure exceeded five generations agreed with individualist approaches to environmental planning (*n* = 19). Regarding the fatalist social control frame, 7.3% (*n* = 12 of 164) of respondents whose families had lived in the region three through five generations agreed with this approach to environmental planning, and no respondents whose families had lived in the area less than three, or greater than five generations agreed with this perspective (*n* = 36). Agreement with the hierarchist approach to environmental planning was less linear. For example, 20.1% (*n* = 33 of 164) of respondents with family tenures of three through five generations agreed with this perspective, whereas only 11.8 and 5.3% (*n* = 2 of 17, and 1 of 19, respectively) of those whose families had lived in the region less than three, or greater than five years, respectively, expressed agreement with the hierarchist social control frame.

4.1.2. Principal occupation

Principal occupation occurred in three of four models, making it the second most predictive independent variable for respondents' social control frames (Table 2.3). All respondents, regardless of occupation, agreed with egalitarian approaches to natural resource management. For example, a forest management professional employed by the state of Sikkim explained, "We are a part of this whole system. . . . Community voice is very important. . . . We can't make a policy on our own" (R018). A farmer echoed this sentiment when asserting that, "in the multitude of opinions, you know, lays the wisdom. A collective decision will be stronger. . . . It will be better" (R34).

Occupation was the most significant independent variable in the fatalist model, with which most respondents disagreed. Neither respondents employed by the Sikkim Forest

Environmental and Wildlife Management Department, nor those who identified their principal occupation as education, private business, or laborer agreed with the fatalist outlook towards community-based natural resource management (n = 40), and only 7.5% (n = 12 of 160) of those in other occupations agreed with this approach.

Occupation also was significant in the hierarchist social control model. Similar to the fatalist model, neither respondents employed by the Sikkim Forest Environmental and Wildlife Management Department nor those who identified their principal occupation as laborer favored the hierarchist social control frame (n = 13). As with generations in region, however, a minority of respondents (19.3%; n = 36 of 187) employed in other occupations favored this approach to environmental planning, with respondents who were employed as educators and farmers most likely to support the hierarchist perspective (25.0 and 22.3%; n = 3 of 12 and 21 of 94, respectively). The results differ in type from most of the existing research on associations between occupation and environmental management. Where published studies tended to explore possibilities for developing alternative livelihood strategies that are less environmental destructive than current practices (Chen 2011; Cinner 2010), this study analyzed whether and how occupation may influence the social control model preferred by an individual.

4.1.3. Age

Respondent age occurred in two of the four models (Table 2.3). Most respondents disagreed with both the individualist and fatalist approach to environmental decision-making regardless of age. The proportion agreeing with the individualist perspective, however, increased with age (10.2, 13.0, 17.3, 16.7, and 23.8% for those 16–34, 35–44, 45–54, 55–64, and $\geq$65 years of age; n = 5 of 49, 7 of 54, 9 of 52, 4 of 24, and 5 of 21, respectively). No respondents 55–64 years of age agreed with the fatalistic social control frame in this context (n = 24), while those

35–44 years of age were most likely to agree with this perspective (9.3%; n = 5 54). Although these results are consistent with research that demonstrates differences in environmental attitudes and behavior among different age groups (Deng et al., 2015; Gold and Goodey, 1989; Riechard and Peterson, 1998; Tindall et al., 2003), it is difficult to draw conclusions regarding the specific ways age influences preferences regarding how natural resources should be managed.

4.1.4. Gender

Respondent gender was the most significant predictor variable in the hierarchist model, yet did not occur in any of the other three models (Table 2.3). Such differences likely occur when differentially gendered perceptions of the environment and environmental attitudes exist (Deng et al., 2015; Naz et al., 2018; Stern et al., 1993). I found a greater propensity for males than females to agree with the hierarchist social control frame, or management decisions made solely by technical experts (21.0 versus 13.6%; n = 25 of 119 and 11 of 81, respectively; G^2 = 10.51, p = 0.0154). At the same time, males were more likely to *strongly* disagree with this perspective than females (17.6 versus 6.2%; n = 21 of 119 and 5 of 81, respectively). This may simply reflect the tendency for males to hold and express stronger opinions than females (Deng et al., 2015; Hunter et al., 2004; Naz et al., 2018; Tindall et al., 2003). Within the context of Sikkim, studies have documented that females are often excluded from participatory processes, resulting in a gendered gap between participatory policy intent and action (Arora, 2007; Banerjee, 2016; Murali et al., 2002b; Subba, 2014). The findings appear consistent with this literature.

4.1.5. Proportion of females in a household

The proportion of household made up of females was a significant predictor variable only for the fatalist social control frame (Table 2.3). As previously stated, most respondents disagreed

with the fatalist perspective. Only 2.7% (n = 2 of 75) of respondents from female dominated households had a fatalist attitude towards natural resource management, whereas 12.3% (n = 8 of 65) of respondents from male dominated households exhibited fatalist social control frames. These results, combined with those in the last subsection, concur with studies that recognize different patterns of environmental attitudes and behavior among males and females (Deruiter, 2002; Mainieri et al., 1997; Shumway et al., 2014; Vicente-Molina et al., 2018).

4.2 Spatial variables

4.2.1. Elevation

Elevation was a significant predictor variable for both the hierarchist and individualist social control frame models, with most respondents disagreeing with these perspectives (Table 2.3). Of 36 respondents who agreed with the hierarchist perspective toward natural resource decision-making, however, 34 resided at 1,095–1,743 m above mean sea level, with 82.4% (n = 28) clustered below 1,370 m (the other two respondents lived at 2,114 and 3,710 m above mean sea level). Seven of nine respondents residing at ≥3,710 m above mean sea level disagreed with the hierarchist perspective (one was neutral). As one resident explained, "[I] strongly disagree because local people are facing the problems so they know more about it than the technical experts, so the locals should be included (R083, household elevation = 3,709 m).

The proportion of 30 respondents who agreed with the individualist social control frame decreased with increasing elevation (i.e., 19, 9, and 2 of these respondents lived at 809–1,178, 1,252–1,740, and 2,028–2,035 m above mean sea level, respectively). These results are consistent with Riehl et al. (2015), who found that the elevation of households influenced environmental attitudes. Although I analyzed how elevation may influence social control frames, or preferences for how decisions should be made, and who should take part in those processes,

rather than attitudes, there are sufficient similarities between worldviews and attitudes to suggest complementarity.

4.2.2. Distance of household from nearest accessible road

Like elevation, distance of households from nearest accessible road occurred only in in hierarchist and individualist social control frames models (Table 2.3). Although most respondents disagreed with the hierarchist perspective regardless of how far they lived from the nearest road, no respondents living >341.3 m from the nearest road agreed with this perspective. Conversely, 10.3% (*n* =15 of 145) of respondents who disagreed or strongly disagreed with the hierarchist statement lived between 342.5 and 1,713.2 m from the nearest road. Although most respondents also disagreed with the individualist perspective toward environmental decision-making (Table 2.3), a disproportionate number of respondents residing farther from the nearest accessible road agreed with this perspective. Whereas only 15% of all respondents (*n* = 200) agreed, and 78% disagreed with the individualist perspective, 5 of the 11 respondents living >440 m from the nearest accessible road agreed with the individualist perspective, whereas 4 of the 11 disagreed, and 2 of the 11 were neutral. Although I explored social control preferences rather than identifying positive or negative conservation attitudes among respondents, the less negative responses to an individualist social control frame among those living furthest from a road may be related to factors discussed by Deng et al. (2015), who reported more favorable conservation attitudes among residents who lived closer to roads and were less dependent on resources of the natural reserve.

4.2.3. Distance of household from nearest forest boundary

Distance of household from nearest statutory forest boundary was significant only in the fatalist social control frame model (Table 2.3). Again, most respondents disagreed with this

perspective toward environmental decision-making. All those who agreed with this viewpoint, however, lived between 472.4 and 2,233.7 m outside the forest boundary (n = 12), yet all respondents who lived within the forest boundary disagreed or strongly disagreed with this perspective (n = 20). For example, one respondent who lived within the forest explained that he disagreed because, "if, say for example, my crops are destroyed by wild animals, it would do me no good to sit at home and do nothing about it. I need to inform the Department and others. Just sitting at home will not solve my problem (R155, household distance from nearest forest boundary = 369.4 m). Previous studies found that people living nearer to a reserved forest boundary may experience loss of access to natural resources, and this experience may negatively influence participation in community-based conservation efforts (Deng et al., 2015; Shimizu, 2006). One of the most interesting findings is that all respondents living within the reserved forest disagreed with the fatalist social control frame, which may indicate that they are open to participating in collaborative processes.

4.3. Methodological and conservation implications

The primary significance of this study lies in the research design and conceptual framework that emerged (Hazer Sancar, 1993). Public engagement in environmental decision-making is fundamental to any environmental planning process, and yet resource professionals often struggle to achieve desired levels of stakeholder participation in local decision-making (De Santo, 2016; Laurian, 2004; Mohai, 2017). This policy intention–action gap is often attributed to limited understanding and failure to integrate people's environmental attitudes, perceptions, motivations, and behavior into policy recommendations (Bronfman et al., 2015; Shumway et al., 2014). The results lead me to conclude that (re)consideration and (re)integration of these motley perspectives in environmental decision-making can indeed help policy makers and resource

professionals develop and implement more effective and socially acceptable management policies, and thus help address the gap between policy intent and action (Quiroz Dahik et al., 2018; Shumway et al., 2014).

Within the context of Sikkim, India, the need for engaging the public in environmental decision-making is integral to the continued success of the state's forestry mission (https://www.sikkim.gov.in/portal/portal/StatePortal/Government/ForestryEnvironmentMission). Sikkim's success in the fields of natural resource management, wildlife protection, environmental sustainability, and economic development has earned it the first and second positions in States Sustainability Competitiveness Report 2011 and Environmental Sustainable Index 2009, respectively. Sikkim also ranked highest on India's Forest Protection Index (0.903) in 2004, and was recognized as the top performer in India in Performance in Land Use 2008, and Conservation of Natural Resources 2009 (FEWMD, 2009). In 2016, Sikkim became India's first 'fully organic' state, with more than 75,000 ha of agricultural land designated for organic farming practices (https://www.sikkimorganicmission.gov.in/success-stories/). Although Sikkim is home to the "Greenest Chief Minister of India", whose conservation paradigm "not growth *versus* green but growth *with* green" calls for a greener Sikkim through people's participation (FEWMD, 2007, 2009), lack of trust between forest officials and forest-dependent communities still resulted in less than desired outcomes from collaborative forest management programs in the state (Banerjee, 2013). The evaluation of respondents' social control frames, or preferences regarding how society should be managed or controlled, allowed me to better understand their

worldviews, which can guide natural resource professionals to management options that are more socially acceptable and effective (Peterson, 2003).

For example, all respondents had a strong preference for egalitarian, collaborative approaches to environmental decision-making, so they should be inclined to participate in collaborative environmental planning processes. Further, the fact that generations in the region was integral to all four social control frames suggests tenure in the community is a critical factor for those participating in collaborative processes in Sikkim. As a case in point, the fact that first and second generation respondents were more likely to prefer the individualist perspective than those whose families had lived in the region longer certainly could influence collaborative processes. Similarly, differences in stakeholders' social preferences based on different principal occupations also could help inform effective environmental planning processes.

Even sociodemographic variables that occurred in only one or two models of social control frames could be critically important. For example, since the proportion of respondents agreeing with the individualist perspective to environmental decision-making consistently increased with age could allow those designing collaborative processes to better anticipate attitudes participants may bring to the process. Current objectives of the Sikkim government are to increase inclusion of women in environmental decision-making and to strengthen social capital through empowering women (FEWMD, 2015; JICA, 2009; Subba, 2014). The fact that women were less likely than men to prefer the management decisions being made by technical experts than males, and that respondents from female- versus male-dominated households were an order of magnitude less likely to take a fatalist attitude towards natural resource management surely are key to these government objectives.

Natural resource managers should find altitude-related preferences regarding social control frames useful as they assess the suitability, acceptability, and outcomes of altitude-specific resource management programs in Sikkim. For example, the success of Sikkim's Monitoring of High Altitude Habitats is largely dependent on the "*Himal Rakshaks*", or local community members from high altitude villages (elevation >3,000 m above mean sea level) who volunteer towards the cause of high altitude habitat conservation. Incorporating knowledge about how communities in higher elevations respond to natural resource management options, may help volunteers engage in better monitoring activities and invoke greater community interest in local conservation activities (Shrestha et al., 2013).

For natural resource professionals in Sikkim, the issue of non-participation may be addressed in a timely fashion by incorporating relevant location-specific information into local forest management action plans. For example, resource professionals can choose better locations for community meetings based on location of specific households (Banerjee, 2016), or ensure that efforts are in place to encourage participation of individuals from far-flung areas in locally viable income-generating conservation activities that do not require much travel outside of the immediate locality. For example, several of the survey respondents expressed the desire to establish local plant nurseries with the help of the forest department to help regenerate native plant species, and consequently, benefit local communities economically. Similarly, the finding that no respondents residing within the forest boundaries agreed with the fatalist perspective toward environmental decision-making should help natural resource managers realize these individuals are unlikely to simply resign their fate to others regarding how forests are management. At any rate, for successful community-based forest management in Sikkim, location-specific knowledge is crucial for planning and implementation of conservation efforts

that are specifically designed to address this issue of mistrust and non-participation (Banerjee, 2016).

Globally, considerable research in the recent past recognizes the increasing importance of acknowledging and incorporating people's environmental attitudes, behaviors, and norms into policy dimensions for successful environmental protection and restoration. For example, Bronfman et al. (2015), in their study of environmental attitudes and behaviors in a Chilean community, demonstrate how responsible environmental behaviors and high environmental concerns where shown by communities that had the fewest behavioral restrictions. Similarly, Shumway et al. (2014), in their study on community attitudes toward koala (*Phascolarctos cinereus*) populations in southeast Queensland, Australia, demonstrated how demographic factors and environmental attitudes influenced community behavior towards conservation in the area. In their study on management of derived vegetation communities in central New South Wales, Australia, Sharp et al. (2012) highlight how effective vegetation management strategies required a nuanced understanding of people's values and perceptions of vegetation, both derived and native. These studies, along with others (Anderson et al., 2017; Arjunan et al., 2006; Ban et al., 2013; Chen et al., 2011; Torres et al., 2018) highlight the importance of understanding community attitudes and perceptions towards conservation planning, and the need for local administrators and resource managers to incorporate this knowledge into environmental decision-making for locally adapted successful conservation outcomes.

One way to gain a better understanding of the primary values, beliefs, and preferences of a community is to discover what social control frames are most salient to community residents. Further, examining how sociodemographic and spatial variables interact with social control preferences may enable natural resource managers to re-imagine their responsibilities in ways

that are more consistent with local cultures. This knowledge translation can serve as a catalyst for formulating, recommending, and implementing more effective natural resource management policies and practices that sustain long-term conservation goals and have broader social acceptance.

5. CONCLUSION

This study demonstrates that an understanding of how key sociodemographic and spatial factors influence prevailing social control frames, or how people think natural resources should be managed and by whom, can help resource professionals better understand what motivates individuals to accept or reject natural resource management programs. This knowledge, I posit, can help professionals bridge the schism between policy intent and action by developing more socially appropriate management strategies. While the study demonstrates association between key sociodemographic and spatial variables on prevailing social control frames in this rural forest-dependent community, and its applicability to populations in other sociocultural, political and economic contexts need further validation, the study findings indicate important directions towards understanding and prioritizing people's motivations and attitudes towards conservation efforts. In a world where limited socioeconomic, financial, and institutional capacities present an ever-increasing threat to global conservation, appropriately targeted efforts to synchronize conservation ideals with community priorities is of utmost importance. For developing countries with limited economic resources and high biodiversity threats, this becomes even more relevant. A better understanding of people's social control frames and how key sociodemographic and spatial factors influence and give meanings to peoples' preferences regarding how society should be managed and who should make natural resource management decisions, is an important step

forward towards planning, implementation, and evaluation of any natural resource conservation effort.

ACKNOWLEDGEMENTS

I express my gratitude to all the participants of the study and to those who helped me with fieldwork logistics and data collection in Sikkim, India. I thank my friends and colleagues for inspiration and constant support during various stages of the study. I am also grateful to The University of Texas at El Paso (UTEP) Graduate School Dodson Research Grant for supporting the fieldwork. I thank the anonymous reviewers and editor for their suggestions and constructive comments on earlier drafts of this publication. The Human Subjects Protection Office at UTEP approved all research conducted in this study (IRB # 841069-2).

Chapter 3: Collaborative modeling and social learning: Linking soft-systems thinking with collaborative decision-making in Joint Forest Management in East Sikkim, India

ABSTRACT

In a growing effort to address the challenges arising out of traditional forms of public participation in environmental decision-making, several alternative strategies for stakeholder engagement and collective action have been implemented. Collaborative decision-making as a form of open constructive dialogue with a focus on learning and power sharing is one such approach that has gained popularity over the years. Social learning as a means to encourage stakeholders to recognize the importance of mutual interdependency and jointly work towards common goals is an integral part of any collaborative decision-making process. Collaborative modeling, grounded in social learning theory, thus, is the practice of building models *with* rather than *for* stakeholders. Using the case study of East Sikkim, India, in this paper, I hypothesize that in an environment where there is a general lack of trust and opportunities for stakeholder deliberations in environmental decision-making are limited, collaborative modeling can help provide a common platform where stakeholders have meaningful opportunities to learn, deliberate, and negotiate with a focus on joint problem solving. In particular, I engaged stakeholders in a collaborative modeling process in an attempt to enable them to, (1) openly interact with each other, (2) build trust, (3) unfold mutual interdependencies and see themselves as part of a complex human-dominated ecosystem, and (4) build and translate shared visions towards collaborative environmental decision-making in the region. I then examined how participation in the modeling process provided stakeholders with a sense of voice using the trinity of voice (TOV) concept proposed by Senecah (2004). Through effective engagement and

active participation, collaborative modeling provided diverse stakeholders with a common platform to deliberate, learn, share, and evaluate the complexities of a forest management system. With a focus on joint problem solving, this iterative modeling process enabled stakeholders to unfold mutual interdependencies, opened spaces for power sharing, knowledge (re)creation, sharing, and trust building. The collaborative modeling process helped create a decision space by providing stakeholders with access, standing, and influence—the tools to share their joint visions towards collaborative environmental decision-making in the region.
Keywords: Collaborative modeling, social learning, systems thinking, trinity of voice, Joint Forest Management, Sikkim, India

1. INTRODUCTION

In a growing effort to address the challenges arising out of traditional forms of public participation in environmental decision-making, several alternative strategies for encouraging stakeholder engagement and collective action have been implemented (Peterson and Feldpausch-Parker, 2013). Walker (2004) suggests collaborative decision-making as a form of open, constructive dialogue with a "focus on the future; an emphasis on learning; and some degree of power sharing and leveling of the playing field" (p. 112). Buck et al. (2001) offer "social learning" as a means to encourage an ongoing process of understanding the knowledge, needs, goals, and interests of key stakeholders. According to Buck et al. (2001), social learning encourages different stakeholder groups to recognize and understand the importance of mutual interdependency and jointly work towards common goals and ends. Gray (1989) argues that stakeholders' increased awareness of interdependence may create "renewed willingness to search for trade-offs that could produce a mutually beneficial solution" (p. 11). Collaborative modeling, grounded in social learning theory, is the practice of building models *with* rather than *for*

stakeholders (Langsdale et al., 2013; van den Belt et al., 2013). This shared learning allows collaborations to focus on stakeholder interests rather than positions, enabling collective decision-making through interactive, iterative, and reflective processes (Buck et al., 2001; Daniels and Walker, 2001; Thompson et al., 2010; van den Belt, 2004).

Emphasizing this need to engage stakeholders in learning how to think and behave in increasingly complex human-dominated systems, Sweeny and Meadows (2010) opine that systems learning exercises can help create a non-threatening learning environment in which "participants test theories of effective social behavior and real decision options" (p. 3). According to Sweeny and Meadows (2010), social learning exercises help "engage participants who have a wide range of learning styles", and often promote a "greater awareness of these ways of thinking, seeing and interacting with the world" (p. 2). This systems thinking approach encourages stakeholders to adopt a holistic view to understand complex human-dominated systems (Checkland, 2001; Purnomo et al., 2004). For Mobus (2018), this ability to perceive the wholeness of a thing and the interconnections among things helps a person "use knowledge of systems to reason about the future states of the world based on system behaviors" (p. 14).

According to Rosenhead and Mingers (2001), soft systems thinking—unlike hard systems thinking—assumes that the complexity of the world cannot be objectively modeled, and that systems concepts should be used to structure our "thinking and learning about the nature of the problem, rather than its solution" (p. 6). Thus, soft systems thinking takes on a subjectivist stance whereby participants' perceptions, beliefs, and views in defining problems are of utmost importance. These conceptual models help people understand the complexity of the real world (Wilson, 2001).

Trust plays a critical role in this collaborative modeling process through sharing of information and communication among diverse stakeholders (Banerjee, 2016; Fast and Nourallah, 2018; Martin, 2007; Nielsen, 2004). As an offset to the amount of control, adaptability, and safeguards used during collaboration (MacKenzie, 2008), trust plays an important role in building relationships through reciprocation, and is fundamental in negotiating further collaborations among parties in conflict. By adopting a problem-solving approach that establishes trust and favors discussion, information sharing, and learning, stakeholders can arrive at mutually agreed upon recommendations or workable solutions for their concerns (Daniels and Walker, 2001). This need for engagement and trust building among stakeholders in environmental decision-making is further emphasized by Peterson (2003), who argues that, without social acceptability, agreements often fail to achieve legitimacy, and are difficult to implement.

In this study, I hypothesize that in an environment where there is a general lack of trust among stakeholders and opportunities for meaningful deliberations are limited, collaborative modeling using system-thinking exercises can help create and open spaces for communication among key stakeholders. Through active participant engagement, collaborative modeling may help provide a common platform where stakeholders have meaningful opportunities to learn, deliberate, discuss, share, and negotiate with a focus on joint problem solving (Bell and Morse, 2013). I engaged stakeholders in collaborative modeling process in an attempt to enable them to: (1) openly interact with each other; (2) build trust; (3) unfold mutual interdependencies and see themselves as part of a complex human-dominated ecosystem; and (4) build and translate shared visions towards collaborative environmental decision-making. I then examine the modeling process in an attempt to learn whether, and if so, how participation provided stakeholders with a

sense of voice, using the trinity of voice (TOV) concept proposed by Senecah (2004). Finally, I explore implications for local forest management and related natural resource policy actions. My focus is on learning what is gained through the collaborative modeling *process*, rather than on any eventual product.

2. METHODOLOGY

2.1. Study area and context

I chose Sikkim, the small, mountainous, and landlocked northeastern state of India for my case study (Figure 2.1). Located in the foothills of the Eastern Himalayas bordering Nepal to the west, Tibet Autonomous region of China to the north and northeast, and Bhutan to the southeast (https://www.britannica.com/place/Sikkim), Sikkim is one of India's richest states in forest resources, and part of the Indo-Burma global biodiversity hotspot (Arrawatia and Tambe, 2011; Myers et al., 2000). Although it is the second smallest Indian state, covering only 0.2% (7,096 km^2) of the total geographical area of India (http://sikkim.nic.in/sws/sikk_geo.html), Sikkim includes one of the largest forested areas of the country with 47.1% (3,344 km^2) of its total geographical area under forest cover (ENVIS, 2011). Reserved and Protected Forests occupy 93.4 and 6.7% of the total forested area of Sikkim, respectively (ENVIS, 2011). Currently, there are eight Protected Areas, comprising one National Park and seven Wildlife Sanctuaries, covering 31.0% of the geographical area of the state. The State Forest Department has administrative control over 82.3% of the geographical area of Sikkim (FEWMD, 2010). Sikkim is the least populated state in India, with only 0.1% of the nation's population estimated at 610,577 in 2011 (Directorate of Census Operations, 2011). The state's population is 74.9% rural, with heavy dependency on forest resources for livelihoods and income generation (FEWMD, 2007; Government of Sikkim, 2014).

The call for community participation in forest management in Sikkim was operationalized through the adoption of Joint Forest Management (JFM) program in 1998. Classified as village-based committees for the purpose of conservation and management of forests under the jurisdiction of State Forest Departments, Joint Forest Management Committees (JFMCs) are guided by local byelaws and micro plans (MOEF, undated). Through the decentralization of financial and administrative powers, JFMCs seek to provide rural communities meaningful opportunities to "enhance their livelihoods through forestry, ecotourism, and other income generation activities" (FEWMD, 2015, p. 23). In the years since its adoption, various governmental reports proclaim that JFM in Sikkim has been widely successful at integrating the livelihood needs of its forest-dependent communities along with the forest management goals of the state (FEWMD, 2007, 2009, 2015). As of 2009, there were 158 JFMCs established in Sikkim, with provisions for including additional ones in 90 newly created intervention villages by 2015 (FEWMD, 2009, 2015). Despite these claims of successes, critical evaluations call for a close scrutiny of JFM in Sikkim (Banerjee, 2016).

I conducted the study in the East District of Sikkim, one of four administrative districts of the state, and home to the state capital, Gangtok. Occupying the southeast corner of the state, East Sikkim is bounded by China and Bhutan in the east, the state of West Bengal, India, in the south, and the North and South Districts of Sikkim in the north and west, respectively (Figure 2.1). As of 2011, the East District had an estimated human population of 283,583, with a decennial population growth of 15.7% (Census Organization of India, 2015). For administrative purposes, the East District of Sikkim is divided into three subdivisions: Gangtok (the state capital), Pakyong, and Rongli subdivisions, which are further divided into *gram panchayat units* (GPUs) or village administrative units comprising of *gram panchayat wards* (GPW). A *panch* or

ward member elected by villagers represents each GPW. As of 2015, the East District comprised 52 GPUs and 290 GPWs (Government of Sikkim, 2016). Of the district's geographical area of 954 km^2, forest cover was 73.3% (699 km^2) in 2013 (Forest Survey of India, 2013). Of the forest cover, 23% (162 km^2) was classified as very dense, 59% (411 km^2) as moderately dense, and 18% (126 km^2) as open forest in 2013 (Open Government Data (OGD) Platform India, 2016). The East District is also home to three wildlife sanctuaries: (1) Fambong Lho Wildlife Sanctuary, (2) Kyongnosla Alpine Sanctuary, and (3) Pangolakha Wildlife Sanctuary—a trans-boundary protected area bordering Bhutan, China, and the Neora Valley National Park in West Bengal, India (ENVIS, 2019).

2.1.1. Study sites

I selected 13 JFMCs within Rongli and Phadamchen Territorial Forest Ranges for my units of analysis (Figure 2.1; Table 1.1). I selected the GPWs within each JFMC based on their dependency on forest resources. Approximately 81% of the population in the selected GPWs were dependent on forests for their daily livelihoods and income generation (SDMO, 2014). As of 2005, the estimated human population of the selected GPWs was 21,494, comprising 4,436 households (DESME, 2005). The annual per capita income of 89% of selected households in the selected GPWs was <INR₹60,000 (US$884), 32% lower than the state average (DESME, 2005; Government of Sikkim, 2014).

2.2. Collaborative modeling process

Collaborative modeling provided the framework for social learning through information gathering and sharing, reflective discussions, and systems learning exercises related to science, policy, and management of forests in the Rongli and Phadamchen Territorial Forest Ranges, East Sikkim, India. The collaborative modeling process was designed to proceed iteratively through

three phases. The first phase included identification of relevant issues and components related to JFM in the region and identification of key stakeholders in the JFM process. During the second phase, through a series of two workshops, stakeholders were encouraged to share their knowledge of the forest management system. Through system learning activities such as forest history mapping, resource mapping, storytelling, stakeholder presentations, and reflective discussions, I anticipated greater engagement and dissemination of shared knowledge among key stakeholder groups. The third phase of the modeling process included follow-up interviews with workshop attendees to evaluate the outcomes of the collaborative modeling process in terms of new knowledge gained and problem (re)definition. Finally, I use the study findings to determine if the collaborative modeling process provided the participants with access, standing, and influence—the trinity of voice concept as proposed by Senecah (2004), and its implications for local forest management and policy actions in the region.

2.2.1. First phase: Problem definition and key stakeholder identification

The primary objectives of the first phase of collaborative modeling process were to understand (1) the key issues and components of JFM in the study area and (2) identify key stakeholders in the JFM process. I follow Grimble and Wellard's (1997) definition of stakeholders as "any group of people, organized or unorganized, who share a common interest or stake in a particular issue or system" (p. 70).

I recruited interested villagers and forest management professionals from nine JFMCs under Rongli and four JFMCs under Phadamchen Territorial Forest Ranges to participate in in-person interviews (Table 1.1). I recruited by word of mouth at the village level, and contacted forest management professionals through emails, phone calls, and face-to-face interactions. I purposively selected the participants to provide variety in role, gender, caste, ethnicity, power

and position within the JFM process in the region .I trained two interviewers (one local resident and Banerjee) with a strict interview protocol to ensure data comparability and consistency (see Appendix Table 1.2 for interview protocol). Together, we interviewed 200 residents (one resident per household) of the selected JFMC intervention villages between May 2014 and February 2015. We conducted our interviews in Nepali, Hindi, Bengali, or English depending on the participant's choice. Interviews lasted 20–30 minutes each, and were recorded with consent of participants. We transcribed all interviews verbatim, and then translated them into English where the source language was different. Subsequently, we undertook back translations of all interviews both by the interviewers and independently through commercial translation services to ensure accuracy. As a member check, I sent a set of transcribed interviews to study participants for additional clarifications, feedback, and validation (Thomas, 2017). I identify quotations from interview transcripts by respondent's unique identifying number. For example, a quotation identified (R001) indicates the quotation came from respondent number 1. We supplemented our data with hand written notes taken during interviews. Additionally, we collected sociodemographic information from all participants (see Appendix Table 1.1 for participant demographic information sheet).

Crucial to this first phase of collaborative modeling was the identification of relevant stakeholders in the JFM process in the region. Interactions with participants during personal interviews helped me identify eight key stakeholder groups (see Appendix Table 3.1 for stakeholder identification survey protocol). I sent workshop invitations to representatives from the Forests, Environment & Wildlife Management Department (FEWMD), *panchayat* committees (PCs), JFMCs/Eco-Development Committees (EDCs), local villagers, non-

governmental-organizations (NGOs)/self-help groups (SHGs), Tourism Department, Roads and Bridges Department (RBD), and Rural Management and Development Department (RMDD).

2.2.2. Second phase: Collaborative modeling workshop series

In March 2015, I coordinated a series of two workshops in the Rongli and Phadamchen Territorial Forest Ranges. I conducted a workshop in each of the two forest ranges to ensure greater local participation. I held the workshops on two consecutive Sundays (local market day ensures greater foot traffic) between 10:30 am (commenced with opening remarks and icebreaker games) and 3:30 pm (concluded with lunch) to obtain higher participation rates. I selected centrally located community halls as workshop venues to ensure greater accessibility. Attendance was optional, and participants were free to leave the workshop as per convenience. I did not compensate the attendees either monetarily or otherwise for their participation. While most participants volunteered to attend the workshops, others attended on behalf of their institutional affiliation. Thirty-three participants attended the first workshop held in Rongli on March 15, 2015, while 49 attended the second workshop help in Phadamchen on March 22, 2015.

Of the 33 attendees of the first workshop, 10 (30%) were female and 23 (70%) male, with representatives from six of the eight key stakeholder groups identified by participants in the first phase of the study. Thirteen (39%) attendees represented local JFMCs/EDCs, five (15%) were local villagers, four (12%) representatives from FEWMD, four (12%) from local PCs, while two (6%) attendees each represented local NGOs/SHGs and RMDD. Participants' age ranged between 18 and 64, with a mean of 46.3.

Of the 49 participants who attended the second workshop, 13 (27%) were females and 36 (73%) males, with representatives from six of the eight key stakeholder groups. Thirty-three

(67%) attendees were local villagers, six (12%) represented local JFMCs/EDCs, four (8%) were members of local PCs, three (6%) represented FEWMD, two (4%) from RMDD, and one attendee represented a local NGO/SHG. Participants' age ranged between 18 and 82, with a mean of 48.1. Of the 49 participants, nine attended the first workshop as well. Repeat attendees included two representatives of the local PC; three were local villagers, one representative from RMDD, and three members of JFMC/EDCs. Six repeat attendees cited work-related reasons for attending both the workshops, while two cited personal interest in the research topic.

For the two workshops, I outlined four specific objectives to enable stakeholders to (1) freely interact with each other; (2) build trust; (3) unfold mutual interdependencies and see oneself as part of a complex human-dominated ecosystem; and (4) build and translate shared visions towards collaborative JFM decisions in the region. In order to address these objectives, I designed three soft-systems thinking activities including mapping the forest history of the region, qualitative resource mapping, and storytelling as modeling using key components of the forest management system. Participants identified eight key components and nine actions related to the forest management process during the first phase of the collaborative modeling process (Table 3.1). A brief discussion followed each activity, whereby, I encouraged participants to address what they observed and learned from each system thinking exercise. This was followed by oral presentations from key stakeholders, where participants talked about their roles, responsibilities, and interests in the JFM process. I also encouraged participants to discuss their expectations from the various groups of stakeholders as it pertained to participatory forest management in the region. I wrapped up the workshops with extended discussion sessions where participants were encouraged to interact freely and share insights with members of different stakeholder groups.

Table 3.1. Key forest management system components and actions identified by participants during pre-workshop and post-workshop evaluation phases, Sikkim, India, 2014–2016.

Pre-workshop		Post-workshop additions	
Components	Actions	Components	Actions
Animals and birds	Birth and death	Air	Climate change
Fruits and vegetables	Fencing	Earth/Nature	Community development
Grass	Grazing	FEWMD officials	Conflicts
Lakes	Growing	Firewood	Crop damage
Rocks	Landslides	Fodder	Crop management/ terracing
Soils	Logging	Insects and micro-organisms	Disease control
Streams	Planting	JFMC/EDC members	Drought management
Trees	Plants absorbing water	Local villagers	Economic development
	Water flowing	NGOs/SHGs	Eco-tourism development
		Other governmental departments	Forest ecosystem conservation and management
		Panchayat/Zilla members	Forest degradation and deforestation
		Roads & Bridges Department	Growing native plant species
		Rural management & development	Healthy environment
		Sunlight	Illegal hunting/entry in forests
		Traditional medicinal plants	Local employment
		Water cycle	Local participation
			Loss of animal habitats
			Management of water sources
			Pollution (air and water)
			Setting up local plant nurseries
			Social fencing
			Social forestry
			Soil management/ enrichment

2.2.3. Third phase: Evaluation of collaborative modeling workshops

I carried out the final phase of the collaborative modeling process between March and June 2016, a year after the conclusion of the second phase of the modeling process. The rationale for waiting a year was to allow participants enough time to assimilate and reflect upon what they

had learnt and experienced at the workshops. This time-gap, I anticipated, would also allow stakeholders to apply the knowledge and experience gained towards future JFM decisions and actions in the region. The main objectives of this phase were to identify (1) participants motivations to attend the workshops; (2) effectiveness of the modeling process in terms of new knowledge gained; (3) opportunities for trust building; and (4) to understand if and how this shared knowledge translated to collaborative forest management decisions in the region.

To achieve these goals, I requested workshop attendees to respond to a survey questionnaire designed to identify (1) new knowledge gained through workshop activities; (2) opportunities to communicate new knowledge gained; and (c) workshop logistics (see Appendix Table 3.3 for post-workshop evaluation survey protocol). Additionally, I requested each participant to draw a cognitive map of the forest ecosystem, identifying the negative and positive interrelations among the various forest components and actions. I then compared these cognitive maps with qualitative resource maps drawn by participants during the second phase of the collaborative modeling process to assess if participants developed a more nuanced understanding of the complex interconnections in the forest ecosystem. Forty-two of 81 (52%) workshop attendees took part in the follow-up study. Thirteen (16%) attendees declined to take part in the study citing personal reasons, while I was unable to initiate contact with 26 (32%) attendees. In the following section, I combine the findings from both the workshops to describe the social learning outcomes of the collaborative modeling process.

3. RESULTS

3.1. Social learning through collaborative modeling using soft systems thinking exercises

3.1.1. Forest history mapping

The first system thinking activity at the workshop employed forest history timeline mapping. Before the workshop began, I posted blank sheets of paper on the conference hall wall. In the upper left corner of the paper, I labeled the year 1960, followed by the years 1975, 1990–1998, 2000, 2010, and 2015. I requested that participants work individually or collectively in identifying and characterizing the forest history of Sikkim from when Sikkim was a monarchy under the erstwhile Chogyals (pre-1975), to its joining India as its 22nd state in 1975), to the current year (2015). Overall, 62.6% (n = 20 of 33) of attendees at the first workshop and 61.2% (n = 30 of 49) at second workshop participated in the forest history mapping activity. During the two workshops, 68 contributions were made to the history wall. Participants' contributions to the forest history wall varied from historical details of forestry in Sikkim (5.9%, n = 4), such as the "Tibetan-war in 1971–72 and it's impacts on the forests", and "Sikkim became a part of India in 1975" so Indian Forest Act now applied to Sikkim; to changing conservation ideals in the state (35.3%, n = 24). These changing ideals included, during "1960s, there were no restrictions on entering the forests … we were allowed to cut trees", "forests were for all", "around 1975, forests in Lingtam were degraded", and during "1998–2000, JFMCs were established in Sikkim ... the forests have started improving". Similarly, participants noted, "in "2000, after declaration of Pangolakha Wildlife Sanctuary, all the people in our village stopped grazing cattle in the forests", and during "2002–2015, no one is allowed to enter the forests to cut trees, graze cattle free, or hunt …government has done little to compensate for that".

The years 2010–2015 show a marked shift in people's perception of forest management with a greater focus on community capacity building, social forestry, establishment of NGOs/SHGs, eco-tourism development, and the role of locals as protectors of forests (58.8%, *n* = 40 of 68). For example, contributions noted the "need to impart more awareness to people in order to protect and save forests", we need to "improve the nature and quality of our activities as protectors of forests", and "information on forest surveys, demarcation, land surveys, social forestry, land acreage need to be sent to panchayat" so locals have access to these data.

After participants wrote their observations on the history wall, I asked them to walk around the room to see what others had written and take mental notes of these contributions. Subsequently, I encouraged the participants to reflect upon their observations and share their perspectives. While the majority deemed differences in stakeholder perspectives as positive (e.g., "it was an eye opener, even as a forest officer I did not know all the history of the area"), some participants perceived the activity as futile as their observations did not match those of others (e.g., "ban on logging maybe good for his agency, but not for me"). This activity successfully assessed stakeholders' knowledge of Sikkim's forest history, and helped identify key forest management issues that were locally relevant and interconnected with broader developmental issues in the region.

3.1.2. Qualitative resource mapping

For this activity, I provided participants with blank maps of their respective wards/villages, and requested they use two different colored markers to (1) identify existing resources or points of significance on the map and (2) mark resources and activities they would like to see more of in the village. I also encouraged participants to indicate the key components and actions they had identified during the first phase of the collaborative modeling process on

their resource maps (Table 3.1; see Illustrations section). Overall, 42.4% (*n* = 14 of 33) attendees from the first workshop and 67.3% (*n* = 33 of 49) from the second participated in this activity. Of these 47 participants, location of forest boundaries were identified by 55.3% (*n* = 26), followed by the *panchayat* member's house (53.2%, *n* = 25), the participant's home (48.9%, *n* = 23), deforested and degraded lands (34.0%, *n* = 16,), the participant's farming/agricultural land (31.9%, *n* = 15), and forest plantation areas (29.8%, *n* = 14,). Only 25.5% (*n* = 12) of participants were able to locate the house of their elected JFMC members. As one local villager stated, "I don't know who the JFM members are in my ward, or what they do. If I knew, I'd be able to mark it on the map" (R0141).

Regarding resources participants wanted to see more of, establishment of native plant nurseries ranked highest by the 47 participants, with 42.6% (*n* = 20) in its favor. Participants also identified plantation activities (38.3%, *n* = 18), construction of footpaths and roads (34.0%, *n* = 16), fencing (29.8%, *n* = 14), common land for collection of fodder/firewood/grazing (25.5%, *n* = 12), water source development and maintenance in forests (21.3%, *n* = 10), and better monitoring and patrolling of forests (10.6%, *n* = 5) as resources and activities of interest. Protection of wildlife, development of eco-tourism, and better sanitation facilities each were identified by 6.0% (*n* = 3) of participants (see Illustrations section). Participants also showed a greater willingness to (re)evaluate their own demands and (re)consider the needs of others. For example, as one participant explained, "from what it seems, I can do without fencing in my property now … it would be better if the forest department helped finish building the CC footpath before the monsoons … more people will benefit from it" (R054). This qualitative resource mapping exercise helped participants identify key resources in the region, assess their

accessibility to natural resources, and identify mutual dependency, interrelationships, interconnectedness, and causal feedback among these natural resources.

3.1.3. Storytelling as modeling

For this activity, I encouraged participants to think about all the activities and discussions they participated in during the workshop, and identify key forest management components and actions (Table 3.1). I then asked them to add settings (e.g., day/night; indoor/outdoor; winter/summer/monsoons) and characters (e.g., humans/animals/plants) to the selected components, and tell a real-life story about their interactions with the forests using these components (see Appendix Table 3.2 for storytelling protocol). Nine attendees participated in this activity over the course of the two workshops. All nine participants associated forests with positive memories from childhood, demonstrating a strong connectedness with the forests in their everyday lives. For example, one participant stated, "as a child, I would accompany my father to the [wildlife] sanctuary frequently. . . . I learnt about medicinal plants, wild animals, [and] their habitats through these experiences" (R058). Six participants linked forests with deforestation and degradation, while four associated forests with sources of clean drinking water. Only two participants reported wildlife protection and forest management problems. Following this activity, I encouraged all workshop attendees to reflect upon what they had learned from the storytelling exercise, and share their observations and perspectives with each other. One attendee stated that the knowledge gained through this exercise would help him make better choices regarding planting fruit trees in his agricultural field. According to the attendee, "I now have a better idea for tackling the *dumsi* (*Hystrix indica*, i.e., Indian crested porcupine) problem in my land. I will start growing fruit bearing trees along the forest edge so that the *dumsi* has enough to eat and will leave my crops alone (R067).

This activity helped me understand how participants linked individual components of the forest ecosystem to a larger connected whole through information (re)collection, assimilation, and sharing. This activity also helped me understand the ways in which attendees were willing to incorporate the new knowledge gained into their everyday lives and their willingness to share this new knowledge with others.

3.2. Evaluation of collaborative modeling workshops

3.2.1. New knowledge gained through workshop activities

All but one of 42 participants completing the evaluation study either strongly agreed or agreed with the four statements that seek to identify whether participants gained new knowledge during the collaborative modeling process (see Appendix Table 3.3 for post-workshop evaluation survey protocol). Of these 42 participants, 33.3% (n = 14) strongly agreed that the workshops helped them better understand time-related issues in the forests/JFM process, whereas 64.3% (n = 27) agreed with this statement. Only one participant indicated a neutral viewpoint, stating, “I am a little confused, with time, maybe, I will understand [time related issues] better” (R199, JFMC/EDC member). Regarding whether participating in the workshops helped them understand the interconnections and interrelationships among the forest components, 47.6 and 52.4% (n = 20 and 22) of participants strongly agreed and agreed with this statement, respectively. Whereas 40.5% (n = 17) of participants strongly agreed that they had a greater understanding of the complex nature of feedback loops in the forests/JFM process, a greater proportion (59.6%; n = 25) agreed with this statement. Finally, 52.4 and 47.6% (n = 22 and 20) of participants strongly agreed or agreed, respectively, that participating in the modeling process helped them understand the complexity of forest management system.

3.2.2. Opportunities to communicate new knowledge gained

All 42 participants either strongly agreed (19.0%, *n* = 8) or agreed (81.0%, *n* = 34) that participation in the workshop provided them with opportunities to gain new knowledge about forest management in the area (see Appendix Table 3.3 for post-workshop evaluation survey protocol). Similarly, 11.9 and 88.1% (*n* = 5 and 37) of participants strongly agreed and agreed, respectively, with the statement that they could use the newly gained knowledge to inform others about forest management in the area. This trend of agreement continued with 16.7 and 83.3% (*n* = 7 and 35) of participants strongly agreeing and agreeing, respectively, that the workshops provided them with opportunities to communicate ideas about forest management with others. I found that 28.6% (*n* = 12) of participants strongly agreed that participating in the workshops provided them with opportunities to interact with other parties involved in forest management, while 69.0% (*n* = 29) agreed with this statement. One participant indicated a neutral response. Finally, 9.5 and 76.2% (*n* = 4 and 32) of the respondents strongly agreed or agreed, respectively, that they felt more confident in approaching forest officials with their concerns after participating in the workshops. Six (14.3%) participants expressed a neutral response to this statement. Explaining his rationale for a neutral viewpoint, one respondent stated, “I am somewhat confident to approach the forest officials with my own problems, but with my limited knowledge of the area [forest], I will not be able to talk about other bigger problems with them” (R178, RMDD representative).

3.2.3. Cognitive mapping

To supplement and broaden my understanding of how participants gained a more nuanced knowledge of interconnections and feedback loops associated with forests in East Sikkim, I encouraged each participant to draw a cognitive map of the forest ecosystem,

identifying the interrelationships and interconnectedness among its various components (see Illustrations section). I provided each of the 42 participants with the qualitative resource maps they had drawn during the workshop phase of the project for reference. A comparison of these qualitative resource maps alongside the cognitive maps drawn in the evaluation phase indicated a greater understanding of the components of the forest management system among participants. For example, participants identified an additional 16 components and 23 related actions integral to the forest management system in addition to the eight components and nine actions previously identified during the first phase of the modeling process (Table 3.1). Further, participants displayed a greater understanding of the interconnectedness of the forest management system through the identification and mapping of negative and positive feedback loops among the various components(Table 3.1; see Illustrations section). Acknowledging the importance of this systems knowledge for the management of natural resources, a JFMC member stated, "Yes, I am now better [aware] of the complex nature of forest ecosystems. The interconnections among the various elements, how the forest ecosystem affects the aquatic ecosystem and vice versa . . . . This knowledge is very important for forest management or any other natural resource management for that matter" (R049).

3.2.4. Workshop logistics

All 42 participants either strongly agreed (9.5%, $n = 4$) or agreed (90.5%, $n = 38$) they were given adequate prior notice about workshops (see Appendix Table 3.3 for post-workshop evaluation survey protocol). Similarly, all participants strongly agreed (16.7%, $n = 7$) or agreed (83.3%, $n = 35$) that the venues chosen for the workshops were accessible. Most participants strongly agreed (21.4%, $n = 9$) or agreed (59.5%, $n = 25$) that holding the workshops on weekends enabled them to attend without missing work, whereas 19.0% ($n = 8$) of participants

indicated a neutral response to this statement. Of these respondents, three were representatives of PCs, three were government employees, and two were local villagers. In explaining her rationale for choosing a neutral response, a PC member stated, "as a *zilla panchayat* member, I do not have weekends off, so it did not matter that the workshop was on a Sunday" (R189). All participants either strongly agreed (38.1%, $n = 16$) or agreed (61.9%, $n = 26$) that the seating arrangements at the workshops made them feel comfortable. Similarly, all participants strongly agreed (33.3%, $n = 14$) or agreed (66.7%, $n = 28$) that the overall informality of the workshop was appealing. The statement that participating in the workshops denoted an overall positive experience was strongly agreed upon by 47.6 and 52.4% ($n = 20$ and 22) of participants. Finally, 38.1 and 61.9% ($n = 16$ and 26) of participants strongly agreed or agreed, respectively, to participate in future workshops on forest management in the area.

4. DISCUSSION

This collaborative modeling process was the first of its kind in East Sikkim that provided a diverse group of stakeholders with a common platform for informal and open dialogue about their knowledge, preferences, and perceptions of JFM. Opportunities for deliberations enabled participants to build rapport, unfold mutual interdependencies, engage in social learning, and articulate systems-based thinking and learning. By moving away from traditional public engagement that often shrouds an "elitist policy making process in the cloak of democracy" (Persons, 1990, p. 121), the collaborative modeling process affirmatively sought to create an environment conducive to effective engagement, where, through trust building, apparent schisms among participant's expectations and experience were minimized.

Senecah (2004) maintains that trust forms the core of any effective participation process, and the integrity of community capacity is dependent on building, preserving, and enhancing

trust through the practices of access, standing, and influence, or what she called the TOV. Specifically, access refers to appropriate opportunities for participants to express choices and opinions in an active capacity, while standing refers to opportunities for deliberation and dialogue among participants. Influence, as a direct outgrowth of access and standing, refers to the ability of participants to meaningfully participate in collaborative processes where their voices and ideas matter (Senecah, 2004). Together, the TOV provides a rubric for creating a shared decision space where "power sharing, mutual learning, and participatory access and inclusiveness" create potential for engaged public participation (Walker et al., 2006, p. 200).

Activities employed during the collaborative modeling process such as forest history mapping, qualitative resource mapping, storytelling, stakeholder presentations, and cognitive maps, along with feedback and evaluation of the modeling process reflected stakeholders' access, standing, and influence (Senecah, 2004). Below, I illustrate examples of participant's comments during the collaborative modeling process that correspond to the three pillars of the TOV. To highlight stakeholders' changing perceptions of public participation in environmental decision-making over time, I compare these comments with thoughts expressed by the same individual during the pre-workshop phase of the study conducted between May 2014 and February 2015.

4.1. Access

Respondents during the pre-workshop phase of the study often expressed the lack of meaningful opportunities for local communities to participate in deliberations regarding JFM. According to a respondent, lack of prior notice and inadequate publicity about upcoming meetings often prevented her from actively participating in the JFM activities: As she explains:

> We never know when or where the meetings are held. If I know in advance, I will definitely attend the meetings. I am interested in knowing what is going on in the village,

> about the funds that have been allocated for plantations, and the projects and schemes sanctioned by the government. . . . I hear about the meetings after they have taken place. What is the use of holding such meetings then? (R098; pre-workshop phase).

Further, this lack of relevant information and non-participation resulted in greater mistrust between forest resource professionals and local community members. As the respondent continues to explain: "I think the [JFM] committee does this on purpose; if no one is present, they can do whatever they want. No one will ever come to know where the funds have gone" (R098; pre-workshop phase). Another respondent echoed similar sentiments:

> What is the use of attending these meetings if what we say never matters? The officials note down our concerns in a copy, and then forget about it altogether. They say they will take necessary actions but they never do. Perhaps, if I were someone influential and important, my problems would have been solved by now. . . . I used to take active interest in the meetings, but now I know better. I have stopped attending these meetings altogether (R87, pre-workshop phase).

Evaluation of respondents' comments during the post-workshop evaluation phase, interestingly, unfolded a changing attitude towards participation in collaborative processes in the region. In particular, the respondents reflected a growing trust for forest resource professionals in the region, and felt confident in approaching the forest officials with their concerns after participating in the collaborative modeling process. As pointed out by a respondent:

> I was given prior notice about the workshops, its goals, and objectives. Because I knew forest officials would be there too, I was curious. The meeting was on a Sunday in the *panchayat* hall, so I went with my son. I participated in the mapping activity with a JFM member, and listened carefully to his presentation. He was nice, we drew the maps together, and I learned from him a lot. He asked me about good plantation areas in my ward. . . . I feel confident to approach this member with my forest related issues in the future. I will attend future workshops on forest management in the area (R098; post-workshop evaluation).

Similarly, evaluations of comments by forest resource professionals reflected a common thread. For example, a state forest official involved in forest management decisions in the region stated:

> Yes, [the workshop] was very helpful because we were given time to talk with the people and all. Normally we do not get to interact at all with EDCs and all. Therefore, I think it was helpful, because I could tell them our viewpoint, like what we are planning to do, and what the status is right now. So, they [the locals] are also quite aware of what the department is doing now. I think if we had we had a common platform like your workshop, we could interact with all the JFMCs and EDCs together. (R162; post workshop evaluation).

4.2. Standing

While JFM in Sikkim calls for the incorporation of location-specific ecological knowledge of the rural community members in the forest conservation and management process, the failure of the JFMCs to seek community input in local forestry activities has often resulted in less than positive outcomes. For example, studies show that plantation schemes in JFM intervention villages have mostly been unsuccessful regarding regeneration of primary oak forests due to a thick undergrowth of quickly growing exotic species (JICA, 2009). Additionally, these secondary forests often fail to maintain species biodiversity and other crucial ecosystem functions (Banerjee, 2016; Murali et al., 2002a; Rao et al., 2002). For example, despite his repeated requests to the local forest department officials to undertake planation of native species, a respondent stated that his requests yielded no immediate results. As he explained:

> Forests are not what they used to be 20-30 years ago. The species are not native to our area. The forest department brings saplings from just about anywhere. The survival rates of saplings are very low. You need to nurture them and undertake regular weeding, but the forest department cares less about these things. Most saplings die within weeks of planting, and those that survive will be of no value to us in the future. (R104; pre-workshop phase).

Reflecting on the importance and immediate need of engaging the local villagers in the JFM decision-making processes, a JFMC member commented:

> It is necessary to engage the locals in all our activities. All decisions concerning our forests should be made jointly with the people. I cannot decide on my own what needs to be done in order to protect our forests. The villagers have a lot of experience and local knowledge too. Together we can protect our forests (R91; pre-workshop phase).

Analysis of respondents' comments during the collaborative modeling evaluation phase, revealed a more nuanced understanding of the mutual interdependencies between forest professionals and local villagers in the JFM process. For example, a respondent agreed that social learning through systems thinking exercises helped him gain a better understanding of the interconnectedness in the forest ecosystem, and as a result, he was willing to interact with other parties involved in forest management. As he explained:

> We have to work jointly to make this [JFM] work in our village. We are all connected with each other. All departments and personnel should work jointly. . . . Yes, I strongly agree to attend future meetings so that I can share my ideas with the officers. I am 78 years old; I have a lot to teach these young people. They respect me a lot here (R104; post-workshop evaluation).

Similarly, an evaluation of the JFMC member's post-workshop comments revealed a greater emphasis on the mutual interdependencies among different stakeholder groups, and the crucial need to incorporate diverse stakeholder knowledge in community-based forest management decisions in the region. As one respondent pointed out:

> JFM involves so many components. Not just trees or animals or forest personnel. Look at the connections. It is very complicated as you can see. Community and local panchayats are all so important. All JFM meetings should involve these people more (R130).

While creation of opportunities for meaningful and active stakeholder participation in the collaborative modeling process demonstrated access, social learning through systems thinking

exercises indicated standing by enabling participants to think about forest management as part of a larger complex human-dominated ecosystem, unfold mutual independencies, and acknowledge varied stakeholder knowledge and perceptions in the JFM decisions in the region. Together, access and standing created opportunities for diverse stakeholder groups to translate and integrate these shared knowledge and visions into tangible and meaningful conversations towards participatory forest management decisions in the region, demonstrating influence.

4.3. Influence

The collaborative modeling process established the importance of integrating local stakeholder knowledge with the technical expertise of natural resource professionals. As preliminary first-steps, I shared the results from the collaborative modeling process with local forest professionals. Diverse stakeholder knowledge of the forest ecosystem reflected in forest history mapping, qualitative resource mapping, and cognitive maps laid the groundwork for forest professionals to incorporate community knowledge in forest management micro plans in the region. Pointing out the importance of community knowledge and active engagement in forest decision-making, a forest resource professional stated:

> The villagers too will have knowledge about the forests, how to conserve the forests. That is why we have to jointly work with them; undertake plantations with their local knowledge too. Moreover, if they attend workshops like these then the villagers can go and inform others who did not participate. They can give others information, and the word will spread in that manner. This needs to happen to make conservation successful. It is better to combine all our knowledge and work together (R179, post-workshop evaluation).

In addition to the integration of diverse stakeholder knowledge in the JFM decision-making process, results from the collaborative modeling process further implies the urgent need to integrate *panchayati raj* institutions (PRIs) or local self-government institutions with JFMCs

in the region. While both PRIs and JFM represented critical steps towards devolution of power and control over resources in India (Bose, 2019), differences in institutional structures and purposes often created a barrier to successful linkages between the two.

Constituted in 1992, the PRIs were mandated by the Constitution of India, while JFMCs created under the National Forest Policy in 1988 were registered under the state forest departments with no legal identity. While the JFM Guidelines published in 2000 and 2002 emphasized on building strong relationships with the PRIs in the conservation and management of forests, critics argue that PRIs as political entities often reflected the vested interests of the dominant class (Kumar, 2002). Proponents for the establishment of stronger linkages between PRIs and JFMCs, on the other hand, point out that JFMCs failed to emerge as autonomous institutions, with decision-making authority primarily remaining in the hands of the state forest departments (Ravindranath et al., 2000). PRIs as democratically elected institutions, however, would reflect local conservation priorities and interests. Further, Bose (2019) notes that greater involvement of the PRIs could provide JFMCs with developmental assistance necessary for its establishment and functioning as a sustainable broad rural development effort by creating linkages between the JFMCs and the three tiers of PRIs at the village, block, and district levels.

The importance of PRIs in the economic, political, and social-cultural milieu of rural East Sikkim is reflected in the evaluations of the collaborative modeling process. As grassroots institutions that sustain community interests and needs, PRIs form the backbone of rural self-governance and community-based democratic participatory process in the region. Evaluations of workshop activities indicated an overarching importance of PRIs in rural East Sikkim. For example, while 53.2% of 47 workshop participants successfully identified the location of a PRI member's house, only 25.5% were able to locate the house of their elected JFMC members on

the qualitative resource maps. Similarly, of the 81 workshop attendees, 58.0% (n = 47) indicated that they would first approach PRI members for forest related problems, while only 28.4% (n = 23) attendees opted for forest resource professionals. In explaining her rationale for choosing a PRI member over a forest resource professional for forest related problems, a local villager stated:

> I know all the PRI members in the village, their house, and *panchayat bhavan* [local PRI office]. I do not know for sure who the JFMC members are in my ward, so I would not be able to go there for my forest related issues. I know where the forest office is, but it is very far from my house. Therefore, I will definitely go to my panchayat and ask for help. They can help me quickly (R200; workshop phase).

Similarly, during the collaborative modeling evaluation phase, 54.8% (n = 23) of 42 participants favored PRI members over forest resource professionals regarding management of forest-related problems. Only 40.5% (n = 17) chose forest resource professionals as their first choice for any forest-related problems. While explaining his rationale for preferring a forest officer to a PRI member, a respondent stated:

> If it is forest related issue, then of course I will go to a forest officer. They will have the technical knowledge to resolve the problem. For example, if I need a permit for cutting a tree on my land, I have to go to RO office for permission. No one can help (R181; post-workshop evaluation).

Lack of transparency among JFMC officials also influenced participant's decisions regarding approaching forest resource professionals with their forest-related concerns. As one villager disappointedly explained:

> I have heard from a reliable source that this year the JFMC has received funds to undertake plantations in our village. The year is almost coming to an end now, but where are the plantations? I ask where did all the money go. . . . Who needs a salary from the government when you can make more money this way? I do not trust the committee (R41, workshop phase).

Overall, familiarity with PRI members, accessibility to panchayat offices, and trustworthiness were cited as the primary reasons for selecting PRI members over forest resource professionals, while greater technical knowledge and experience were cited as the main reasons for selecting forest resource professionals for solving forest-related issues in the region.

Interestingly, a comparison of the cognitive maps with the qualitative resource maps drawn by participants during the workshops indicated an opposite trend. Of the 26 participants who drew a cognitive map in the workshop evaluation study, 65.4% (n = 17) identified forest resource professionals as the key component of forest management system, with strong positive interconnectedness and mutual interdependencies among other components. Only three participants perceived PRI members as key components of the system. Four participants placed local villagers at the center of forest ecosystem management, while forests/trees and rocks/soil/ were chosen as key components by one participant each. In explaining his rationale for placing local villagers above any other forest resource component, one respondent stated:

> Local villagers form the core of the forest management system. If villagers are not involved in the protection of forests, forest department or panchayat cannot do anything. Everything starts here, with us. . . . Community involvement is a must (R201; post workshop evaluation).

4.4. Précis

The collaborative modeling process provided diverse stakeholder groups with meaningful opportunities to engage in deliberations regarding JFM in the region. Through social learning, stakeholders unfolded their mutual interdependencies and made important interconnections amongst the various components of the forest ecosystem. Further, the collaborative modeling process opened spaces for knowledge (re)creation and sharing, power sharing, and trust building, and helped create a decision space where interactive and innovative participation provided

stakeholders with access, standing, and influence—the tools to share their joint visions towards collaborative JFM decisions in the region.

While this study demonstrates how the collaborative modeling process helped open spaces previously limited to natural resource professionals, and reintegrated local communities with natural resource management decisions in this rural forest-dependent community, its applicability to populations in other sociocultural, political and economic contexts requires further validation. While previous studies have evaluated the plausibility and effectiveness of complex systems modeling through collaborative modeling processes (van den Belt, 2004), there is a dearth of studies that focus on participant's attitude, preferences, or understanding (Thompson et al., 2010). The study findings indicate important first steps towards understanding people's motivations and attitudes towards conservation efforts in East Sikkim, India, and integrating this knowledge with meaningful opportunities for people to share their viewpoints through a dynamic collaborative modeling process. Although it was beyond the scope of this study to quantitatively analyze if the collaborative modeling process lead to better JFM decisions in the region, stakeholders' evaluation of the modeling process with respect to social learning, new knowledge gained, and potential opportunities to communicate new knowledge suggests that future collaborative efforts in the region are more likely to be successful at garnering greater community participation. Engaged and meaningful community participation through collaborative learning can help diverse stakeholders arrive at mutually agreed upon recommendations or workable solutions for their concerns, leading to a more socially acceptable and procedurally legitimate natural resource management decisions in East Sikkim, India.

5. CONCLUSION

This study demonstrates that in communities where opportunities for deliberative environmental decision-making cognizant of a plurality of stakeholder perspectives are limited, collaborative modeling using soft systems thinking can help create and open spaces for engaged stakeholder deliberations in environmental decision-making. The collaborative modeling process created an environment conducive to effective engagement, where, through trust building, apparent schisms among participant's expectations and experience were minimized. The modeling process provided key stakeholders in the JFM process in East Sikkim a common platform to deliberate, learn, share, and evaluate the complexities of a forest management system. With a focus on joint problem solving, this iterative modeling process enabled stakeholders to unfold mutual interdependencies and open spaces for integrating participant's knowledge, values, and perceptions into environmental decision-making. The collaborative modeling process provided participants with access, standing, and influence—the Trinity of Voice, to help build and translate their shared visions towards mutually agreeable and collaborative JFM decisions in rural East Sikkim, India.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to all the participants of the study and to those who helped me with fieldwork logistics and data collection in East Sikkim, India. I am also grateful to The University of Texas at El Paso (UTEP) Graduate School Dodson Research Grant for supporting the fieldwork. The Human Subjects Protection Office at UTEP approved all research conducted in this study (IRB Protocol No. 841069-2).

References

Acey, C., 2016, Managing wickedness in the Niger Delta: Can a new approach to multi-stakeholder governance increase voice and sustainability?, *Landscape and Urban Planning* **154:**102-114.

Agarwal, B., 2001, Participatory exclusions, community forestry, and gender: An analysis for South Asia and a conceptual framework, *World Development* **29**(10)**:**1623-1648.

Agrawal, A., Gibson, C. C., 1999, Enchantment and disenchantment: The role of community in natural resource conservation, *World Development* **27**(4)**:**629-649.

Aguilar, F. X., Kelly, M. C., 2019, US family forest management coupling natural and human systems: Role of markets and public policy instruments, *Landscape and Urban Planning***:**In Press.

Anderson, N. M., Ford, R. M., Williams, K. J. H., 2017, Contested beliefs about land-use are associated with divergent representations of a rural landscape as place, *Landscape and Urban Planning* **157:**75-89.

APFD, 2001, Joint Forest Management: Forest conservation with people's participation, a saga of success towards Swarna Andhra Pradesh, Andhra Pradesh Forest Department, Hyderabad, India, pp. 1-155.

Arbuckle, M. B., Konisky, D. M., 2015, The role of religion in environmental attitudes, *Social Science Quarterly* **96**(5)**:**1244-1263.

Arjunan, M., Holmes, C., Puyravaud, J.-P., Davidar, P., 2006, Do developmental initiatives influence local attitudes toward conservation? A case study from the Kalakad–Mundanthurai Tiger Reserve, India, *Journal of Environmental Management* **79**(2)**:**188-197.

Arora, V., 2004, Just a pile of stones! The politicization of identity, indigenous knowledge, and sacred landscapes among the Lepcha and the Bhutia tribes of contemporary Sikkim, India, University of Oxford, Oxford, UK.

Arora, V., 2006, The forest of symbols embodied in the Tholung sacred landscape of North Sikkim, India, *Conservation & Society* **4**(1)**:**55-83.

Arora, V., 2007, Unheard voices of protest in Sikkim, *Economic and Political Weekly* **42**(34)**:**3451-3454.

Arrawatia, M. L., Tambe, S., 2011, Biodiversity of Sikkim: Exploring and conserving a global hotspot, Information and Public Relations Department, Government of Sikkim, Gangtok, India.

Balooni, K., 2002, Participatory forest management in India: An analysis of policy trends amid management change, *Policy Trend Report***:**88-113.

Ban, N. C., Mills, M., Tam, J., Hicks, C. C., Klain, S., Stoeckl, N., Bottrill, M. C., Levine, J., Pressey, R. L., Satterfield, T., Chan, K. M., 2013, A social–ecological approach to conservation planning: embedding social considerations, *Frontiers in Ecology and the Environment* **11**(4)**:**194-202.

Bandyopadhyay, S., Tembo, G., 2010, Household consumption and natural resource management around national parks in Zambia, *Journal of Natural Resources Policy Research* **2**(1)**:**39-55.

Banerjee, P., 2013, Joint Forest Management in India: A case study of East Sikkim, India, in: *Conference on Communication and Environment (COCE)* (M. S. Meisner, N. Sriskandarajah, S. P. Depoe, eds.), The International Environmental Communication Association (IECA), Uppsala, Sweden, pp. 33-44.

Banerjee, P., 2016, Community conversations on conservation: A case study of Joint Forest Management in East Sikkim, in: *Environmental communication and community: Constructive and destructive dynamics of social transformation* (T. R. Peterson, H. L. Bergea, A. M. Feldpausch-Parker, K. Raitio, eds.), Routledge, New York, pp. 99-123.

Barnaud, C., Van Paassen, A., 2013, Equity, power games, and legitimacy: Dilemmas of participatory natural resource management, *Ecology and Society* **18**(2).

Behera, B., 2006, Determinants of sustainable management of natural resources: The case of Joint Forest Management (JFM) in India, University of Bonn, Center for Development Research pp. 149.

Bell, S., Morse, S., 2013, How people use rich pictures to help them think and act, *Systemic Practice and Action Research* **26**(4)**:**331-348.

Bhat, P. R., Rao, R. J., Murthy, I. K., Murali, K. S., Ravindranath, N. H., 2000, Joint forest planning and management in Uttara Kannada: A micro and macro level assessment, in: *Joint Forest Management and community forestry in India: An ecological and institutional assessment* (N. H. Ravindranath, K. S. Murali, K. C. Malhotra, eds.), Oxford and IBH Publishing, New Delhi, India, pp. 48-98.

Biggs, R., Rhode, C., Archibald, S., Kunene, L. M., Mutanga, S. S., Nkuna, N., Ocholla, P. O., Phadima, L. J., 2015, Strategies for managing complex social-ecological systems in the face of uncertainty examples from South Africa and beyond, *Ecology and Society* **20**(1).

Blaikie, P. M., Springate-Baginski, O., 2007, Introduction: Setting up key policy issues in participatory forest management, in: *Forests, people and power: The political ecology of reform in South Asia* (O. Springate-Baginski, P. M. Blaikie, eds.), Earthscan, London, UK, pp. 1-24.

Blunt, M., Fisher, M. J., Mitra, K., Sarin, M., 1999, Forestry project: Impact assessment report (Government of Himachal Pradesh, ed.), Forest Department, India, pp. 1-99.

Bohnet, I., Smith, D. M., 2007, Planning future landscapes in the wet tropics of Australia: A social–ecological framework, *Landscape and Urban Planning* **80**(1)**:**137-152.

Bose, S., 2019, Role of user groups and panchayati raj institutions (PRIs) in strengthening participatory forest management (PFM) in India, in: *11th Biennial Conference, IASCP* Ubud, Bali, Indonesia, pp. 18.

Brandt, F., Josefsson, J., Spierenburg, M., 2018, Power and politics in stakeholder engagement: Farm dweller (in)visibility and conversions to game farming in South Africa, *Ecology and Society* **23**(3)**:**1-14.

Briggs, J., Sharp, J., 2004, Indigenous knowledges and development: A postcolonial caution, *Third World Quarterly* **25**(4)**:**661-676.

Bronfman, N., Cisternas, P., López-Vázquez, E., Maza, C., Oyanedel, J., 2015, Understanding attitudes and pro-environmental behaviors in a Chilean community, *Sustainability* **7**(10)**:**14133.

Brown, G., 2013, Relationships between spatial and non-spatial preferences and place-based values in national forests, *Applied Geography* **44:**1-11.

Bryan, T., Wondolleck, J., 2003, When irresolvable becomes resolvable: The Quincy Library group conflict, in: *Making Sense of Intractable Environmental Conflicts: Concepts and Cases* (R. J. Lewicki, B. Gray, M. Elliott, eds.), Island Press, Washington, DC, pp. 63-90.

Buck, L., Wollenberg, E., Edmunds, D., 2001, Social learning in the collaborative management of community forests: Lessons from the field, in: *Social learning in community forests*

(E. Wollenberg, D. Edmunds, L. Buck, J. Fox, S. Brodt, eds.), Center for International Forestry Research (CIFOR), Bogor, Indonesia, pp. 1-20.

Butler, C., Adamowski, J., 2015, Empowering marginalized communities in water resources management: Addressing inequitable practices in participatory model building, *Journal of Environmental Management* **153:**153-162.

Callister, D. C., 2013, Land community participation: A new "public" participation model, *Environmental Communication* **7**(4)**:**435-455.

Carr, G., 2015, Stakeholder and public participation in river basin management—an introduction, *Wiley Interdisciplinary Reviews: Water* **2**(4)**:**393-405.

Caves, J. K., Bodner, G. S., Simms, K., Fisher, L. A., Robertson, T., 2013, Integrating collaboration, adaptive management, and scenario-planning: Experiences at Las Cienegas National Conservation Area, *Ecology and Society* **18**(3).

Census Organization of India. 2015. East Sikkim District: Census 2011 data. Census Organization of India. https://www.census2011.co.in/census/district/464-east-sikkim.html.

Charmaz, K., 2001, Grounded theory, in: *Contemporary field research: Perspectives and formulations* (R. Emerson, ed.), Waveland, Long Grove, IL.

Chaudhuri, T., 2013, From policing to 'social fencing': shifting moral economies of biodiversity conservation in a South Indian Tiger Reserve, *Journal of Political Ecology* **20:**376-394.

Checkland, P., 2001, Soft sytem methodology, in: *Rational analysis for a problematic world: Problem structuring methods for complexity, uncertainty and conflict* (J. Rosenhead, J. Mingers, eds.), John Wiley & Sons, Chichester, London, UK., pp. 61-90.

Chen, X., Peterson, M. N., Hull, V., Lu, C., Lee, G. D., Hong, D., Liu, J., 2011, Effects of attitudinal and sociodemographic factors on pro-environmental behaviour in urban China, *Environmental Conservation* **38**(1)**:**45-52.

Choudhury, M. 2006. *Sikkim: Geographical perspectives*. New Delhi, India: Mittal Publications.

Cinner, J. E., Bodin, Ö., 2010, Livelihood diversification in tropical coastal communities: A network-based approach to analyzing 'livelihood landscapes', *PLOS ONE* **5**(8)**:**e11999.

Cundill, G., Thondhlana, G., Sisitka, L., Shackleton, S., Blore, M., 2013, Land claims and the pursuit of co-management on four protected areas in South Africa, *Land Use Policy* **35:**171-178.

Dake, K., 1992, Myths of nature: Culture and social construction of risk, *Journal of Social Issues* **48**(4)**:**21-37.

Damon, M., Zivin, J. G., Thirumurthy, H., 2015, Health shocks and natural resource management: Evidence from western Kenya, *Journal of Environmental Economics and Management* **69:**36-52.

Daniels, S. E., Walker, G. B. 2001. *Working through environmental conflict: The collaborative learning approach*. Westport, CT: Praeger.

De Santo, E. M., 2016, Assessing public "participation" in environmental decision-making: Lessons learned from the UK Marine Conservation Zone (MCZ) site selection process, *Marine Policy* **64:**91-101.

DeGeorges, P., Reilly, B., 2009, The realities of community based natural resource management and biodiversity conservation in Sub-Saharan Africa, *Sustainability* **1**(3)**:**734.

Deng, H., Chen, Z., Cao, H., Shen, Y., Wang, Y., Shan, P., 2015, Perceptions and attitudes of local residents on a nature reserve: a case study in Baimaxueshan National Nature

Reserve, *International Journal of Sustainable Development & World Ecology* **22**(2)**:**165-170.

Denzin, N. K. 1989. *Interpretive interactionism*. Second ed. Vol. 16. Newbury Park, CA: Sage.

Denzin, N. K., Lincoln, Y. S., eds. 2011. *Introduction: The discipline and practice of qualitative research*. 4 ed, *The Sage handbook of qualitative research*. Thousand Oaks, CA: Sage.

Deruiter, D. S., 2002, A qualitative approach to measuring determinants of wildlife value orientations, *Human Dimensions of Wildlife* **7**(4)**:**251-271.

DESME, 2005, Socio-economic survey of Sikkim, DESME, Gangtok, Sikkim, India.

Dewan, C., Buisson, M.-C., Mukherji, A., 2014, The imposition of participation? The case of participatory water management in coastal Bangladesh, *Water Alternatives* **7**(2)**:**342-366.

Dietz, T., Stern, P. C., 2008, The promise and perils of participation, in: *Public participation in environmental assessment and decision making* (T. Dietz, P. C. Stern, eds.), The National Academies Press, Washington, D.C, pp. 33-74.

Directorate of Census Operations, 2011, District Census Handbook, in: *Population Census 2011*, Census of India, Gangtok, Sikkim, India, pp. 308.

Douglas, M., Wildavsky, A. 1982. *Risk and culture: An essay on the selection of technological and environmental dangers*. First ed. Berkeley, CA.: University of California Press.

Endres, D., Sprain, L., Peterson, T. R., eds. 2009. *Social movement to address climate change*. Amherst, NY: Cambria Press.

ENVIS. 2011. Status of environment and related issues. Forests, Environment & Wildlife Management Department, Government of Sikkim, Ministry of Environment, Forests & Climate Change, Government of India. http://www.sikenvis.nic.in/Database/ForestResource_786.aspx.

ENVIS. 2019. Status of environment and related issues. Forests, Environment & Wildlife Management Department, Government of Sikkim, Ministry of Environment, Forests & Climate Change, Government of India. http://www.sikenvis.nic.in/Database/Wildlife_785.aspx.

Fabricius, C., Koch, E., Turner, S., Magome, H., eds. 2004. *Rights resources and rural development: Community-based natural resource management in Southern Africa*. London: Routledge.

Farley, K. A., 2007, Grasslands to tree plantations: forest transition in the Andes of Ecuador, *Annals of the Association of American Geographers* **97**(4)**:**755-771.

Farley, K. A., Kelly, E. F., 2004, Effects of afforestation of a páramo grassland on soil nutrient status, *Forest Ecology and Management* **195:**281-290.

Fast, S., Nourallah, L., 2018, Public trust in environmental decision-making: A case study of shale gas regulation in Kent County, New Brunswick, *Case Studies in the Environment*.

Ferguson, L., Chan, S., Santelmann, M., Tilt, B., 2017, Exploring participant motivations and expectations in a researcher-stakeholder engagement process: Willamette Water 2100, *Landscape and Urban Planning* **157:**447-456.

FEWMD, 2007, Annual administrative report, Forests, Environment & Wildlife Management Department, Government of Sikkim,, Gangtok, Sikkim, India.

FEWMD, 2009, Centenary report: 100 years of service, Sikkim forestry, Government of Sikkim: Forests, Environment & Wildlife Management Department, Gangtok, Sikkim, India.

FEWMD. 2010. Wildlife Protected Areas. Forests, Environment & Wildlife Managment Department, Government of Sikkim,. http://www.sikkimforest.gov.in/Wildlife.htm.

FEWMD, 2015, Forestry and environment mission Sikkim 2015, Forests, Environment & Wildlife Management Department, Gangtok, Sikkim, India.

Fischer, A. P., 2018, Forest landscapes as social-ecological systems and implications for management, *Landscape and Urban Planning* **177:**138-147.

Forest Survey of India, 2013, Forest and tree resources in states and union territories: Sikkim, Forest Survey of India, New Delhi, India.

Glaser, B. G., Strauss, A. L. 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago: Aldine.

Gold, J. R., Goodey, B., 1989, Environmental perception: the relationship with age, *Progress in Human Geography* **13**(1)**:**99-106.

Government of India, 2008, Sikkim Development Report, Government of India: Planning Commission, New Delhi, India.

Government of India, 2011, Population census 2011, Census Organization of India, New Delhi, India.

Government of India, 2013, Forest and tree resources in states and union territories: Sikkim, in: *India state of forest report 2011*, Forest Survey of India, New Delhi, India.

Government of Sikkim. 2014. Sikkim statistics 2013. Government of Sikkim. https://www.sikkim.gov.in/portal/portal/StatePortal/UsefulLinks/SikkimStatistics2013.

Government of Sikkim. 2015. *Sikkim human development report 2014: Expanding opportunities, promoting sustainability*. First ed. New Delhi, India: Routledge.

Government of Sikkim. 2016. East district at a glance. Department of Economics, Statistics, Monitoring & Evaluation, Government of Sikkim,, Last Modified 12-0-2016. http://www.desme.in/east-district/13.

Gray, B., 1989, Collaboration: The constructive management of differences, in: *Collaborating: Finding common ground for multiparty problems*, Jossey-Bass, San Francisco, CA, pp. 1-26.

Gray, B., 2003, Freeze framing: The timeless dialogue of intractability surrounding Voyageurs National Park, in: *Making sense of intractable environmental conflicts: Concepts and cases* (R. J. Lewicki, B. Gray, M. Elliott, eds.), Island Press, Washington, D.C., pp. 91-126.

Gray, B., Putnam, L. L., 2003, Means to what end? Conflict management frames, *Environmental Practice* **5**(3)**:**239-246.

Grimble, R., Wellard, K., 1997, Stakeholder methodologies in natural resource management: A review of principles, contexts, experiences and opportunities, *Agricultural Systems* **55**(2)**:**173-193.

Gupta, A. K., 2003, Emergence of second generation issues in operationalizing Joint Forest Management, in: *Proceedings of the national workshop on technological innovation and research advancements for application in Joint Forest Management*, Indian Council of Forestry Research and Education (ICFRE), Dehradun, India, pp. 65-82.

Harrison, S., Ghose, A., 2000, Small-scale forestry systems in India, in: *Sustainable small scale forestry: Socioeconomic analysis and policy* (S. R. Harrison, J. L. Herbohn, K. F. Herbohn, eds.), Edward Elgar, Cheltenham, UK, pp. 165-189.

Hazer Sancar, F., 1993, An integrative aproach to public participation and knowledge generation in design, *Landscape and Urban Planning* **26**(1)**:**67-88.

Hill, I., Shields, D., 1998, Incentives for Joint Forest Management in India : Analytical methods and case studies, World Bank Technical Paper No. 394, Washington, D.C., pp. 129.

Hollow, B., Roetman, P. E. J., Walter, M., Daniels, C. B., 2015, Citizen science for policy development: The case of koala management in South Australia, *Environmental Science & Policy* **47:**126-136.

Hope, A. L. B., Jones, C. R., 2014, The impact of religious faith on attitudes to environmental issues and Carbon Capture and Storage (CCS) technologies: A mixed methods study, *Technology in Society* **38:**48-59.

Hoshino, E., van Putten, E. I., Girsang, W., Resosudarmo, B. P., Yamazaki, S., 2017, Fishers' perceived objectives of community-based coastal resource management in the Kei Islands, Indonesia, *Frontiers in Marine Science* **4**(141).

Hosmer, D. W. J., Lemeshow, S., Sturdivant, R. X. 2013. *Applied logistic regression*. 3 ed. Hoboken, New Jersey, USA: John Wiley & Sons.

Hunter, L. M., Hatch, A., Johnson, A., 2004, Cross-national gender variation in environmental behaviors, *Social Science Quarterly* **85**(3)**:**677-694.

IFC. 2011. Sustainable competitiveness report 2011. Institute For Competitiveness. http://competitiveness.in/2011/08/11/press-release-sustainable-competitiveness-report-2011/.

IFMR. 2009. Environmental sustainability index for Indian States 2009. Centre for Development Finance. http://www.sikkimforest.gov.in/docs/News%20Clips/ESI2009.pdf.

JICA, 2009, Preparatory study on integrated project for sustainable development of forest resources in Sikkim (Japan International Cooperation Agency, ed.), Government of Sikkim: Forests, Environment & Wildlife Management Department, Gangtok, Sikkim, India, pp. 349.

Kabeer, N., Subrahmanian, R., 1996, Institutions, relations and outcomes: frameworks and tools for gender-aware planning., in: *IDS Discussion Paper No 357*, IDS, Brighton, UK.

Kant, S., Cooke, R., 1999, Jabalpur district, Madhya Pradesh, India: Minimizing conflict, in: *Cultivating peace: Conflict and collaboration in natural resource management* (D. Buckles, ed.), IDRC, World Bank, Washington D.C.

Kapoor, I., 2001, Toward participatory environmental management?, *Journal of Environmental Management* **63:**269-279.

KFD, undated, Economic impact assessment of JFM: Western Ghats forestry project Karnataka Forest Department, Bangalore, India.

Khare, A., Sarin, M., Saxena, N. C., Palit, S., Bathla, S., Vania, F., Satyanarayana, M., 2000, Joint Forest Management: Policy, practice and prospects, in: *Policy that works for forest and people*, IIED World Wide Fund for Nature, London, UK.

Knapp, C. N., Kofinas, G. P., Fresco, N., Carothers, C., Craver, A., Chapin, S. F., 2014, Parks, people, and change: The importance of multistakeholder engagement in adaptation planning for conserved areas, *Ecology and Society* **19**.

Koontz, T. M., Thomas, C. W., 2006, What do we know and need to know about the environmental outcomes of collaborative management?, *Public Administration Review* **66**(s1)**:**111-121.

Kumar, S., 2002, Does "participation" in common pool resource management help the poor? A social cost–benefit analysis of joint forest management in Jharkhand, India, *World Development* **30**(5)**:**763-782.

Lafont, C., 2015, Deliberation, participation, and democratic legitimacy: Should deliberative mini-publics shape public policy?, *Journal of Political Philosophy* **23**(1)**:**40-63.

Lama, M. P. 2001. *Sikkim Human Develeopment Report 2001*. New Delhi, India: Government of Sikkim, Social Science Press.

Langsdale, S., Beall, A., Bourget, E., Hagen, E., Kudlas, S., Palmer, R., Tate, D., Werick, W., 2013, Collaborative modeling for decision support in water resources: Principles and best practices, *JAWRA Journal of the American Water Resources Association* **49**(3)**:**629-638.

Laurian, L., 2004, Public participation in environmental decision making: Findings from communities facing toxic waste cleanup, *Journal of the American Planning Association* **70**(1)**:**53-65.

Longhi, S., 2013, Individual pro-environmental behaviour in the household context, in: *ISER Working Paper Series 2013-21*, University of Essex, Institute for Social and Economic Research (ISER), Colchester, UK.

MacKenzie, S., 2008, The importance of trust for collaborations in the charity sector, pp. 1-62.

Maguire, L., Lind, E., 2003, Public participation in environmental decisions: Stakeholders, authorities and procedural justice, *International Journal of Global Environmental Issues* **3**(2)**:**133-148.

Mainieri, T., Barnett, E. G., Valdero, T. R., Unipan, J. B., Oskamp, S., 1997, Green buying: The influence of environmental concern on consumer behavior, *The Journal of Social Psychology* **137**(2)**:**189-204.

Malena, C., ed. 2009. *Building political will for participatory governance: An introduction*. Edited by C. Malena, *From political won't to political will: Building support for participatory governance*. Sterling, VA: Kumarian.

Marshall, C., Rossman, G. B. 2006. *Designing qualitative research*. Thousand Oaks, CA: Sage.

Martin, T., 2007, Muting the voice of the local in the age of the global: How communication practices compromised public participation in India's Allain Dunhangan environmental impact assessment, *Environmental Communication* **1**(2)**:**171-193.

Miles, M. B., Huberman, A. M., Saldana, J. 2014. *Qualitative data analysis: A methods sourcebook.* 3 ed. Thousand Oaks, CA: Sage Publications.

Mishra, P. R., Sarin, M., 1988, Social security through social fencing, Sukhomajri and Nada, North India, in: *The greening of aid: sustainable livelihoods in practice* (C. Conroy, M. Litvinoff, eds.), Earthscan, London, pp. 22-28.

Mobus, G. E., 2018, Teaching systems thinking to general education students, *Ecological Modelling* **373:**13-21.

MOEF, undated, Joint Forest Management: A handbook, in: *JICA funded project "Capacity Development for Forest Management & Training of Personnel", ID-P199*, Ministry of Environment & Forest, Government of India,, New Delhi, India.

Mohai, P., 2017, Public participation and natural resource decision-making: The case of the RARE II decisions, *Natural Resources Journal* **27**(1)**:**123-155.

Moorman, M. C., Peterson, M. N., Moore, S. E., Donoso, P. J., 2013, Stakeholder perspectives on prospects for co-management of an old-growth forest watershed near Valdivia, Chile, *Society & Natural Resources* **26**(9)**:**1022-1036.

Murali, K. S., Murthy, I. K., Ravindranath, N. H., 2002a, Joint Forest Management in India and its ecological impacts, *Environmental Management and Health* **13**(5)**:**512-528.

Murali, K. S., Rao, J., Ravindranath, N. H., 2002b, Evaluation studies of Joint Forest Management in India: A review of analytical processes, *International Journal of Environment and Sustainable Development* **1**(2)**:**184-199.

Murali, K. S., Sharma, M., Rao, R. J., Murthy, I. K., Ravindranath, N. H., 2000, Status of participatory forest management in India: An analysis, in: *Joint Forest Management and community forestry in India: An ecological and institutional assessment* (N. H. Ravindranath, K. S. Murali, K. C. Malhotra, eds.), Oxford & IBH, New Delhi, India, pp. 25-58.

Muyengwa, S., 2015, Determinants of individual level satisfaction with community based natural resources management: A case of five communities in Namibia, *Environments* **2:**608-623.

Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B., Kent, J., 2000, Biodiversity hotspots for conservation priorities, *Nature* **403**(6772)**:**853–858.

NATMO, 2007, Natural resource atlas of Sikkim (P. Nag, ed.), National Atlas and Thematic Mapping Organization, Kolkata, India.

Naz, F., Doneys, P., Saqib, S. E., 2018, Adaptation strategies to floods: A gender-based analysis of the farming-dependent char community in the Padma floodplain, Bangladesh, *International Journal of Disaster Risk Reduction* **28:**519-530.

Nielsen, B. B., 2004, The role of trust in collaborative relationships: A multi-dimensional approach, *M@n@gement* **7**(3)**:**239-256.

Office of the Registrar General & Census Commissioner. 2001. Census data 2001/Metadata. Ministry of Home Affairs, Government of India. http://censusindia.gov.in/Metadata/Metada.htm#2d.

Open Government Data (OGD) Platform India. 2016. District-wise forest cover in Sikkim in 2013. Government of India. https://community.data.gov.in/district-wise-forest-cover-in-sikkim-in-2013/.

Ostwald, M., 2000, Local protection of tropical dry natural forest, Orissa, India, Department of Physical Geography., Goteborg, pp. 1-29.

Parikh, M., 2017, Public Participation in environmental decision making in India: A critique, *IOSR Journal of Humanities and Social Science* **22**(6)**:**56-63.

Patton, M. Q. 1990. *Qualitative evaluation and research methods*. Second ed. Newbury Park, CA: Sage.

Persons, G. A., 1990, Defining the public interest: Citizen participation in metropolitan and state policy making, *National Civic Review* **79**(2)**:**118-131.

Peterson, M. N., Liu, J., 2008, Property rights and landscape planning in the intermountain west: The Teton Valley case, *Landscape and Urban Planning* **86**(2)**:**126-133.

Peterson, M. N., Peterson, T. R., Liu, J. 2013. *The housing bomb: why our addiction to houses is destroying the environment and threatening our society*. Baltimore Maryland, USA: Johns Hopkins University Press.

Peterson, T. R. 1997. *Sharing the earth: The rhetoric of sustainable development*. Columbia, SC: University of South Carolina Press.

Peterson, T. R., 2003, Social control frames: Opportunities or constraints?, *Environmental Practice* **5**(3)**:**232-238.

Peterson, T. R., Feldpausch-Parker, A. M., 2013, Environmental conflict communication, in: *The Sage handbook of conflict communication: Integrating theory, research, and practice* (J. Oetzel, S. Ting-Toomey, eds.), Sage, Thousand Oaks , CA, pp. 419-445.

Peterson, T. R., Nils Peterson, M., Peterson, M. J., Allison, S. A., Gore, D., 2006, To play the fool: Can environmental conservation and democracy survive social capital?, *Communication and Critical/Cultural Studies* **3**(2)**:**116-140.

PRIA, Samarthan. 2010. Village resource development programme and eco-development project in Madhya Pradesh: Mid-term evaluation of VRDP and EDP in Madhya Pradesh. Unpublished mid-term evaluation report, New Delhi and Bhopal, Last Modified 2010, accessed 05 August 2015. https://www.pria.org/project-details-evaluation-of-village-resource-development-programme-and-eco-development-programme-in-madhya-pradesh-30-293-7.

PTI, 2013, Sikkim becomes only state to increase forest cover, in: *The Economi Times*.

Purnomo, H., Mendoza, G. A., Prabhu, R., 2004, Model for collaborative planning of community-managed resources based on qualitative soft systems approach, *Journal of Tropical Forest Science* **16**(1)**:**106-131.

Putnam, L. L., Peterson, T. R., 2003, The Edwards aquifer dispute: Shifting frames in a protracted conflict, in: *Making sense of intractable environmental conflicts: Concepts and cases* (R. J. Lewicki, B. Gray, M. Elliott, eds.), Island Press, Washington, D.C., pp. 127-158.

Quiroz Dahik, C., Crespo, P., Stimm, B., Murtinho, F., Weber, M., Hildebrandt, P., 2018, Contrasting stakeholders' perceptions of pine plantations in the Páramo ecosystem of Ecuador, *Sustainability* **10**(6)**:**1707.

Rai, A., Nayak, A., Misra, M. R., Singh, N. M., Nayak, P. K., Mohanty, S., Rao, Y. G., 2000, Gadabanikilo – an example of community forest management with a difference, in: *Joint Forest Management and community forestry in India: An ecological and institutional assessment* (N. H. Ravindranath, K. S. Murali, K. C. Malhotra, eds.), Oxford & IBH Publishing Company, New Delhi, India, pp. 205-220.

Rao, J. R., Murali, K. S., Murthy, I. K., 2004, Joint Forest Management studies in India: A review of the monitoring and evaluation methods, in: *Joint Forest Management in India: Spread, performance and impact* (N. H. Ravindranath, P. Sudha, eds.), Universities Press, Hyderabad, India, pp. 26-40.

Rao, J. R., Murali, K. S., Ravindranath, N. H., 2002, Joint forest planning and management (JFPM) in Karnataka: Current status and future potential, *Wasteland News* **17**(3)**:**14-27.

Ravindranath, N. H., Hall, D. O. 1995. *Biomass, Energy and Environment: A Developing Country Perspective from India*. London: Oxford University Press.

Ravindranath, N. H., Murali, K. S., Murthy, I. K., Sudha, P., Palit, S., Malhotra, K. C., 2000, Summary and conclusions, in: *Joint forest management and community forestry in India: An ecological and institutional assessment* (N. H. Ravindranath, K. S. Murali, K. C. Malhotra, eds.), IBH, New Delhi, India, pp. 279-318.

Reed, M. S., 2008, Stakeholder participation for environmental management: A literature review, *Biological Conservation* **141**(10)**:**2417-2431.

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, C. H., Stringer, L. C., 2009, Who's in and why? A typology of stakeholder analysis methods for natural resource management, *Journal of Environmental Management* **90:**1933-1949.

Riechard, D. E., Peterson, S. J., 1998, Perception of environmental risk related to gender, community socioeconomic setting, age, and locus of control, *The Journal of Environmental Education* **30**(1)**:**11-19.

Riehl, B., Zerriffi, H., Naidoo, R., 2015, Effects of community-based natural resource management on household welfare in Namibia, *PLoS ONE* **10**(5)**:**e0125531.

Robbins, P., 1998, Paper forests: Imagining and deploying exogenous ecologies in arid India, *Geoforum* **29**(1)**:**69-86.

Rosenhead, J., Mingers, J., 2001, A new paradigm of analysis, in: *Rational analysis for a problematic world revisited: Problem structuring methods for complexity, uncertainty and conflict* (J. Rosenhead, J. Mingers, eds.), John Wiley & Sons, New York, NY, pp. 1-21.

Roy, S. B., 1992, Forest protection committees in West Bengal, *Economic and Political Weekly* **27**(29)**:**1528-1530.

Sarin, M., 1998, From conflict to collaboration: Institutional issues in community management, in: *Village voices, forest choices: Joint Forest Management in India* (M. Poffenberger, B. McGean, eds.), Oxford University Press, New Delhi, pp. 165-209.

Sarin, M., 1999, Policy goals and JFM practice: An analysis of institutional arrangements and outcomes, in: *Policy and Joint Forest Management* World Wide Fund for Nature, New Delhi, India, pp. 56.

Schwab, J. A., 2002, Multinomial logistic regression: Basic relationships and complete problems, The University of Texas at Austin.

Scolobig, A., Lilliestam, J., 2016, Comparing approaches for the integration of stakeholder perspectives in environmental decision making, *Resources* **5**(4)**:**37.

SDMO, 2014, Land records, Department of Land Revenue & Disaster Management, Rongli, East Sikkim, India.

Senecah, S., 2004, The trinity of voice: The role of practical theory in planning, in: *Communication and public participation in environmental decision making* (S. P. Depoe,

J. W. Delicath, M. A. Elsenbeer, eds.), State University of New York Press, Albany, NY, pp. 13-34.

Sethi, N. 2015. Forest facts: Delving deeper. DownToEarth, Last Modified 04 July 2015, accessed 04 July 2015. https://www.downtoearth.org.in/news/forest-facts-delving-deeper-11291.

Sharp, E. A., Spooner, P. G., Millar, J., Briggs, S. V., 2012, Can't see the grass for the trees? Community values and perceptions of tree and shrub encroachment in south-eastern Australia, *Landscape and Urban Planning* **104**(2)**:**260-269.

Shimizu, T., 2006, Assessing the access to forest resources for improving livelihoods in West and Central Asia Countries, Livelihood Support Program, Food and Agriculture Organization (FAO), United Nations, Rome, pp. 42.

Shirk, J. L., Ballard, H. L., Wilderman, C. C., Phillips, T., Wiggins, A., Jordan, R., McCallie, E., Minarchek, M., Lewenstein, B. V., Krasny, M. E., Bonney, R., 2012, Public participation in scientific research: A framework for deliberate design, *Ecology and Society* **17**(2).

Shrestha, P., Ghose, P. S., Tsheden Theengh, L., Sharma, B., 2013, Monitoring of high altitude habitats in West Sikkim by Himal Rakshaks, World Wide Fund for Nature, India, pp. 24.

Shumway, N., Seabrook, L., McAlpine, C., Ward, P., 2014, A mismatch of community attitudes and actions: A study of koalas, *Landscape and Urban Planning* **126:**42-52.

SikkimFirst.in. 2013. Sikkim India's greenest state, 47.3 percent land forested. The Sikkim Reporter, accessed 17 March 2019. http://sikkimfirst.in/2013/08/18/sikkim-indias-greenest-state-47-3-percent-land-forested/.

Sowards, S. K., Tarin, C. A., Upton, S. D., 2017, Place-based dialogics: Adaptive cultural and interpersonal approaches to environmental conservation, *Frontiers in Communication* **2**(9).

Stern, P. C., Dietz, T., Kalof, L., 1993, Value orientations, gender, and environmental concern, *Environment and Behavior* **25**(5)**:**322-348.

Sterner, T., Coria, J. 2012. *Policy instruments for environmental and natural resource management*. 2 ed. New York: Routledge.

Subba, B., 2014, Women " quest " for empowerment in Sikkim's society, *International Journal of Scientific and Research Publications* **4**(9)**:**1-5.

Sudha, P., Ravindranath, N. H., 2004, Evolution of forest policies and the spread of Joint Forest Managment in India, in: *Joint Forest Management in India: Spread, performance and Impact* (N. H. Ravindranath, P. Sudha, eds.), Universities Press Hyderabad, India, pp. 1-25.

Suich, H., 2013, Evaluating the household level outcomes of community based natural resource management: The Tchuma Tchato Project and Kwandu Conservancy, *Ecology and Society* **18**(4).

Sultana, F., 2009, Community and participation in water resources management: gendering and naturing development debates from Bangladesh, *Transactions of the Institute of British Geographers* **34**(3)**:**346-363.

Sweeny, L. B., Meadows, D. 2010. *The systems thinking playbook: Exercises to stretch and build learning and systems thinking capabilities*. Hartford, VT.: Chelsea Green Publishing.

Swets, J. A., 1988, Measuring the accuracy of diagnostic systems, *Science* **240**(4857)**:**1285–1293.

Talley, J. L., Schneider, J., Lindquist, E., 2016, A simplified approach to stakeholder engagement in natural resource management: The Five-Feature Framework, *Ecology and Society* **21**(4).

Tengö, M., Hill, R., Malmer, P., Raymond, C. M., Spierenburg, M., Danielsen, F., Elmqvist, T., Folke, C., 2017, Weaving knowledge systems in IPBES, CBD and beyond—lessons learned for sustainability, *Current Opinion in Environmental Sustainability* **26-27:**17-25.

TERI, 1999, Study on Joint Forest Management (T. E. R. Institute, ed.), Ministry of Environment and Forests (MoEF), Government of India, New Delhi, India, pp. 1-16.

Thomas, D. R., 2017, Feedback from research participants: Are member checks useful in qualitative research?, *Qualitative Research in Psychology* **14**(1)**:**23-41.

Thompson, J. L., Forster, C. B., Werner, C., Peterson, T. R., 2010, Mediated modeling: Using collaborative processes to integrate scientist and stakeholder knowledge about greenhouse gas emissions in an urban ecosystem, *Society & Natural Resources* **23**(8)**:**742-757.

Tindall, D. B., Davies, S., Mauboulès, C., 2003, Activism and conservation behavior in an environmental movement: The contradictory effects of gender, *Society & Natural Resources* **16**(10)**:**909-932.

Torres, A. C., Prévot, A.-C., Nadot, S., 2018, Small but powerful: The importance of French community gardens for residents, *Landscape and Urban Planning* **180:**5-14.

van den Belt, M. 2004. *Mediated odeling: A system dynamics approach to environmental consensus building*. Washington, DC.: Island Press.

van den Belt, M., Schiele, H., Forgie, V., 2013, Integrated freshwater solutions — A New Zealand application of mediated modeling, *JAWRA Journal of the American Water Resources Association* **49**(3)**:**669-680.

Veisten, K., Fredrik Hoen, H., Navrud, S., Strand, J., 2004, Scope insensitivity in contingent valuation of complex environmental amenities, *Journal of Environmental Management* **73**(4)**:**317-331.

Vemuri, A., 2008, Joint Forest Management in India: An unavoidable and conflicting common property regime in natural resource management, *Journal of Development and Social Transformation* **5:**80-90.

Vicente-Molina, M. A., Fernández-Sainz, A., Izagirre-Olaizola, J., 2018, Does gender make a difference in pro-environmental behavior? The case of the Basque Country University students, *Journal of Cleaner Production* **176:**89-98.

Wagenet, L. P., Pfeffer, M. J., 2007, Organizing citizen engagement for democratic environmental planning, *Society & Natural Resources* **20**(9)**:**801-813.

Walker, G., Senecah, S., Daniels, S., 2006, From the forest to the river: Citizens' views of stakeholder engagement, *Human Ecology Review* **13**(2)**:**193-202.

Walker, G. B., 2004, The roadless areas initiative as national policy: Is public participation an oxymoron?, in: *Communication and public participation in environmental decision making* (S. W. Depoe, J. W. Delicath, M. F. A. Elsenbeer, eds.), State University of New York Press, Albany, NY, pp. 113-136.

WBFDCL. undated. JFM-People's participation. WBFDCL. http://www.wbfdc.com/jfm.html.

Western, D., Wright, M., Otto, J., eds. 1994. *Natural connections: Perspectives in community-based conservation*. First ed. Washington D.C.: Island Press.

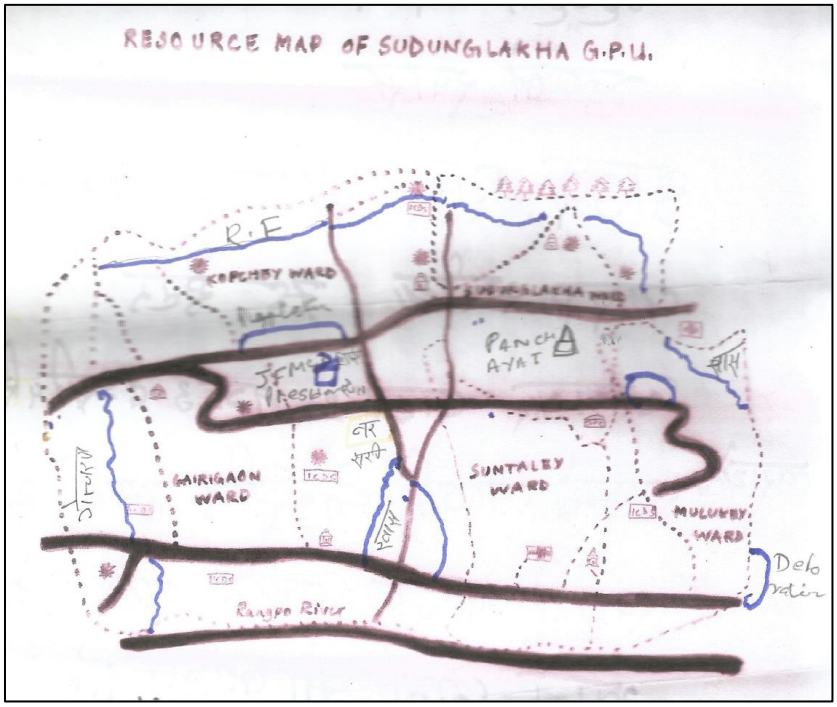
Wildavsky, A., Dake, K., 1990, Theories of risk perception: Who fears what and why?, *Daedalus* **119**(4)**:**41-60.

Wilson, B. 2001. *Soft systems methodology: Conceptual model building and its contribution*. First ed. Chichester, UK: John Wiley & Sons. Ltd.

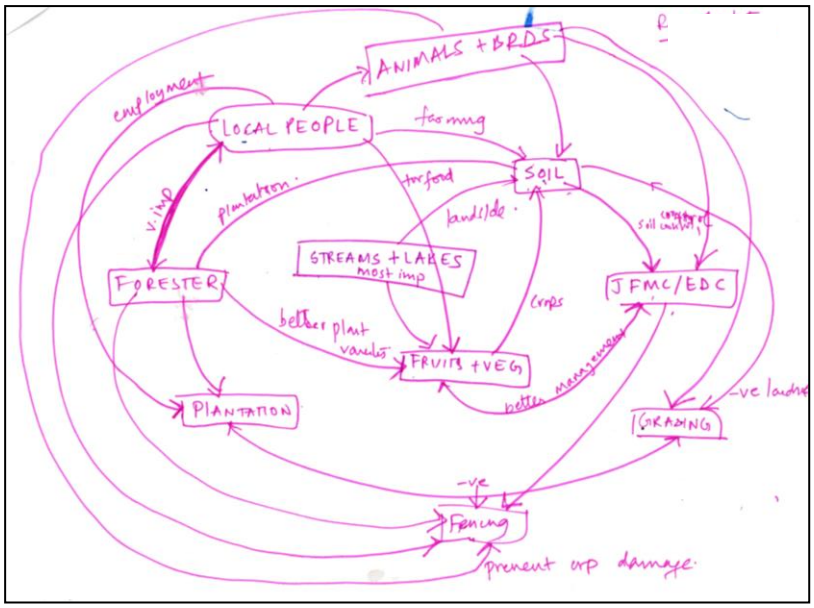
Yaffee, S. L., Wondolleck, J. M., 2000, Making collaboration work: Lessons from a comprehensive assessment of over 200 wide ranging cases of collaboration, *Environmental Management* **1**(1)**:**17-24.

Zinia, N. J., McShane, P., 2018, Ecosystem services management: An evaluation of green adaptations for urban development in Dhaka, Bangladesh, *Landscape and Urban Planning* **173:**23-32.

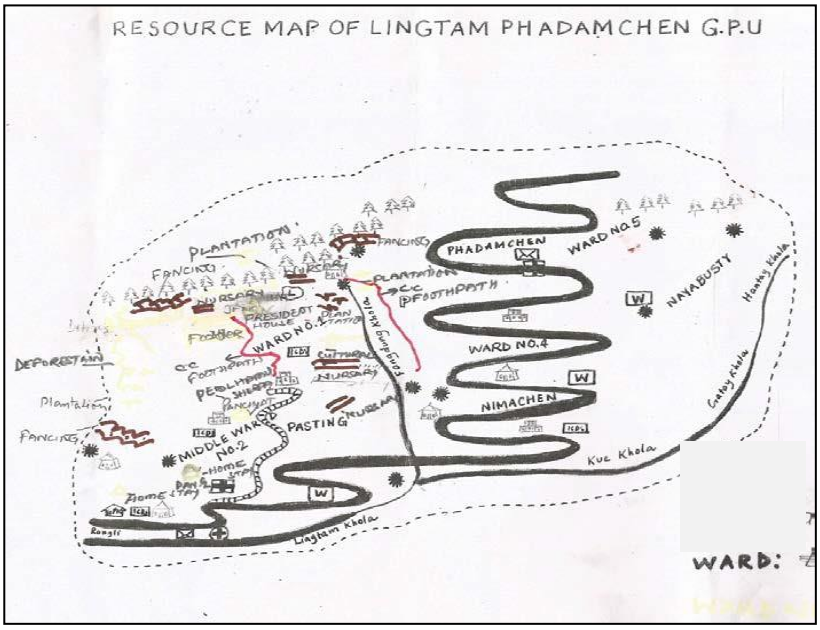
Illustrations



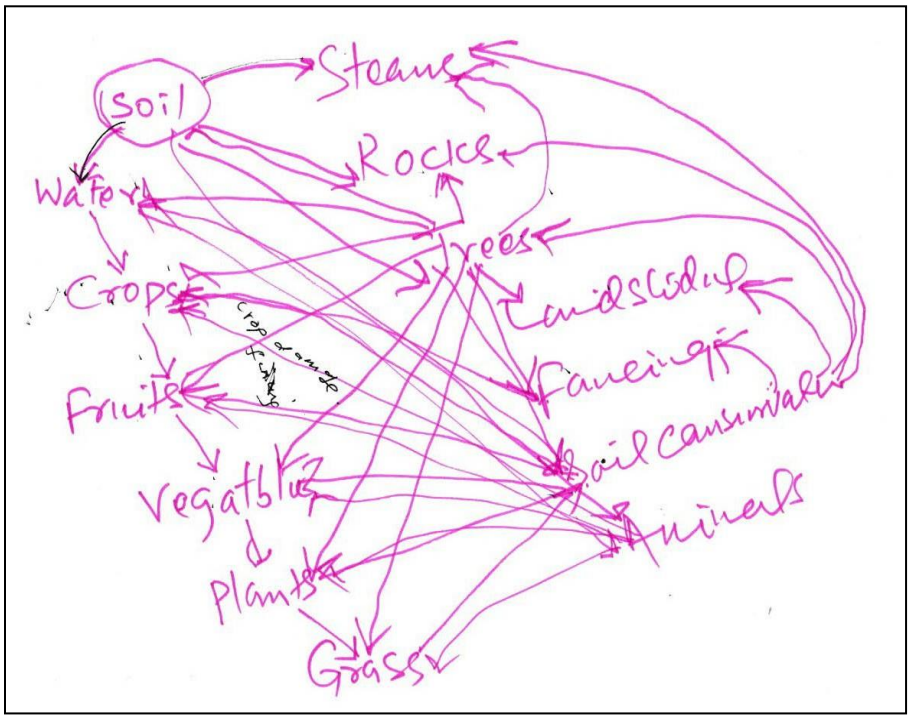
R049, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



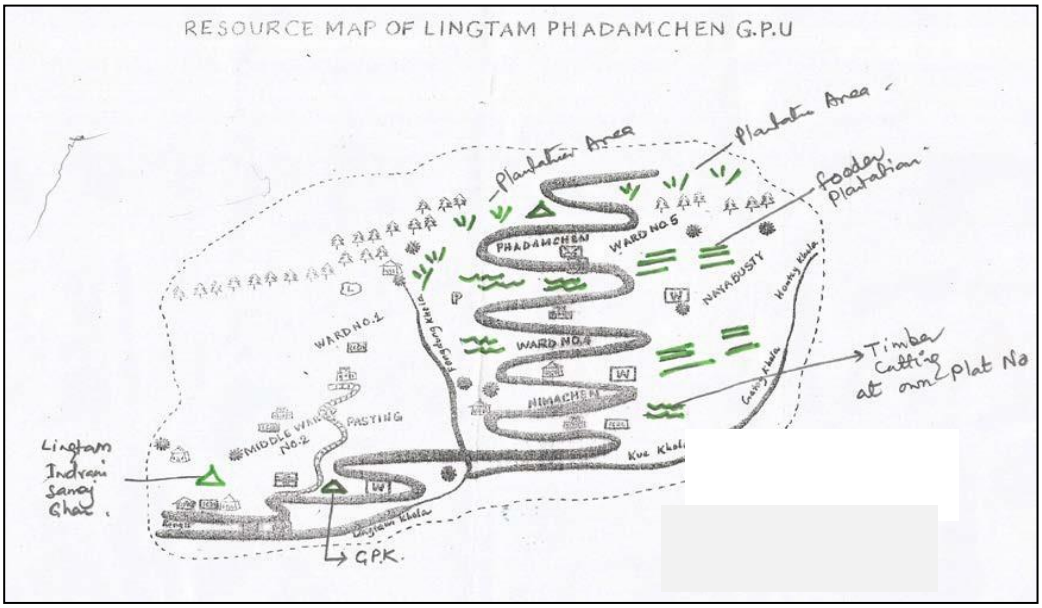
R049, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.



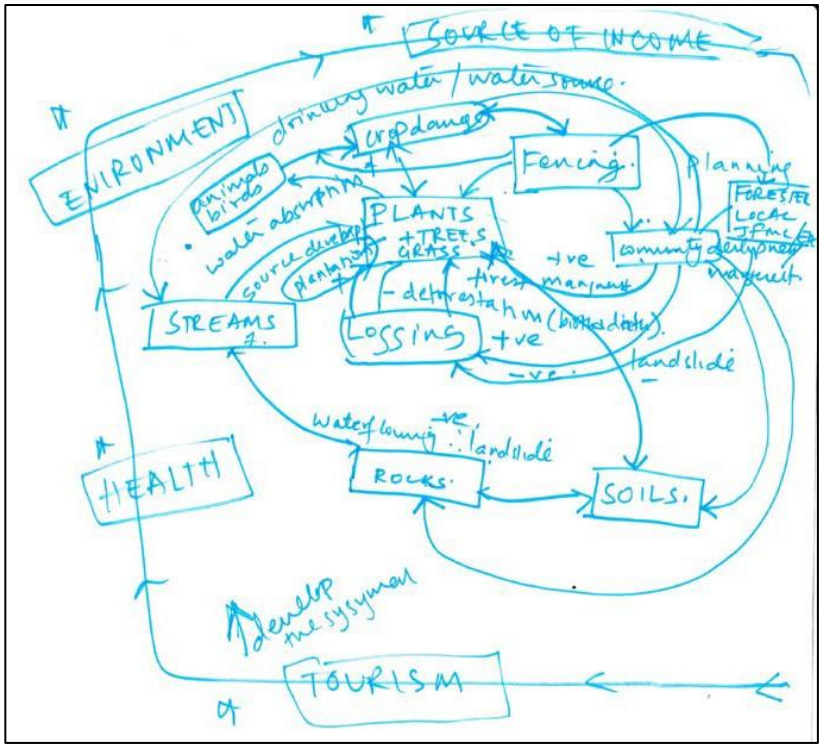
R063, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



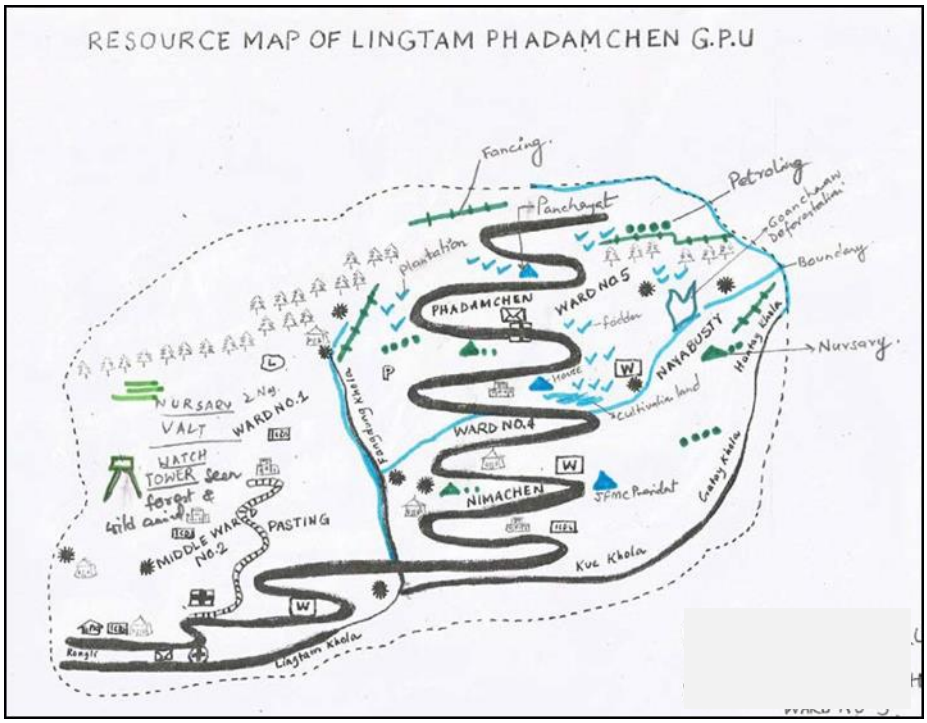
R063, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.



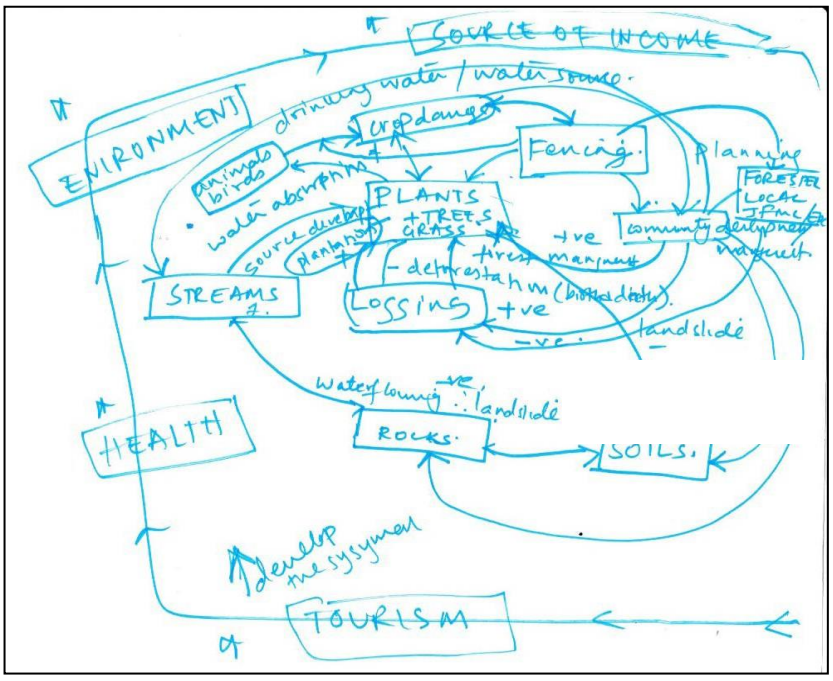
R067, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



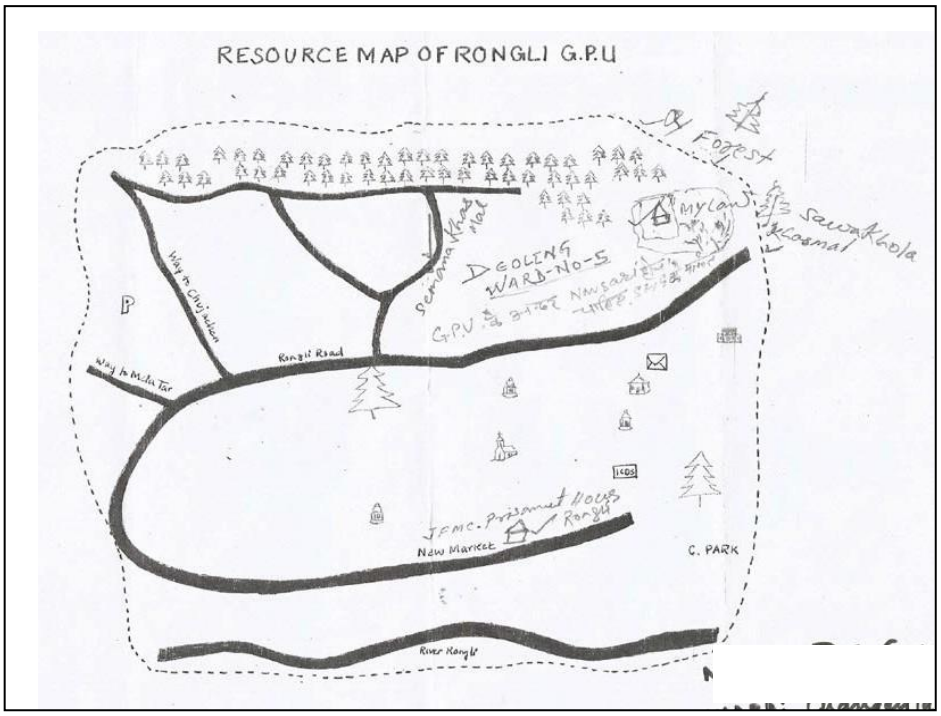
R067, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016. Completed collaboratively with R020 and R080.



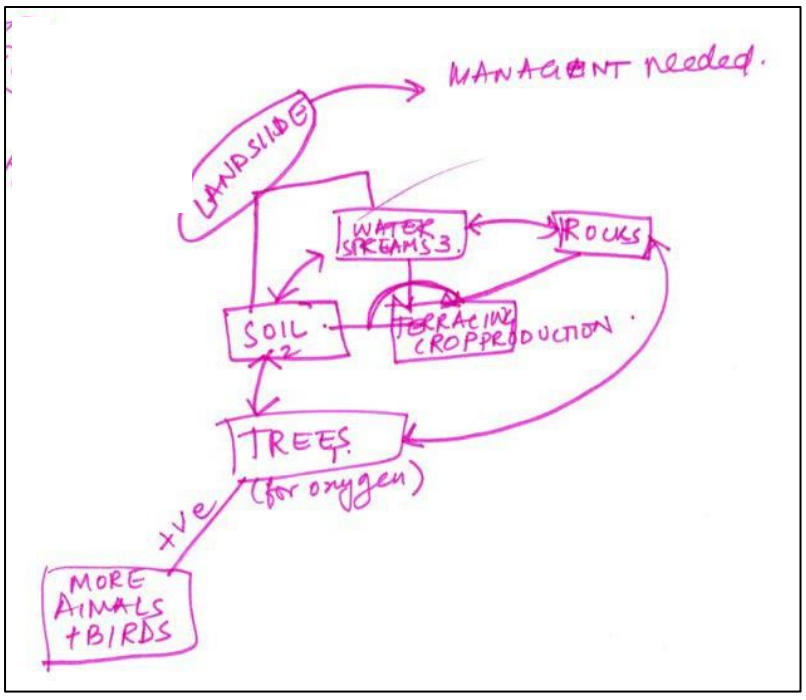
R080, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



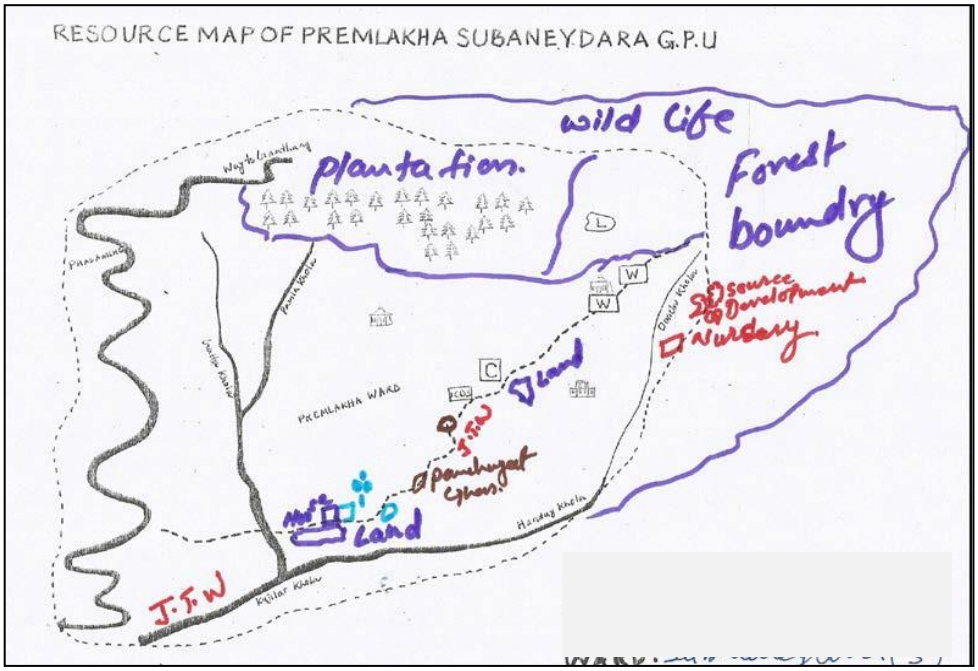
R080, post-workshop causal loop map. Respondent's causal loop map drawn during post-workshop evaluation, East Sikkim, India, 2016. Completed collaboratively with R020 and R067.



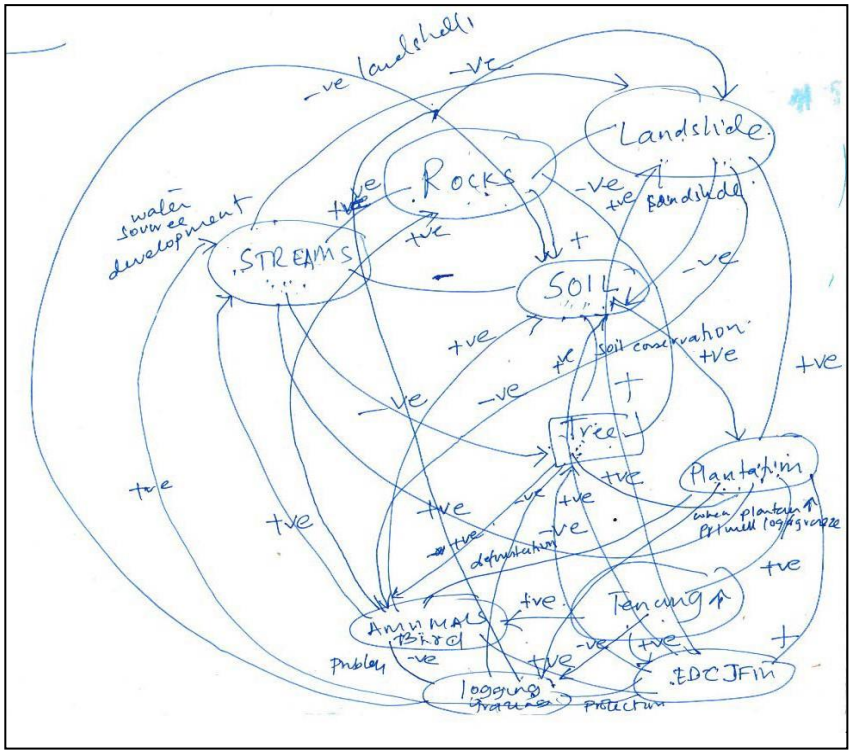
R130, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



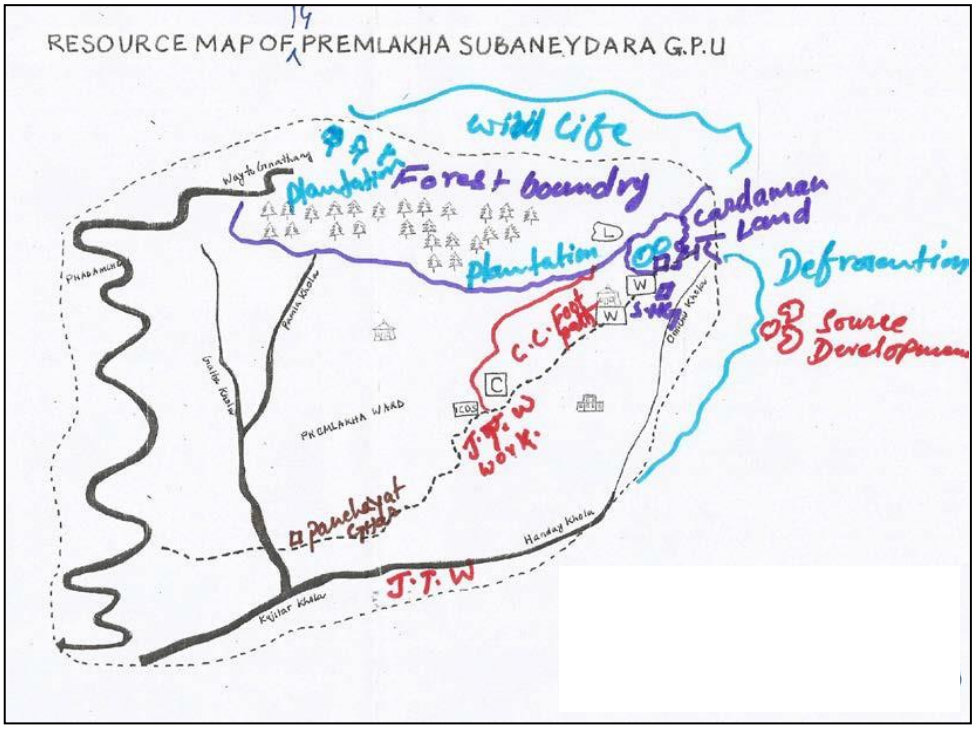
R130, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.



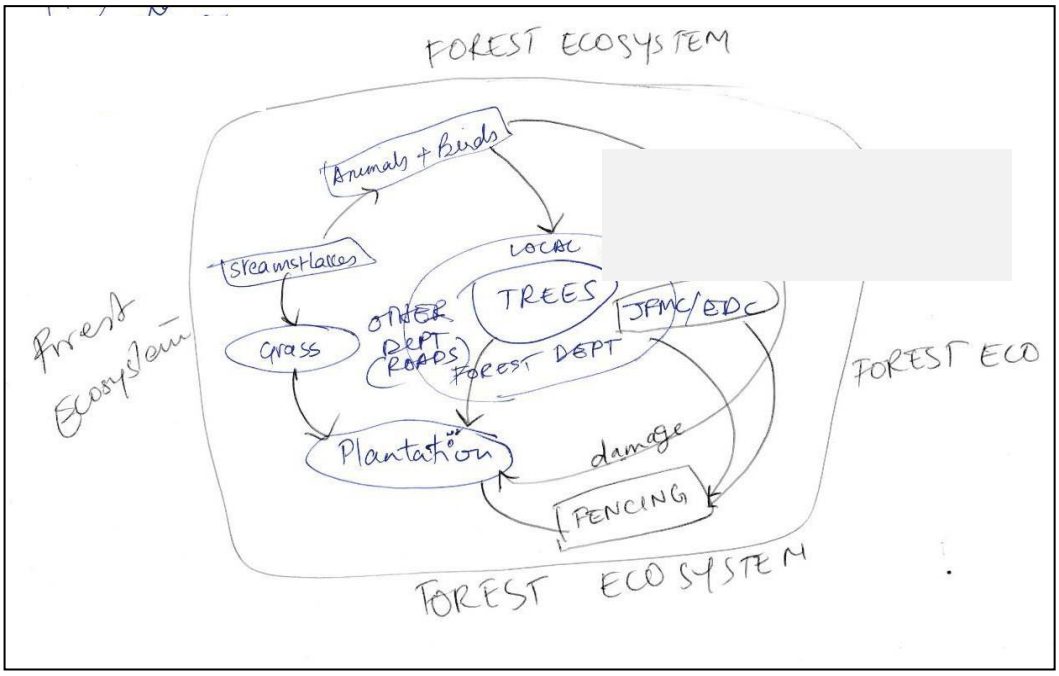
R149, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



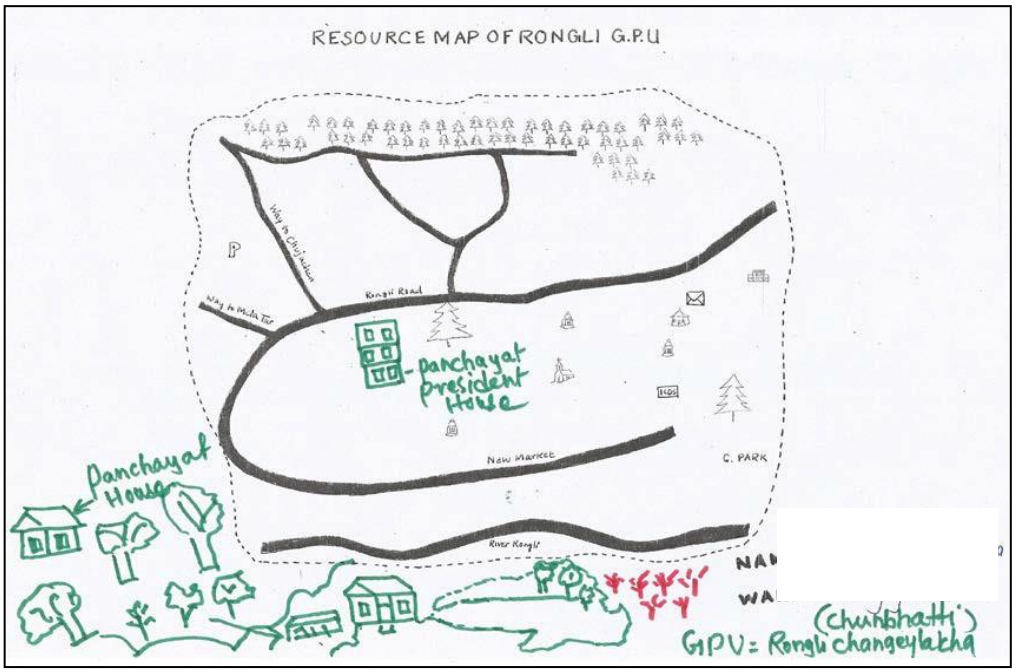
R149, post-workshop causal loop map. Respondent's causal loop map drawn during post-workshop evaluation, East Sikkim, India, 2016.



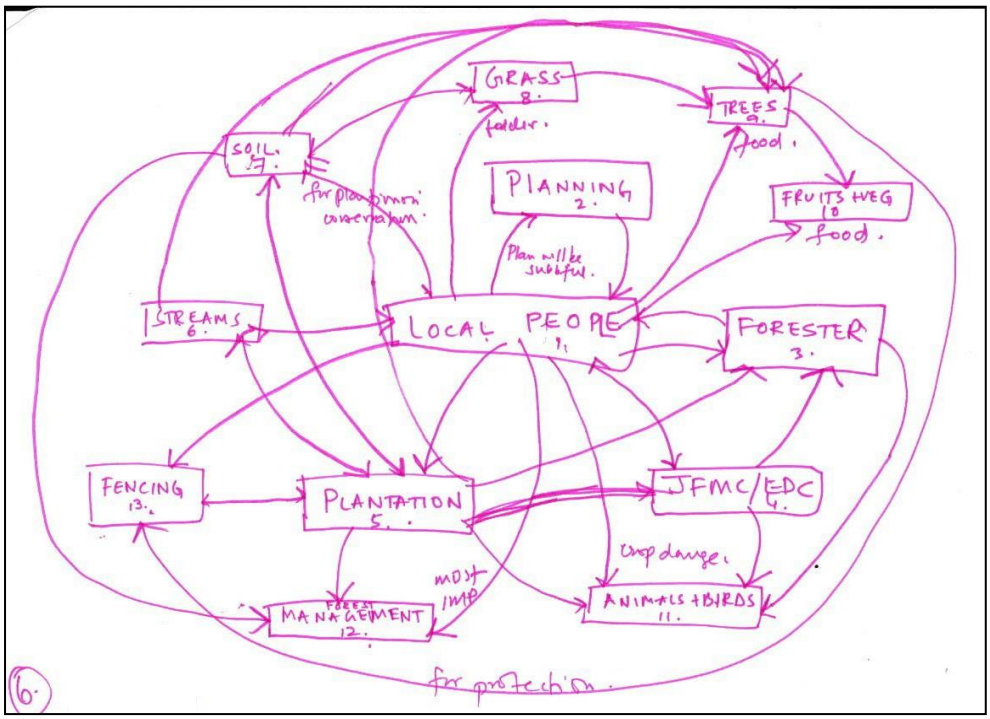
R154, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



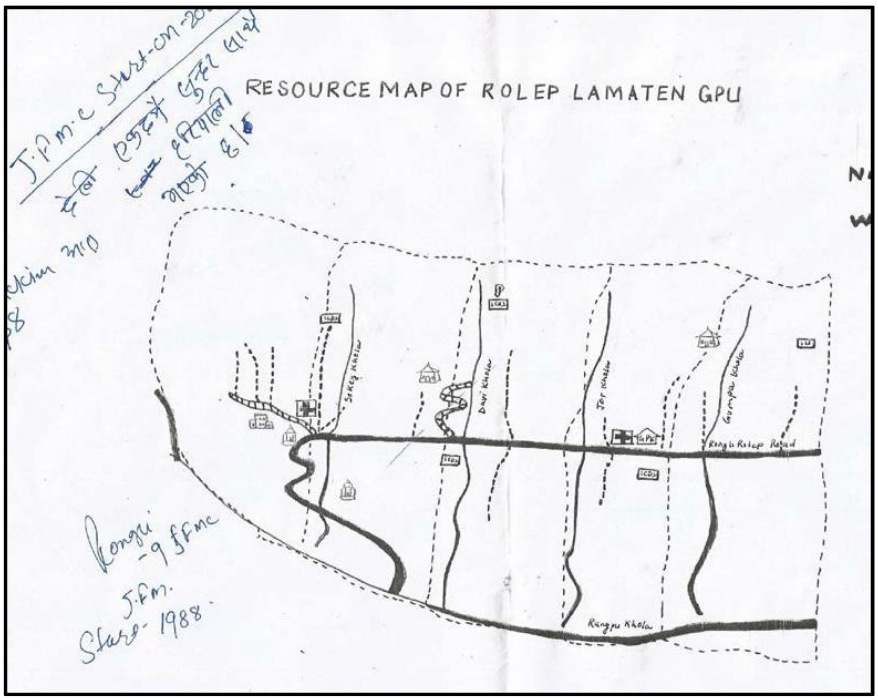
R154, post-workshop causal loop map. Respondent's causal loop map drawn during post-workshop evaluation, East Sikkim, India, 2016.



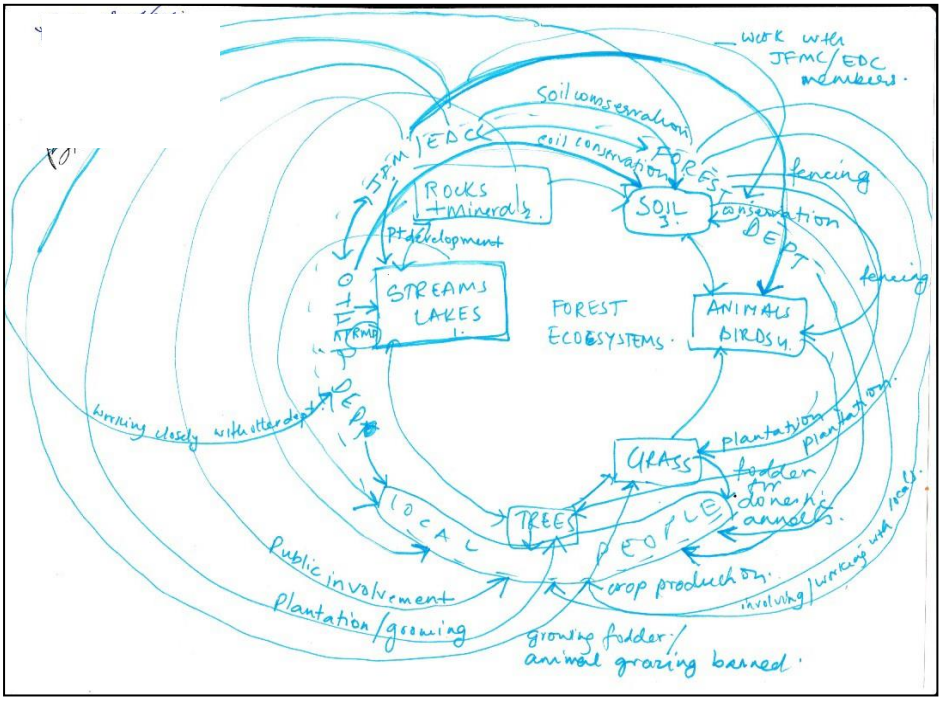
R161, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



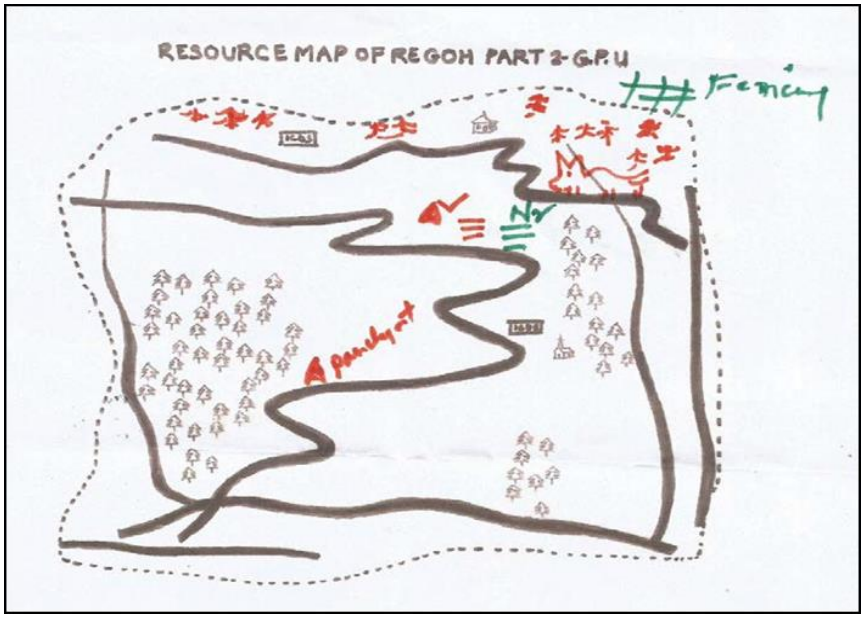
R161, post-workshop causal loop map. Respondent's causal loop map drawn during post-workshop evaluation, East Sikkim, India, 2016.



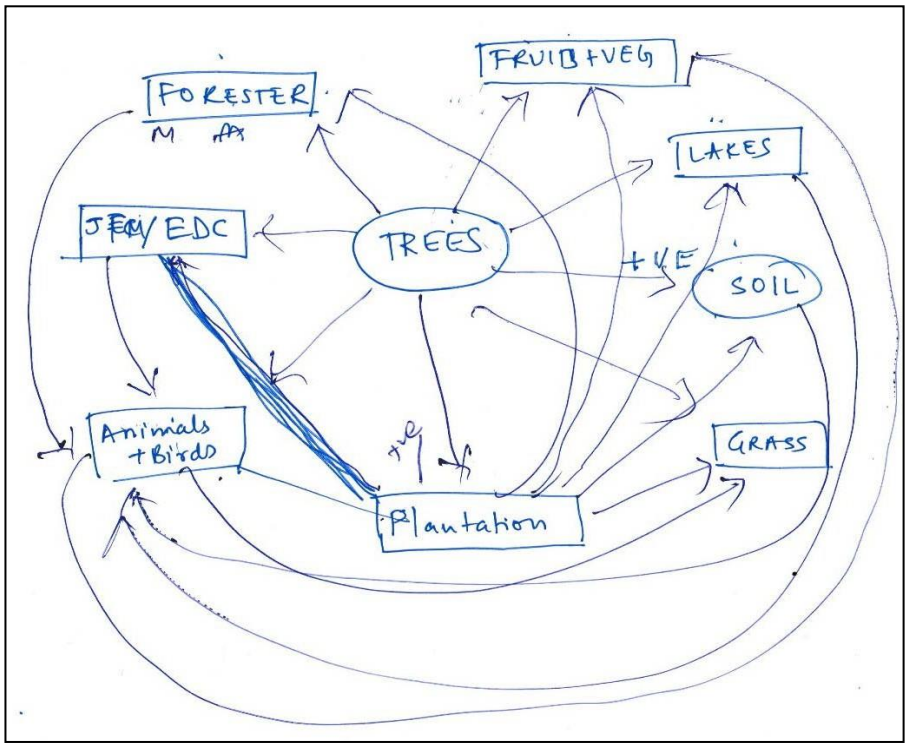
R167, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



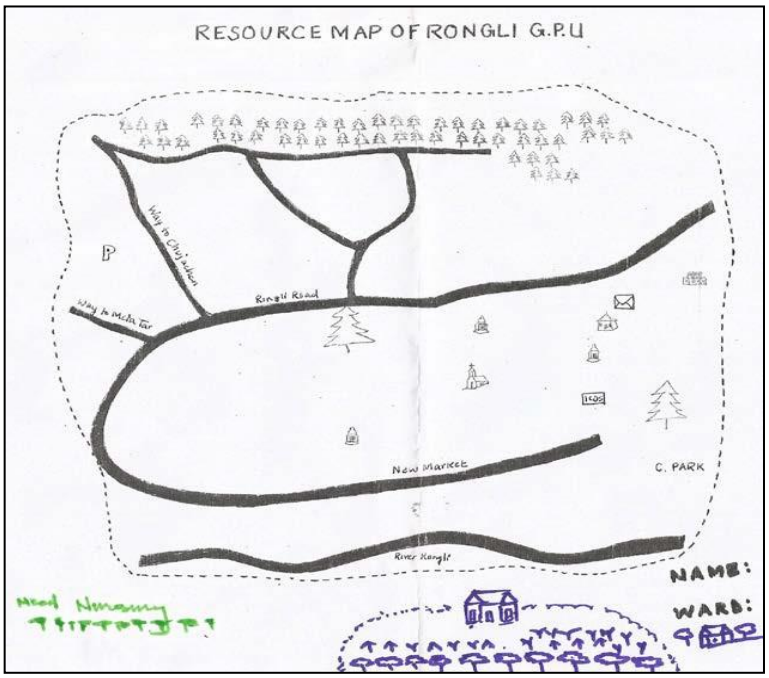
R167, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.



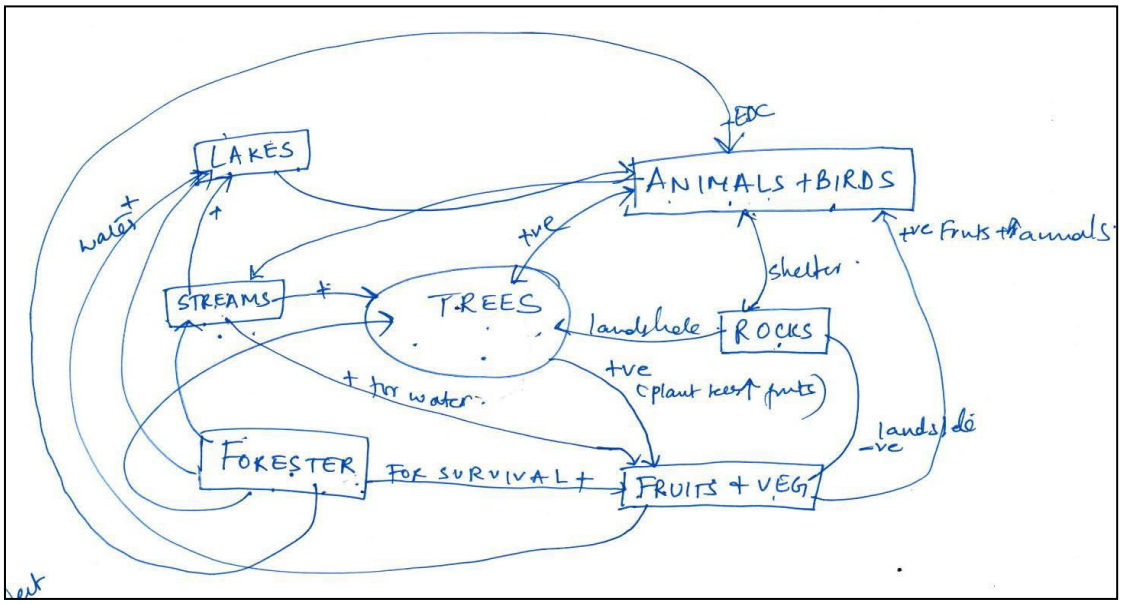
R175, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



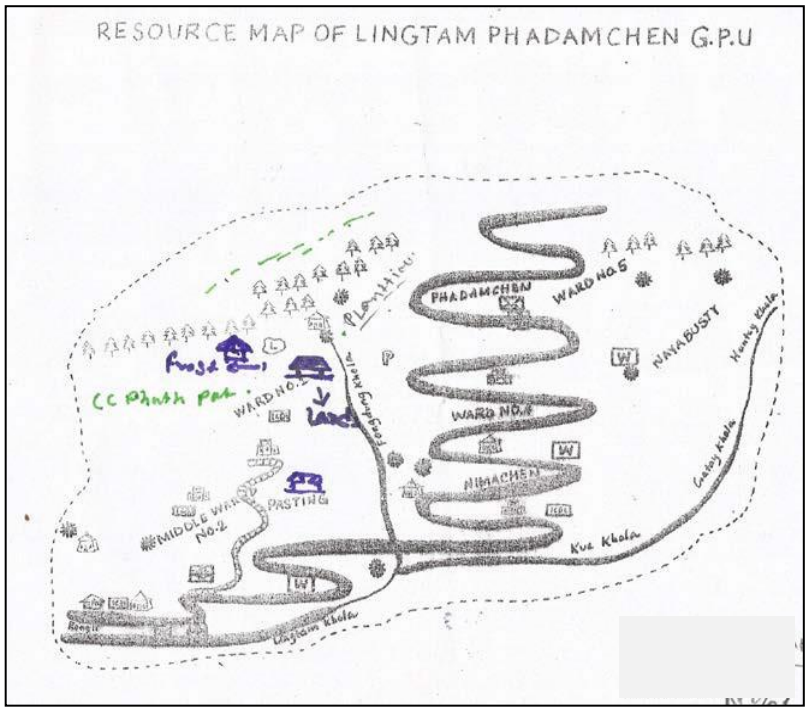
R175, post-workshop causal loop map. Respondent's causal loop map drawn during post-workshop evaluation, East Sikkim, India, 2016.



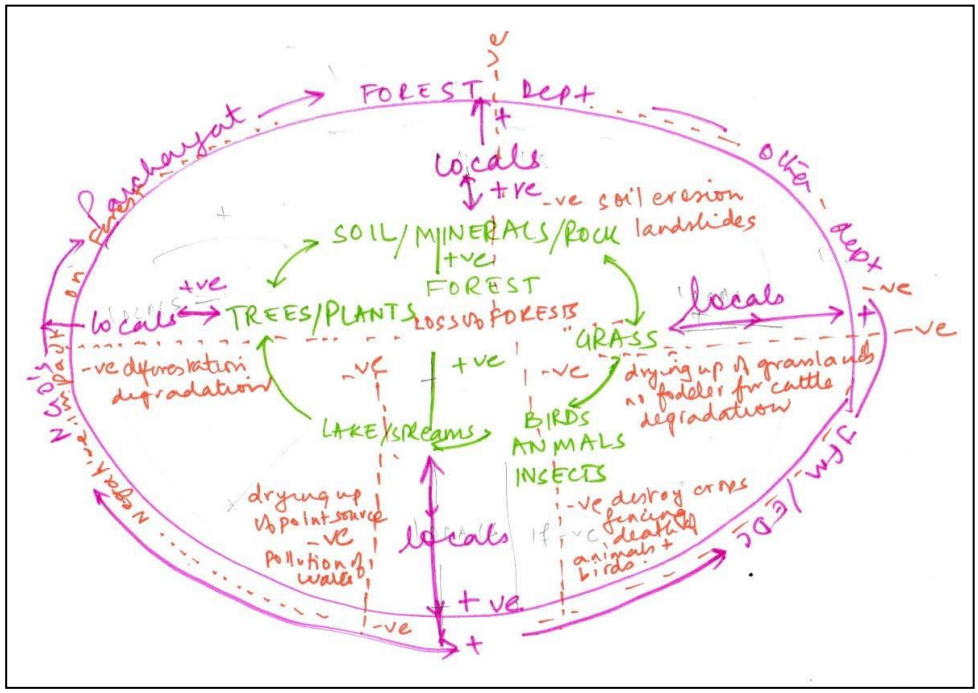
R176, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



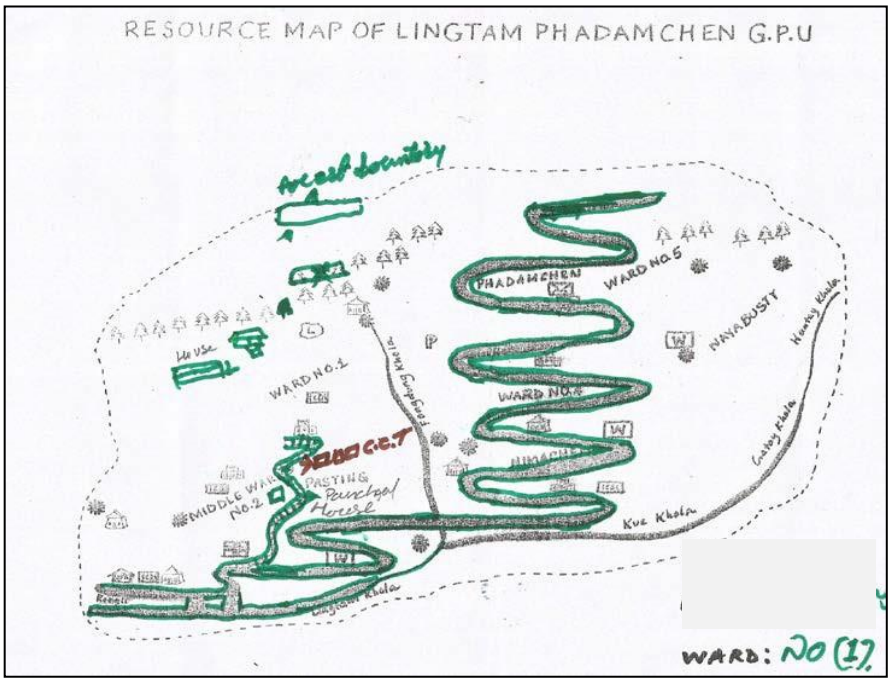
R176, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.



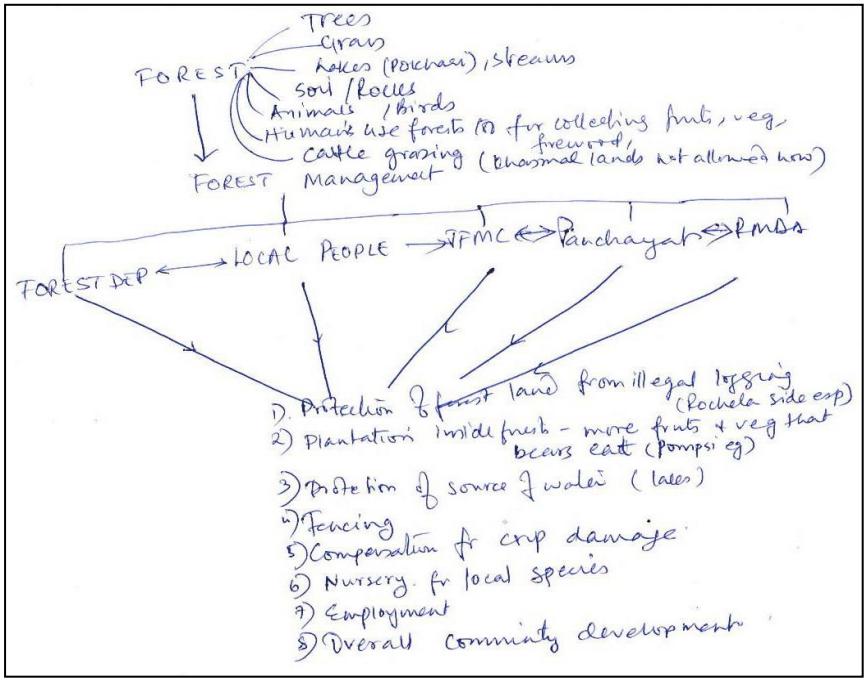
R182, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



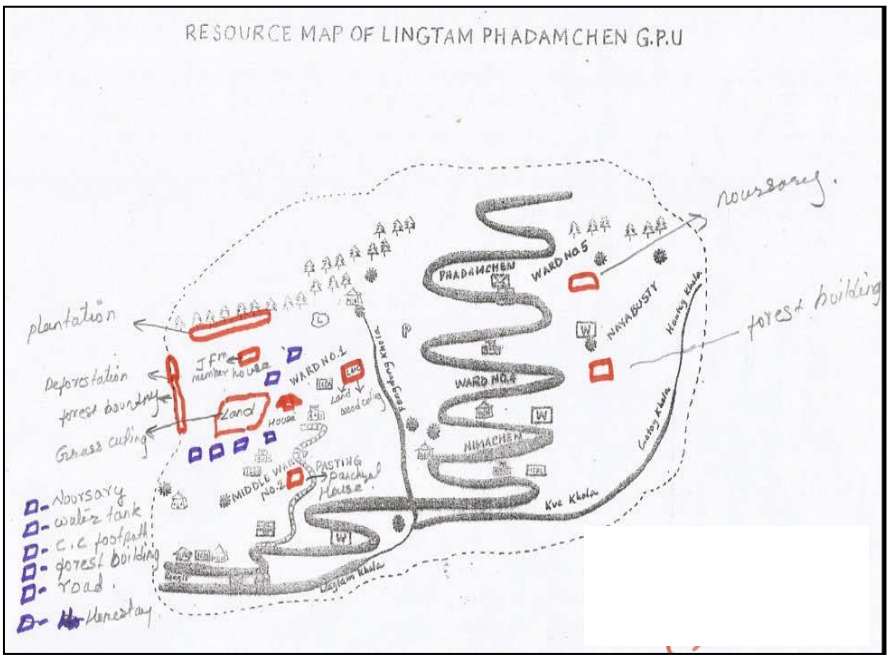
R182, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.



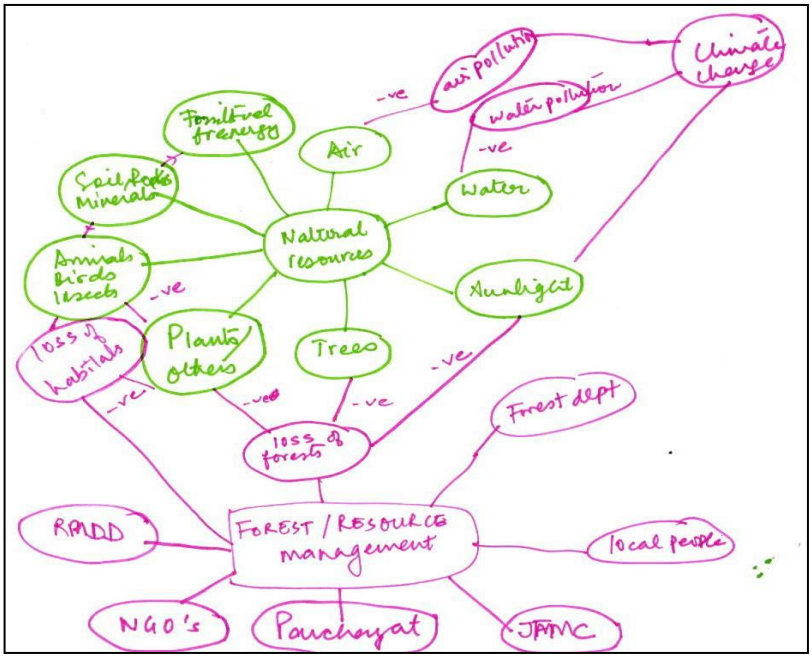
R185, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



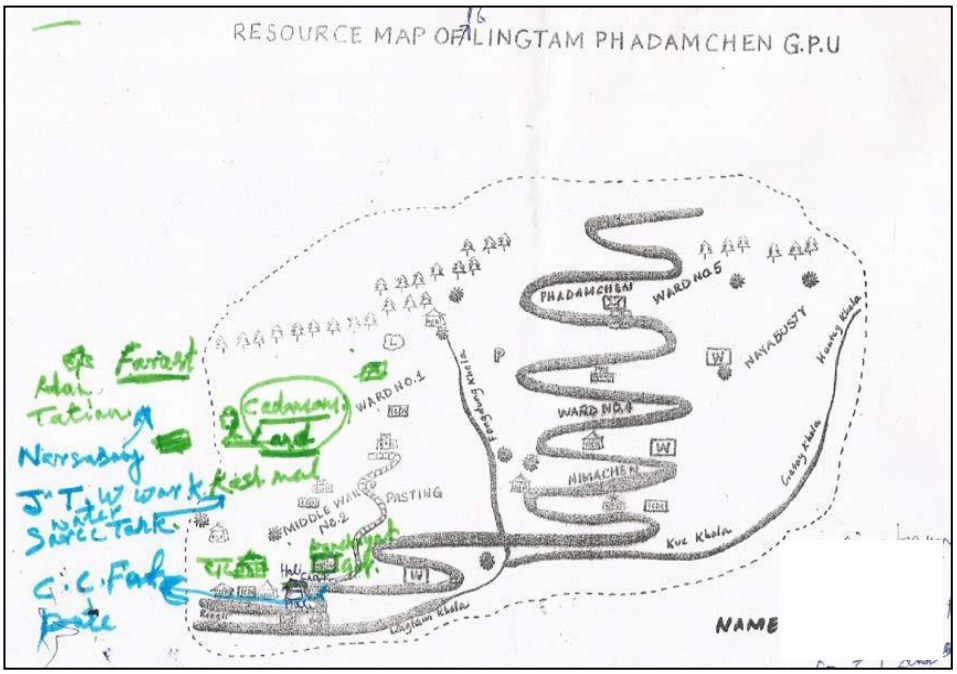
R185, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.



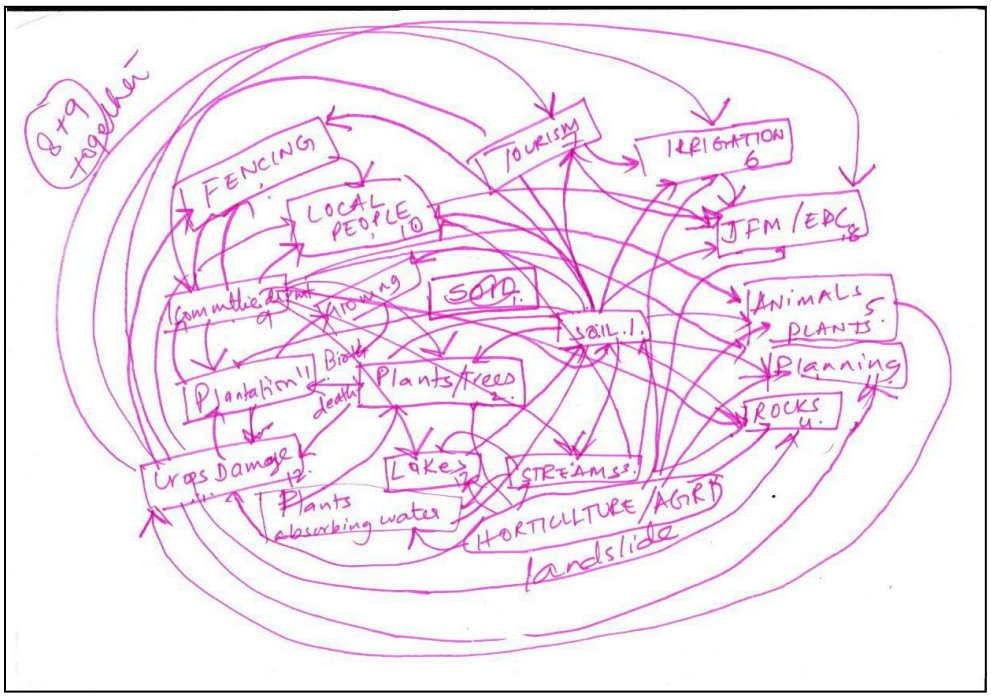
R186, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



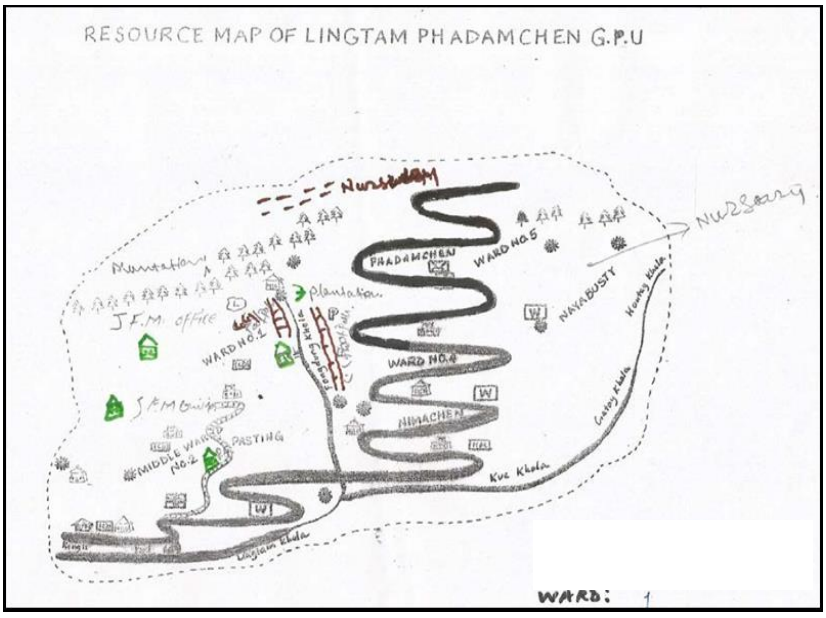
R186, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016. Completed collaboratively with R170.



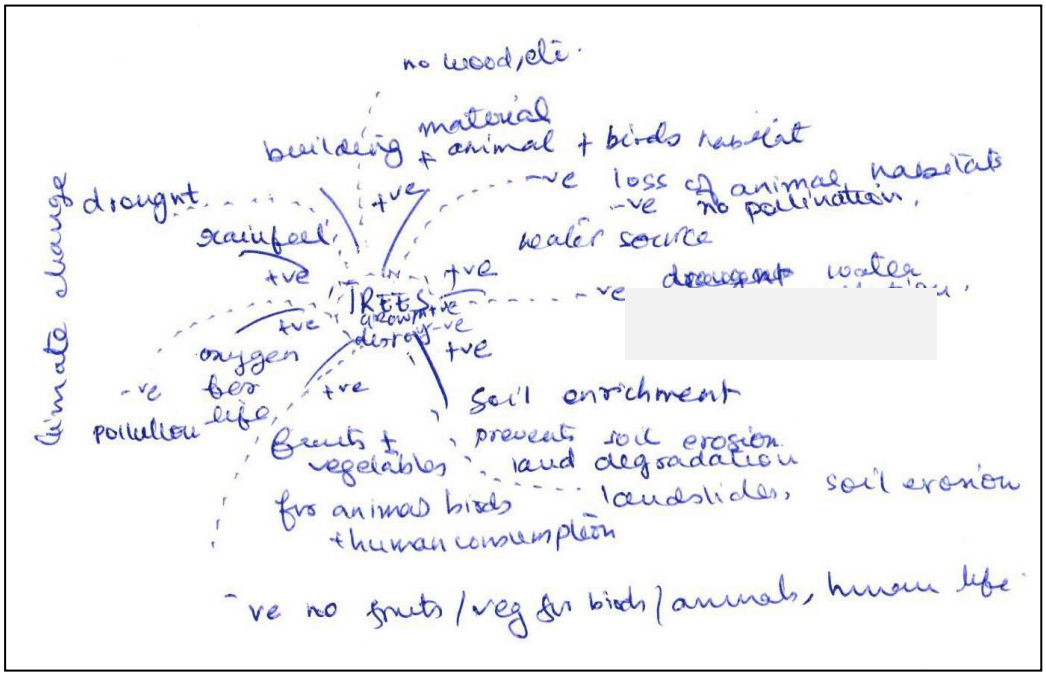
R189, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



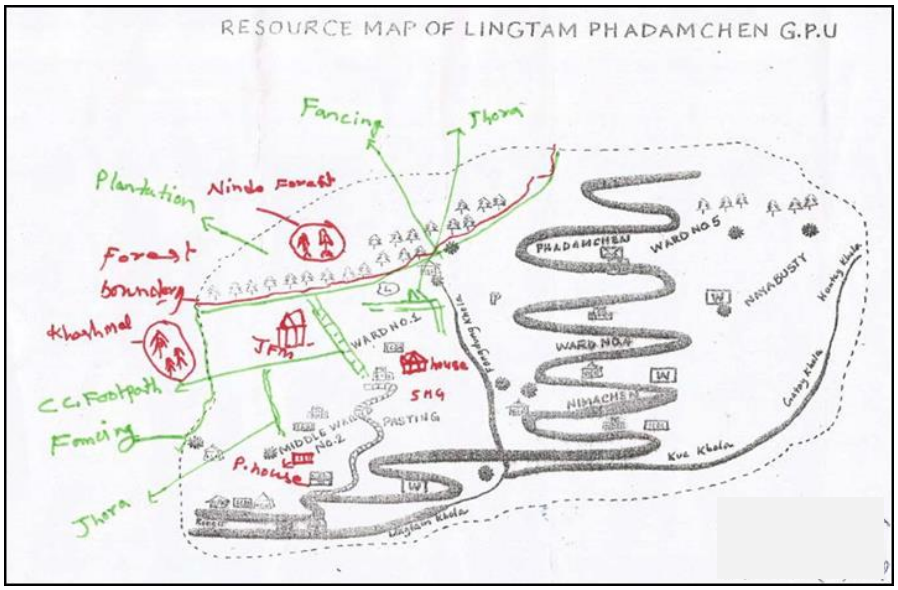
R189, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016. Completed collaboratively with R190.



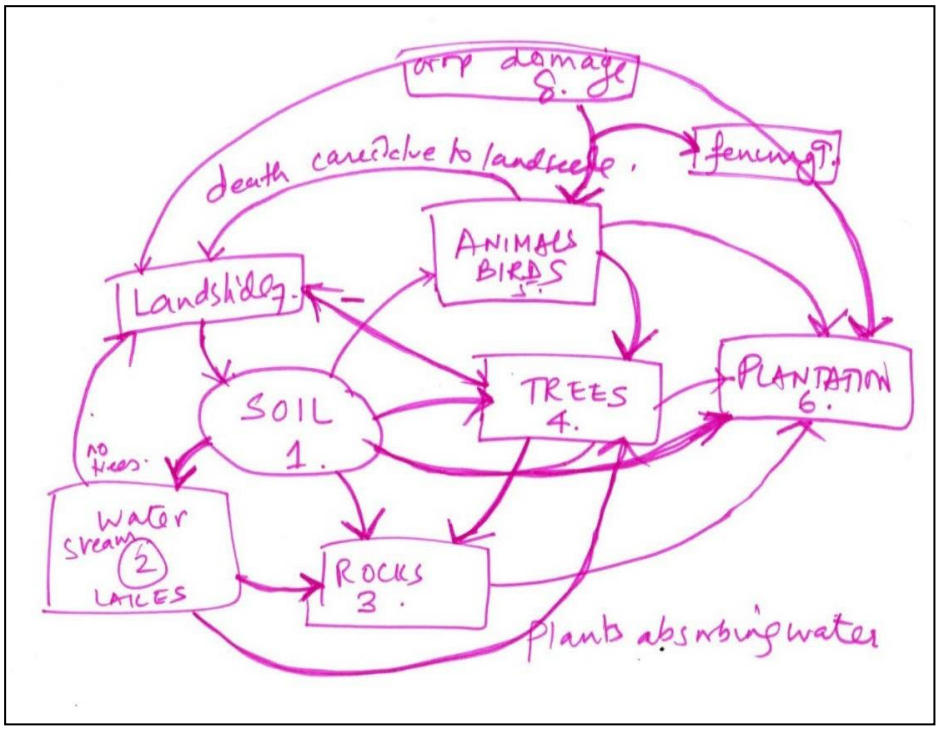
R191, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



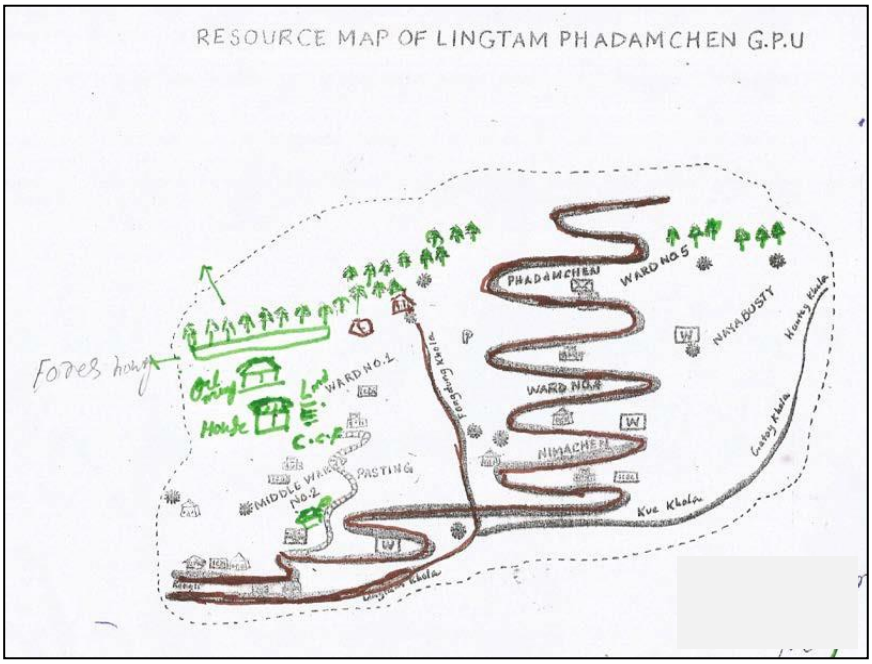
R191, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.



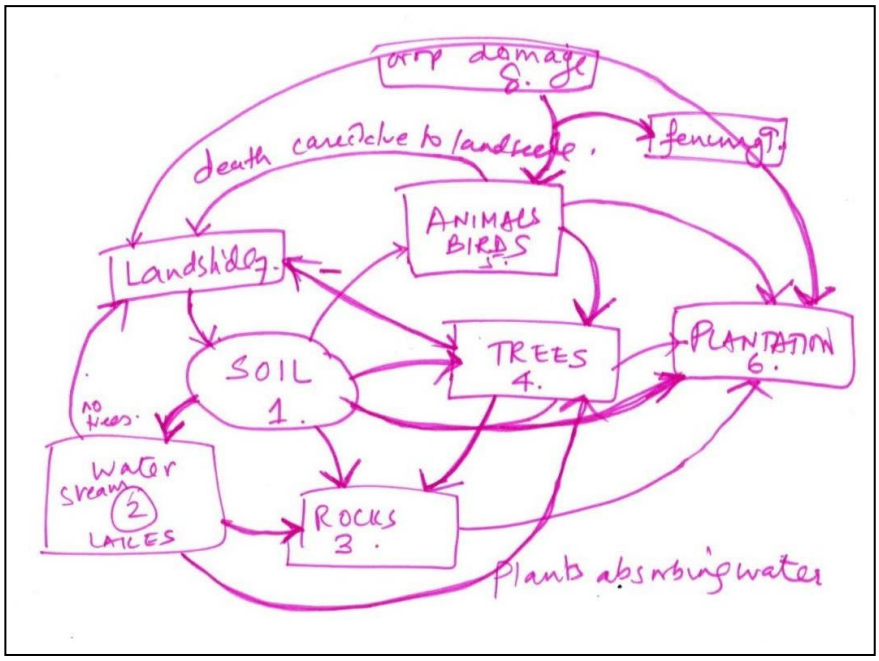
R192, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



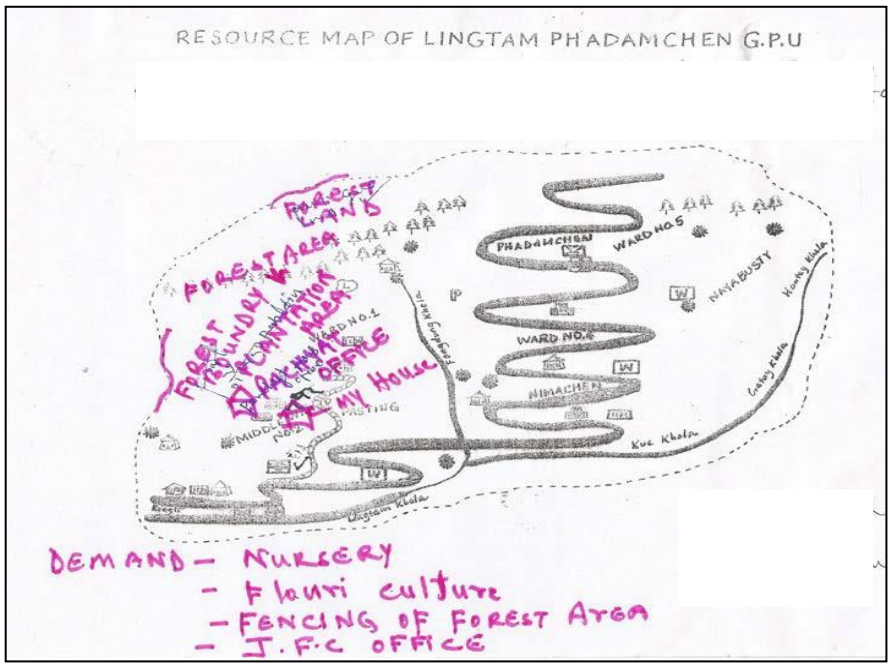
R192, post-workshop causal loop map. Respondent's causal loop map drawn during post-workshop evaluation, East Sikkim, India, 2016. Completed collaboratively with R194.



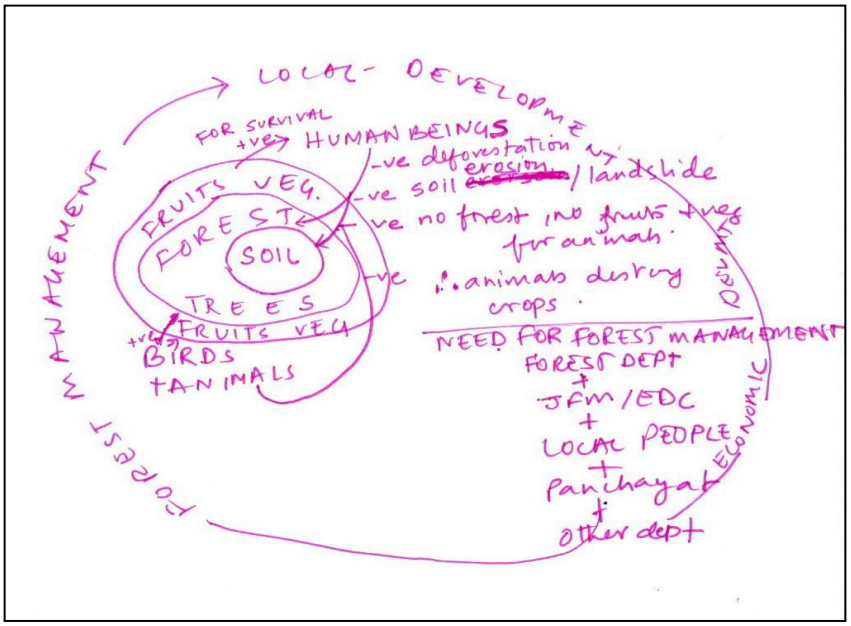
R194, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



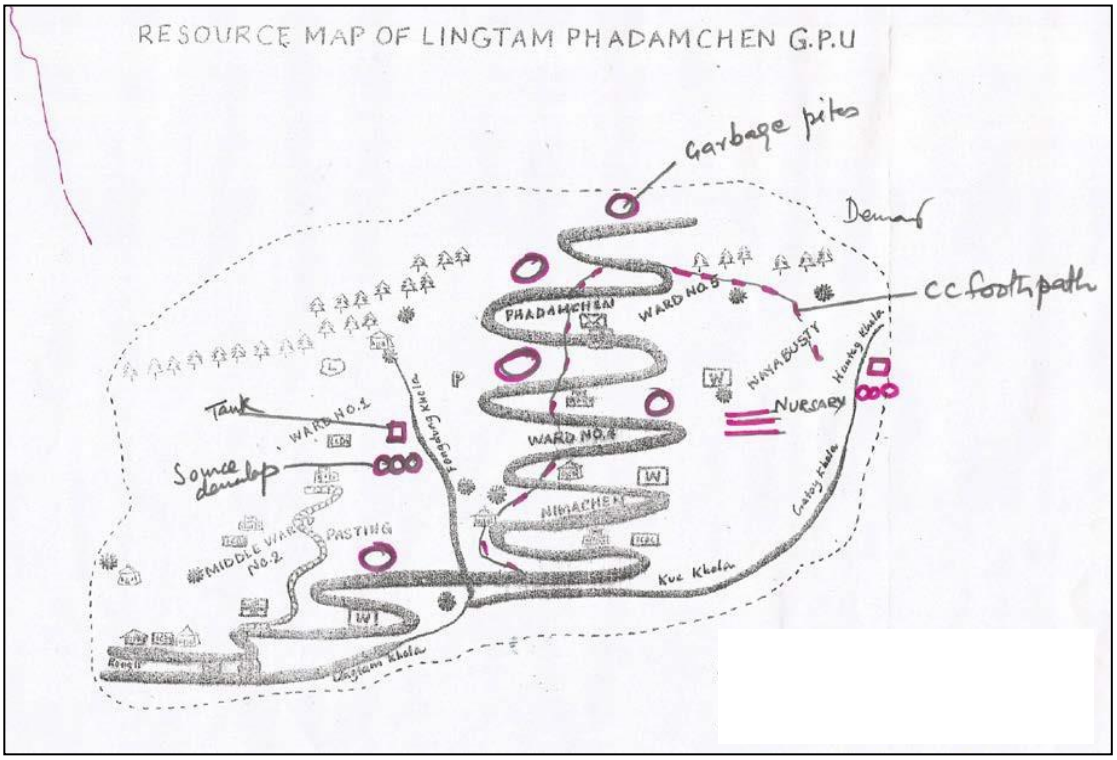
R194, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016. Completed collaboratively with R192.



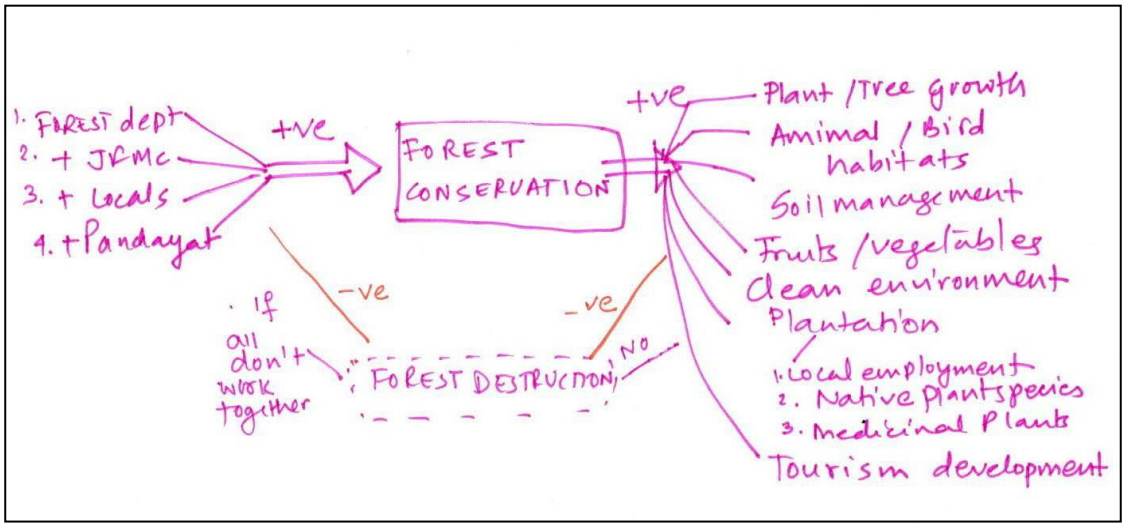
R197, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



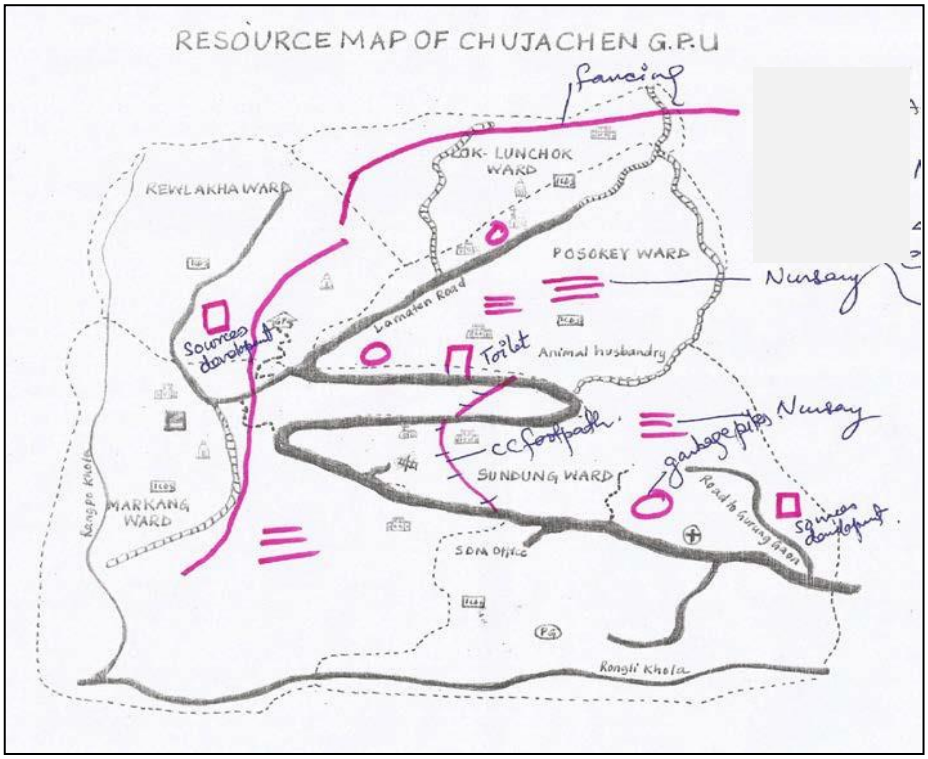
R197, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016. Completed collaboratively with R192.



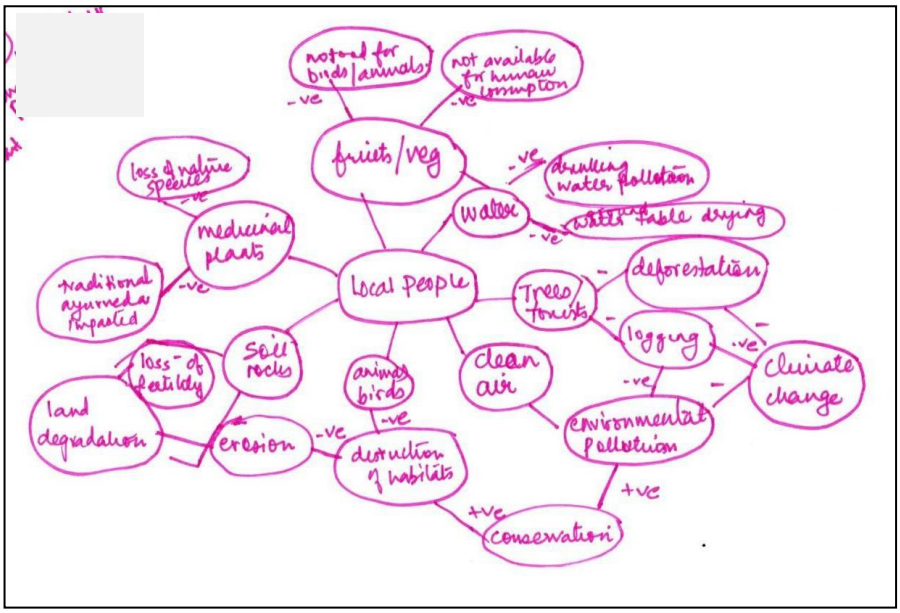
R198, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



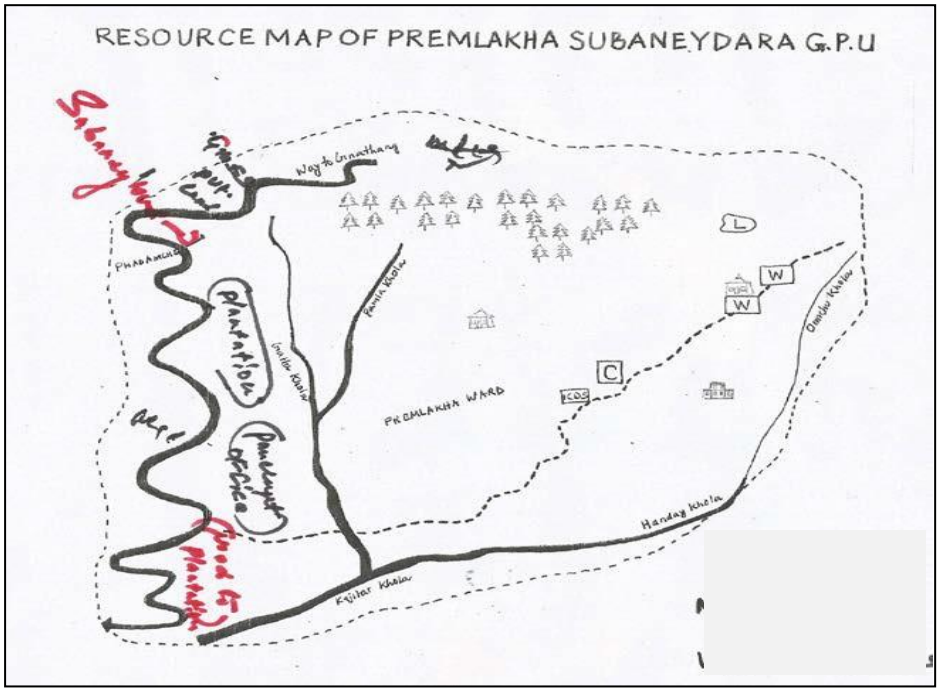
R198, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.



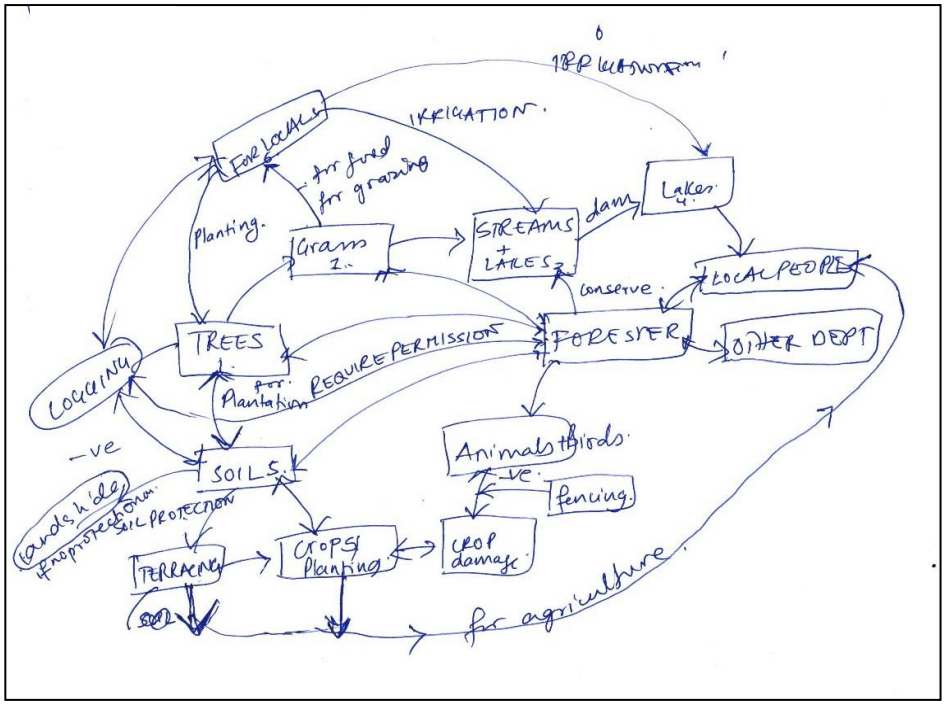
R201, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015. Completed collaboratively with R200.



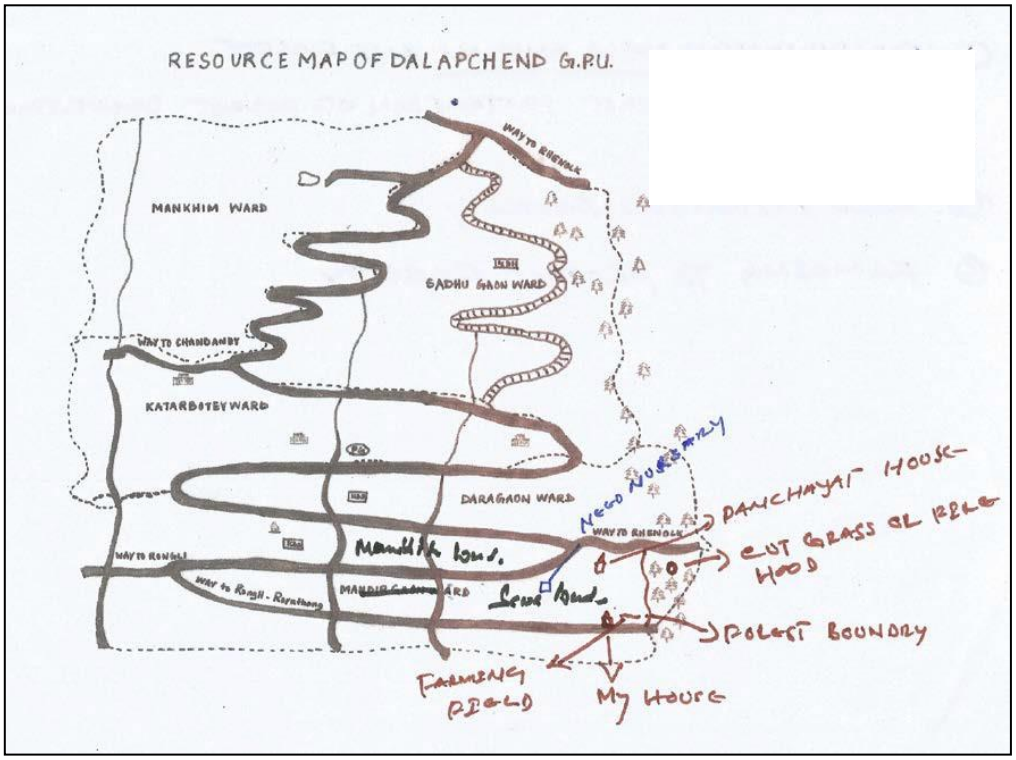
R201, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.



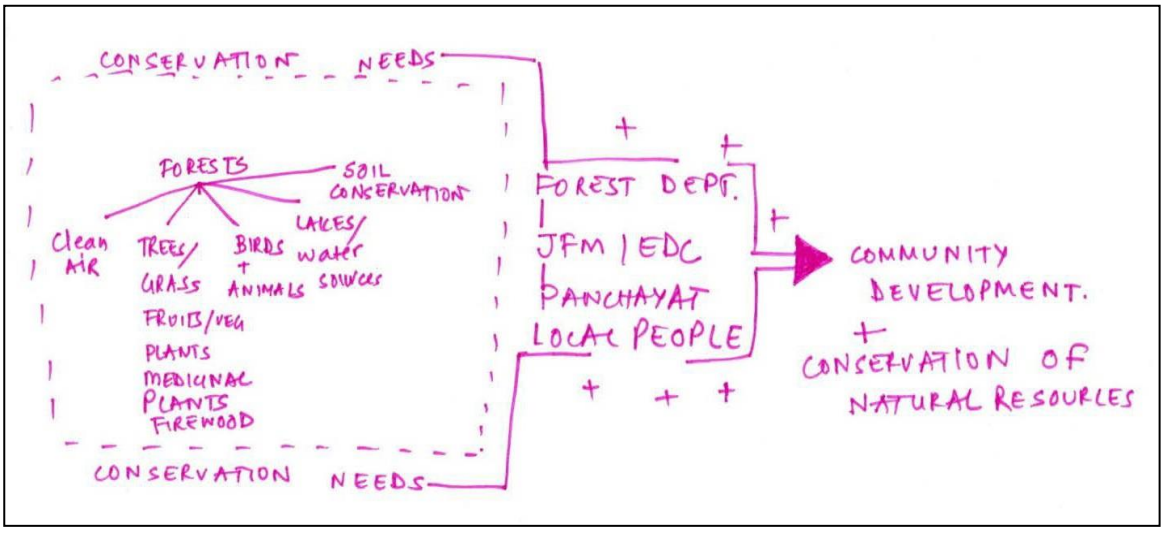
R205, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



R205, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.



R214, workshop diagram. Respondent's qualitative resource map drawn during collaborative modeling workshop, East Sikkim, India, 2015.



R214, post-workshop cognitive map. Respondent's cognitive map drawn during post-workshop evaluation, East Sikkim, India, 2016.

Appendix

Appendix Table 1.1. Participant demographic and social control frames information sheet for study conducted in East Sikkim, India, 2014–2016.

Respondent Datasheet

Date:												Social Control Frames					
ID	GPU	Ward	Name	Age	Phone #	M/F	Occupation	H.H. No.	Time of Residence	HH M	HH F		SA	A	N	D	SD
												1					
												2					
												3					
												4					

Important/key players in forest management & protection	Whom would you approach with forest related issues/concerns
1 _____ 2 _____ 3 _____	_____

Appendix Table 1.2. Interview protocol for study conducted in East Sikkim, India, 2014–2015.

1. What do you see as the most important issues related to forest management?
    a. *[if no issues]*
        i. Why do you think things are working so well?
        ii. How have things improved over time?
    b. [if issues]
        i. Which are the biggest problems with forest management?
        ii. What do you think might be causing these problems?
    c. *[issues or not]* Please help me understand more about managing these forests.
2. What are the ways that forest management either contributes to local development, or causes problems for local development?
    a. [options if they need a start]
        i. Schools, social activities, seeds for planting, jobs, roads, etc.
3. Can you think of any links between participating in JFM and feeling like who live near the forest have power to influence what decisions are made?
    a. [*JFM meeting attendance*] Have you attended any JFM meetings?
        i. [if yes]
            1. Will you please describe your experience at the meeting for me?
            2. Did you ask questions? How did you feel about the answers to your questions? Did you offer your opinion? Do you feel you were listened to? How are you informed about JFM meetings? Who brings the information?

ii. *[if no]* What has prevented you from attending the meetings? Could you think of anything that would make you more likely to attend? *[either yes or no]* What about your neighbors, do any of them attend JFM meetings? How have they described the experience? Did they think it was worth their time? What made it worth their time (or not worth their time)?

b. *[if not answered through preceding probes]* How do you usually learn about JFM meetings?

i. When do you learn about a JFM meeting?

ii. Who do you think is responsible for sending out the notification? if yes)

iii. How does the information come to you?

4. Do you have any suggestions for ways to improve the implementation of JFM?

Appendix Table 2.1. Statements for identifying respondent's Social Control Frames (or natural resource management style choices) for study conducted in East Sikkim, India, 2014–2016.

After each statement, please select the choice that best represents how you feel about the statement. Please feel free to explain your choice. Here are the choices:

Strongly Agree

Agree

Neither Agree nor Disagree

Disagree

Strongly Disagree

Here are the four statements:

1. Forest Management decisions should be made solely by the technical experts. I am willing to comply with the resulting regulations, and I expect the same from others.
2. Forest Management decisions should be made separately by each individual. Each individual should be allowed to make his or her own decisions about forest management without consulting other people.
3. Forest Management decisions should be made collectively. All stakeholders should have a voice in the decision-making process.
4. It does not matter what I think about forest management decisions. My opinion makes no difference.

Appendix Table 3.1. Identification of key stakeholders in the Joint Forest Management (JFM) process in the Rongli and Phadamchen Ranges, Rongli sub-division, East District, Sikkim, India, 2014–2016.

1. Who according to you are the important/key players in forest management? From the list below, please pick your top three choices:

    a. Forest Department
    b. Panchayat Committee
    c. JFM/EDC Committee
    d. Local Villagers
    e. NGO/SHGs
    f. Tourism Department
    g. Roads & Bridges Department
    h. Rural Management & Development Department
    i. [Any other, please identify]

2. If you have any forest related issues/concerns, whom would you first approach with your problems/issues?

Appendix Table 3.2. Storytelling as modeling exercise conducted during the collaborative modelling workshops in the Rongli and Phadamchen Ranges, Rongli sub-division, East District, Sikkim, India, March 2015.

Work individually/pairs/groups to tell the story of the forests around your village (including the ecosystem services it provides). [True story, that you have experience or someone in your village who has experienced].

1. Do forests have any significance/importance in *your* life?

    a. Please explain how forests are linked to your:

        i. economic well-being

        ii. socio-cultural well-being

        iii. spiritual well-being

        iv. emotional well-being

        v. others

2. Answer three questions in telling your story.

    a. What is the setting/environment for your story? Dark /bright sunny/ dark, funny/ clean/others

    b. Who are the main characters of your story? [For example- Cattle, animals/birds, forest officials, JFMC/EDC members, local villagers/ others]

    c. What happens in your story? [Please give examples]

3. Please share your story [include setting, characters, plot, action].

Appendix Table 3.3. Post-workshop evaluation survey conducted in the Rongli and Phadamchen Ranges, Rongli sub-division, East District, Sikkim, India, March–June 2016.

A. New knowledge gained through workshop activities

		SA	A	N	D	SD
1	Time related issues in the forests/JFM					
2	Interconnection in the forests/JFM					
3	Feedback loops in the forests/JFM					
4	Complexity in forest ecosystem management/JFM					

B. Opportunities to communicate new knowledge gained

		SA	A	N	D	SD
1	Participation in the workshop provided me with opportunities to gain knowledge about forest management in my area					
2	I feel that I can use this knowledge to inform others about forest management in this area					
3	Participation in the workshop provided me with opportunities to communicate my ideas about forest management in my area					
4	Participation in the workshop provided me with opportunities to interact with other parties involved in managing the forests					
5	After participating in the workshop I feel more confident in approaching the forest officials with my concerns					

C. Workshop logistics

		SA	A	N	D	SD
1	I was given prior notice about the workshops					
2	The venue chosen was accessible					
3	Holding the workshop on a weekend enabled me to attend without missing work					
4	The seating arrangements made me feel comfortable					
5	The overall informality of the workshop was appealing					
6	Overall, participating in this workshop was a positive experience					
7	And I am willing to participate in future workshops on forest management in the area					

Vita

Paulami Banerjee earned her B.Sc. (honors) degree in Geography from Presidency College, India, in 2003 (University 2nd rank holder). In 2005, she received her M.Sc. (honors) degree in geography from the University of Calcutta, India. Prior to embarking on her PhD, she taught as a lecturer at two of the most highly reputed undergraduate women's colleges in Kolkata, India. She joined the University of Texas at El Paso's (UTEP) doctoral program in Environmental Science and Engineering in 2015, with a home base in the Department of Communication. During her study at UTEP, she was the recipient of Dodson Research Grant (2017 & 2016), Graduate Student Travel Grant (2018 & 2017), Research Incentive Grant, Department of Communication (2018), and Graduate Student Research Assistant Summer Program (2016). She was also a recipient of the Kalpana Chawla Memorial Scholarship (2016-2017). Paulami has presented her research at various international conferences including International Communication Association (ICA) 2018, Prague, Czech Republic; International Congress for Conservation Biology (ICCB) 2017, Cartagena, Colombia; and the Conference on Communication and Environment (COCE) 2013, Uppsala, Sweden. She published part of her dissertation as a book chapter in 2016. Paulami has also co-authored an article in the journal *Conservation Biology* in 2016. Recently, she submitted one of her dissertation manuscripts to the journal *Landscape and Urban Planning* and have others in preparation. While pursuing her degree at UTEP, Paulami worked as a research and teaching associate for the Department of Communication. In Spring 2019, Paulami was appointed as a Visiting Assistant Professor in the Public Policy & Administration Program, School of Public Service, Boise State University, ID.

Contact Information: paulami.banerjee@gmail.com

This dissertation was typed by Paulami Banerjee