SOCIAL LEARNING AND ADAPTIVE CO-MANAGEMENT IN/FOR

KOREAN VILLAGE GROVES

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SOCIAL LEARNING AND ADAPTIVE CO-MANAGEMENT IN/FOR

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Village groves in Korea are similar to urban community forestry in the US in their small size of forest patches and the engagement of local people in forest management. Village groves, which can be considered as cases of human and nature interactions, are common in the rural landscape of Korea, but also vulnerable to rapid social-ecological changes. Considering village groves' historical, cultural, and ecological values, better management and policy tools are needed to face the challenges brought by constantly recurring disturbances and increased human pressures and to guide toward more resilient social-ecological village groves systems.

I first reviewed the literature on community forestry and related adaptive capacity in three East Asian countries, China, Japan, and Korea, to understand Korean village groves in the context of community forestry and to investigate the indicators of adaptive capacity along with disturbances in this region. Through a systematic review, I addressed the role of diverse knowledge systems, such as traditional and Western scientific knowledge, and civic traditions of self-organization in local communities that characterized adaptive capacity of this region.

Second, I explored the role of social learning for social-ecological resilience in the four village groves restoration projects using multiple-case studies. In applying the framework of social learning processes and outcomes to Korean cases, I found that multiple elements of social learning, including interaction, systems orientation,

integration, and reflection, were present, but did not always lead to desired

management outcomes viewed through the lens of multiple-loop learning.

Third, I investigated how local people, their relational structures and functional

roles in networks contributed to the development of adaptive co-management of

village groves. Through a qualitative network analysis, I described the social relations

of local people in four village groves restoration projects and multiple functions of

bridging organizations that helped local people to achieve conservation outcomes and

to improve village grove governance processes with multiple stakeholders, while

contributing to emergent adaptive co-management.

This dissertation shows how local efforts to restore village groves can change

village groves from cultural landscapes to dynamic social-ecological systems. In this

process, the fact that local people can serve not just as simple stewards, but also as

agents of change for resilient village groves may provide implications for local

resource management under similar conditions.

BIOGRAPHICAL SKETCH

Eunju Lee was born in 1976 in Seoul, Republic of Korea. She majored in environmental studies and education, graduating from Korea National University of Education in 2000 with a dual secondary school teacher's certificate in environmental science and geography. She received the Master of City Planning degree in 2003 from Seoul National University and the Master of Arts degree in 2006 from The Ohio State University. She received her doctorate in 2017 from Cornell University.

Dedicated to the villagers who plant and care for their village groves

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LIST OF ABBREVIATIONS

VGRP   Village Groves Restoration Project

VG   Village Grove

KFS   Korea Forest Service

CHA   Cultural Heritage Administration

CHAPTER 1

INTRODUCTION

Human and nature interactions are of great concern to environmental
management. The integrated 'humans-in-nature' (Berkes and Folke 1998) or social-
ecological systems perspective is particularly emphasized in recent resilience
scholarship (Gunderson and Holling 2002; Berkes et al. 2003; Folke 2006). Village
groves, which can be considered as cases of human and nature interactions, are very
common in the rural landscape of Korea, but also very vulnerable to rapid social-
ecological changes. Korean village grove management is my research focus in the
three chapters in this dissertation.

Korean village groves are similar to urban community forestry in the US in the
small size of forest patches and in the engagement of local people. According to the
Korean Institute of Forest Science (2014), 1335 village groves remain, 78% of which
are under 1 ha in size. These village groves are cooperatively owned, managed, and
conserved by local people with their own rules and regulations to secure communal
use of forest resources. They have traditionally been planted by local people adjacent
to villages and/or along river banks based on cultural guidelines (e.g., fengshui) and
beliefs that they protect villages from natural disturbances such as strong winds and
floods. Considering village groves' historical, cultural and ecological values, better
management and policy tools are needed to face challenges brought by constantly
recurring disturbances and increased human pressures, and to guide toward more
resilient social-ecological village groves systems.

In this journey, I first seek to understand village groves in the context of
community forestry (chapter 2). Through systematic literature reviews, I compare

community forest management traditions in East Asian countries, including village groves in Korea, fengshui forests in China, and satoyama in Japan, where a common cultural influence of geomancy on people and forest interactions exists. Recognizing climate change and other contemporary social-ecological changes that impact local communities and forest resources, this review pays attention to adaptive capacity of local people in response to frequent, large infrequent, gradual, and abrupt disturbances in community forest management systems. Indicators of adaptive capacity, including traditional ecological knowledge, civic traditions of self-organization, and diverse knowledge systems, can be identified and characterized in this region. It is noteworthy that the East Asian studies discuss these indicators in terms of biodiversity conservation or sustainable forest management, but not in terms of adaptive capacity. Further, although learning is a key ingredient for adaptive capacity in social-ecological systems (Gunderson et al. 2006), mention of learning to live with change and uncertainty was limited in the reviewed articles, particularly in Korea. To fill this gap, I conducted a study to empirically investigate learning as a means to foster adaptive options in recent village groves restoration efforts.

In chapter 3, I focus on social learning among people who participated in the village groves restoration projects using four different villages as multiple cases. Social learning combines collaborative learning processes through interaction and communication, and the management outcomes of such processes based upon a shared understanding and common interests (Keen et al., 2005; Muro and Jeffrey 2008; Cundill and Rodela 2012). In applying environmental management frameworks of learning processes and outcomes to Korean village groves restoration efforts, this study found that multiple elements of social learning were present, including interaction, systems orientation, integration, and reflection, but did not always lead to desired management outcomes viewed through the lens of multiple-loop learning. By

distinguishing social learning outcomes from the characteristics of the learning process, this study sheds light on the vague notion of social learning (cf. Reed et al. 2010). In particular, focusing on multiple-loop learning as an indicator of social learning outcomes can provide insights into the links between perspective transformations and social changes in nested systems. This study also showed different dimensions of social learning in the cultural and historical context of Korea, where two villages presented multiple level changes, such as adapted management practices, changed policies and goals, and even changed governance system in one case. A need exists to explore such differences with a focus on enabling/disabling factors that could influence flexible and adaptive management systems and resilience outcomes.

Chapter 4 delves into the differences among the cases focusing on the role of local people in the village groves restoration projects and their contribution to the development of adaptive and collaborative management systems. Adaptive co-management has been proposed as a means to navigate social-ecological dynamics for resilient systems (Olsson et al. 2004; Armitage et al. 2007). Given that traditional village groves have been managed by villagers, the role of local people is essential in creating the conditions necessary for adaptive co-management. Further, a rise in different organizations and agencies involved in village grove restoration issues has been widely witnessed, demanding a change in the role of villagers to encompass co-management with multiple stakeholders. Current social-ecological changes in village groves, specifically different management outcomes among the villages, also raise a question about how and by whom village groves are being managed. This chapter investigates how local people, their relational structures and functional roles in networks contribute to the establishment of adaptive co-management. I use qualitative network analysis to gain an in-depth understanding of networks of local people in the

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four village groves restoration projects. I identify a range of actors and actor groups who participated in the restoration projects, with a focus on influential individuals and bridging organizations. Multiple functions of bridging organizations in the restoration projects and their contributions to the management of village groves are presented, such as accessing critical resources, identifying common interests, addressing conflicts, building local capacity, and enhancing mutual trust among villagers. Served by citizen organizations, these multiple functions can be understood as the roles of networkers, interpreters, followers, and knowledge retainers in site-specific conditions (cf. Folke et al. 2003; Plummer 2009). Citizen-led bridging organizations helped local people to improve village grove governance processes and achieve conservation outcomes for resilient village groves. The findings give insights on bridging roles of local citizen organizations in the Korean context, while contributing to our understanding of emergent adaptive co-management and citizen engagement in local resource management.

In sum, traditional community forest management systems of village groves and their capacity to adapt to change (chapter 2), current social learning processes and outcomes within village groves restoration projects (chapter 3), and adaptive co-management of village groves through local people and bridging organizations (chapter 4) are pursued in the following chapters. These chapters build towards an understanding of resilient social-ecological systems of village groves and local resource management grounded in humans-in-nature perspectives.

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CHAPTER 2

ADAPTIVE CAPACITY IN COMMUNITY FOREST MANAGEMENT:

A SISTEMATIC REVIEW OF STUDIES IN EAST ASIA[1]

Abstract

  This study investigated the indicators of adaptive capacity along with disturbances in community forest management systems in the East Asian countries, China, Japan and South Korea. Although these countries have centuries-old traditions of community-based forest management, they have been less researched in light of adaptive capacity for resilient social-ecological systems. Recent social and ecological disturbances bring about new challenges and/or opportunities to the capacity of forest related communities to adapt to rapidly changing conditions. Through a systematic review of the community forestry and related adaptive capacity literature in three East Asian countries, this study addressed the role of diverse knowledge systems, such as traditional and Western scientific knowledge, and civic traditions of self-organization in local communities that characterized adaptive capacity of this region. This study extends our understanding of community-based conservation efforts and traditions of this region, and adds to the understandings gleaned from studies of community forestry in the West and sacred forests in other parts of Asia and Africa. Further research on ways to increase adaptive capacity is needed in a site-specific context.

Introduction

      Community forestry is both an ancient approach to managing forests (Charnley and Poe 2007; Berkes 2012) and part of a more recent social movement to ensure greater local control over local natural resources and their benefits (Baker and Kusel 2003; Armitage 2005). In its recent revival in the US and Canada, community forestry is a reaction to the negative social, economic, and environmental impacts of globalization and industrial forestry. As such, it attempts to enhance local control, economic stability, and forest management practices. Although actual levels of control, distribution of benefits, ownership, actor engagement, and conservation values vary across a diversity of practices, three factors--collaborative decision-making, collective land ownership and access, and the capacity for adaptation as conditions change--are integral to community forestry (Bullock and Hanna 2012).

      Similar to how community forestry is consistent with discourses emphasizing participatory democracy and managing common property resources for the collective good (Gibson et al. 2000; Baker and Kusel 2003; Flint et al. 2008; Bullock and Hanna 2012), research on social-ecological systems resilience often emphasizes participatory approaches to resource management (Walker et al. 2002). Complexity and uncertainty inherent in social-ecological systems makes it difficult to predict the future, and so requires an ability to learn to live within systems, rather than control them. In this process, social-ecological resilience scholarship questions the wisdom of managing for steady-state monocultures to maximize production, and instead suggests managing for ongoing disturbance and change and for a range of community attributes that enable communities to adapt to ongoing change and transform after major catastrophes. In short, to address concerns about resilience, social and economic equity, and environmental quality, resource management requires not only the active involvement

of communities but also their ability to cope with social-ecological change (Armitage 2005).

Increasingly, researchers and practitioners are examining management challenges brought about by change and disturbance through employing the notion of adaptive capacity (Gunderson and Holling 2002; Berkes et al. 2003; Dietz et al. 2003). Adaptive capacity is defined as the ability of a system to incorporate or deal with disturbances and changes (Adger 2003; Folke et al. 2003; Olsson et al. 2004; Armitage 2005). Although adaptive capacity has been examined at different levels, from different perspectives, and in varying contexts (Bergsma et al. 2012), its study within community forestry has been limited. A small number of case studies focus on particular aspects of disturbances and ensuing responses; for example, a study in Indonesia illustrates the trade-offs between conservation and development goals faced by hunter-gatherers when they moved from the forest to the city (Levang et al. 2007), while a recent study conducted in the same region focuses on the impacts of natural disaster (floods) and communities' coping strategies such as increasing reliance on forest resources, seeking paid employment, and relocating houses (Liswanti et al. 2011).

Further, although community forestry in the US, Canada and Europe has been the subject of numerous studies and a recent book (Krogman and Beckley 2002; Baker and Kusel 2003; Pagdee et al. 2006; Charnley and Poe 2007; Ballard et al. 2008; Bullock and Hanna 2012; Keskitalo 2013), relatively little has been published on community forestry in East Asia. This is despite centuries-old traditions of community forestry in the East Asian countries, including village groves (*maeul soop*) in Korea, fengshui forests in China, and satoyama in Japan. These three countries have rich histories of traditional knowledge about forest ecosystems showing a common cultural influence of fengshui (geomancy) on diverse patterns of people and forest interactions.

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Their management traditions have focused on both environmental and social benefits, in particular retaining authority and responsibility in local communities. However, in contrast to the situation in the West, research about community forestry is relatively new in modern Korea, China and Japan. Further, climate change and other recent social-ecological changes that impact local communities and forest resources bring about new challenges not only for community residents but also for researchers studying adaptation to such disturbances (IPCC 2007; Coleman 2011). This also applies to community forest management in Korea, China and Japan where multiple stakeholder participation in decision-making has increased, while forest degradation and deforestation continue to be a challenge with increasing instances of disasters associated with climate change (Inoue and Shivakoti 2015). Understanding these processes could inform policies that help build the capacity of local communities to adapt to change and crisis.

To better understand adaptive capacity in communities engaged in community forestry in East Asia, we conducted an overview of the community forest management literature in South Korea, China, and Japan. The first author systematically reviewed and analyzed the existing literature on community forests in these three countries, using the lens of adaptive capacity in local forest-related communities. In addition to providing insights into community forestry and adaptive capacity in East Asia, the authors hope that this review will highlight opportunities and barriers for future study on adaptive capacity more broadly. Three questions guided our review of the literature:

    a. What are the characteristics of the community forest management literature in Korea, China and Japan?

    b. What kinds of disturbances exist in community forests in Korea, China and Japan?

c. How is adaptive capacity in response to disturbances impacting community forests expressed in Korea, China and Japan?

Prior to describing the methods and findings of our literature review, we briefly define the main concepts used in the study, including adaptive capacity and disturbance.

Main Concepts

Adaptive capacity

The term adaptive capacity is increasingly used in the context of climate change and social-ecological systems resilience. Rooted in community-based resource management, adaptive capacity refers to the ability of a social system to act collectively to incorporate and respond to various disturbances and stresses (Armitage 2005; Olsson et al. 2004; Folke et al. 2003; Adger 2003). The Millennium Ecosystem Assessment (2006, Glossary, p.599) and IPCC (2007) define adaptive capacity as "the ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences." First applied to ecological systems (Holling 1986), this concept is now being applied to social-ecological systems that demonstrate robustness in the face of disturbance, i.e., resilience.

Adaptive capacity is multi-dimensional and its determinants or variables not entirely agreed upon (e.g., Yohe and Tol 2002; Eakin and Lemos 2006; Engle and Lemos 2010; Gupta et al. 2010). For example, Engle and Lemos (2010) categorize a set of variables into seven basic underlying components: human capital, information, material resources, organizational/social capital, political capital, wealth/financial capital, and institutions. Focusing on institutions, Gupta et al. (2010) developed the 'adaptive capacity wheel,' which has 22 criteria grouped into six dimensions: variety, learning capacity, room for autonomous change, leadership, resources, and fair

governance. However, studies to directly assess the amount of adaptive capacity and empirically estimate the effects of adaptive capacity have been limited (Agrawal 2008). According to Engle (2011), measuring adaptive capacity is not easy due to its latent nature, which means "researchers often struggle to measure it until after its realization or mobilization within a system" (p.653). Engle (2011) also distinguished between measuring and characterizing adaptive capacity. Measuring means an attempt to directly assess the amount of adaptive capacity based on the response to a recent event, while characterizing is an attempt to assess adaptive capacity based on predetermined indicators that are known to increase this capacity. Studies involving measurements can advance theory through understanding of the determinants of adaptive capacity, while studies that characterize adaptive capacity can help to understand factors that affect it.

Table 2. 1. Dimensions of adaptive capacity (Modified from Folke et al. 2003; Armitage 2005; McCarthy et al. 2012)

Components	Subcomponents
Learning to live with change and uncertainty	· Learn from crises · Expect the unexpected · Evoke disturbance
Nurturing diversity for renewal and reorganization	· Nurture ecological memory · Sustain social memory · Enhance socio-ecological memory
Combining different types of knowledge for learning	· Combine experiential and experimental knowledge · Integrate knowledge of structure and function · Incorporate process knowledge into institutions · Encourage the use of different knowledge systems
Creating opportunity for self-organization toward resilience	· Recognize relationship between diversity and disturbance · Deal with cross-scale dynamics · Match scales of ecosystems and governance · Account for external drivers

In our review of the literature, we used four critical components that characterize adaptive capacity while interacting with each other at multiple scales: "learning to live with change and uncertainty, creating opportunity for self-organization toward social-ecological resilience, combining different types of knowledge for learning, and nurturing diversity for renewal and reorganization" (Folke et al. 2003, p.355, see also Table 2.1). Because these are mentioned in and applied to the context of resource management emphasizing social and institutional relationships, it is appropriate to use them to investigate the evidence of adaptive capacity of forest related communities.

Disturbance

In studies of adaptive capacity, disturbance is as an essential driver of social and ecological changes (Berkes et al. 2003). Many traditional societies have recognized the importance of disturbance not only for securing ecosystem services but also for internal renewal of local ecosystems (Folke et al. 1998). Such adaptive response is based on ecological understanding and culturally evolved management practices that help communities survive and maintain, and renew social-ecological systems. Often referred to as shock, crisis and surprise, disturbance is defined in ecology as "any relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment" (White and Pickett 1985, p.7). Extending to integrated systems, it is important to recognize that disturbance to social-ecological systems may arise from changes in either social or ecological, or both variables. Thus, it is not easy to find truly 'natural' disasters but both natural and human inputs are required to explain spatially and temporally varied disturbances (Kelman 2008).

Disturbance can be characterized in a variety ways based on its scale, frequency, intensity and severity. For example, Walker and Salt (2012) categorized 'characteristic disturbance' and 'large infrequent disturbance' based on frequency and intensity. Systems anticipate and can respond to characteristic disturbances, such as frequent floods and wildfires, often generating desirable outcomes over short time periods. Meanwhile, systems are unable to absorb large infrequent disturbances, which lead to a new systems regime or total transformation. Walker and Salt (2012) also mention 'unknown shocks,' which are almost impossible to predict and prepare for, like a tsunami in a place that has never experienced such an event.

Some disturbances build slowly until a tipping point is reached, while others are sudden crises (Frelich and Reich 1998). Pelling (2001) differentiates 'catastrophic' disasters such as specific events and 'chronic' disasters that slowly overwhelm a community's ability to cope. Due to the catastrophic impacts of sudden crises, they command attention in the media and in academia. But long-term creeping changes, in particular the slow erosion of capacity of communities through economic stagnation, social fragmentation, and environmental degradation, is also important (Stedman and Ingalls 2014). Interactions between slow erosion and sudden crises could become 'unknown shocks' to systems (Walker and Salt 2012). To understand systems resilience, it is important to know what disturbances take place as well as how systems respond to multiple types of disturbances.

Methods

This study systematically reviewed the published literature on community forests in East Asia. The focus of the review was limited to community forest management along with traditional knowledge and practices in South Korea, China, and Japan, and attempted to identify, appraise, and synthesize all relevant studies to

answer the research questions. Recently, systematic reviews have been used in the context of environmental management to provide objective and transparent evidence for conservation outcomes (e.g., Bowler et al. 2012) and to understand research contributions in the field (e.g., Rodela 2011; Plummer et al. 2012; von der Porten and de Loe 2014). Considering that research in community-based forest management often uses case studies, a qualitative systematic review is suited for broader analyses of the three countries' relevant but disparate literature. To limit researchers' bias and systematic error in our review, we used a search strategy and analytical procedures developed in consultation with experts, and a data extraction form. The method used for this review was adapted from *A Practical Guide of Systematic Reviews in the Social Sciences* (Petticrew and Roberts 2006), *Collaboration for Environmental Evidence Systematic Review Guidelines* (CEE 2013), and reports based on the latter method (see Bowler et al. 2010; Randall and James 2012).

Search strategy

The first author used bibliographic data bases specializing in environment and natural resources to identify English-language forest management literature focused on East Asia, including Agricola, Environment Index, Web of Science, JSTOR, Springer, and Science Direct. She also used general web search engines such as http://scholar.google.com and http://library.cornell.edu to maximize coverage of both peer-reviewed and non peer-reviewed literature. Searches were conducted prior to June 18, 2014; thus, publications available after that date are not included. The following search terms and combinations of terms were used: 'community forest'; 'traditional forest'; 'forest management'; 'fengshui forest'; 'satoyama'; 'village groves'; 'traditional forest knowledge'; AND 'Korea'; 'China'; 'Japan.' The terms 'adaptive capacity' and 'disturbance' were also searched in Korea, China and Japan,

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and only forest related articles were considered for the review. The first author applied inclusion/exclusion criteria (i.e., study region, language, relevance of topic, and research consistency) to all potential literature at title and abstract level to remove spurious citations, and then at full text level to identify those that addressed at least some aspects of the review questions. More than 80 articles were selected at the first level, but 12 articles were excluded at the second level due to inconsistent research focuses and duplicate publications. A total 70 articles (Korea 15, China 19, Japan 36) met our criteria for the final review.

Although a number of studies have been conducted in each country in their own languages, we exclusively focus on English-language literature. We recognize this as one of limitations in our literature search due to the exclusion of inaccessible studies that might result in the over-representation of a particular type of study (Petticrew and Roberts 2006), and thus bias our findings.

Analytical Procedure

The first author appraised and analyzed each of the selected articles (n=70) relative to the three research questions. To address the first question on the state of the community forest management literature in Korea, China, and Japan, the study characteristics of each paper, such as publication year and type, research focus and approach, scale, first author's field of study, and key terms used for community forests, were entered into an Excel spreadsheet for further analysis. To determine the development trend of research in each country, the textual contents of all articles were analyzed by word occurrence and frequency using QSR NVivo (Ver.10) software. This word frequency query was performed by country under the same conditions; only words with four letters or more were included and similar words were grouped together for the best results.

To address the second and third questions on disturbance and adaptive capacity, relevant textual passages were coded and organized into an NVivo database for qualitative data analysis. The first author identified the presence of each element of adaptive capacity listed in Table 2.1, along with any new codes that emerged as factors influencing the adaptive capacity of local communities. Descriptive data (textual passage) appeared under more than one category where relevant. A thematic analysis was performed to categorize similar concepts so as to discover trends related to evidence of local communities' adaptive capacity.

Results

Characteristics of community forest management literature in Korea, China, and Japan

We observed an increasing trend in number of studies published since 1997 (Figure 2.1), especially in Japan. A special issue on natural and cultural characteristics of Japanese satoyama landscapes was published in 2011 in the journal of Landscape and Ecological Engineering. Across the three countries, the major publication type is journal articles (n=48) oriented to empirical studies based on a variety of methods such as case study, survey, action research, participatory rural appraisal, and ecological modeling (Figure 2.2). While different types of scholarship exist in Japan and Korea ranging from empirical to conceptual, most Chinese studies are empirical and focus on specific villages, ethnic communities, or nature reserves at local and regional levels. Some studies are conducted beyond national borders, comparing community forests systems to Canada (Cho 2008), India (Kumar and Takeuchi 2009), Thailand (Henocque 2013), Scandinavia (Berglund 2008) and among the East Asian countries (Kim et al. 2008; Youn 2009).
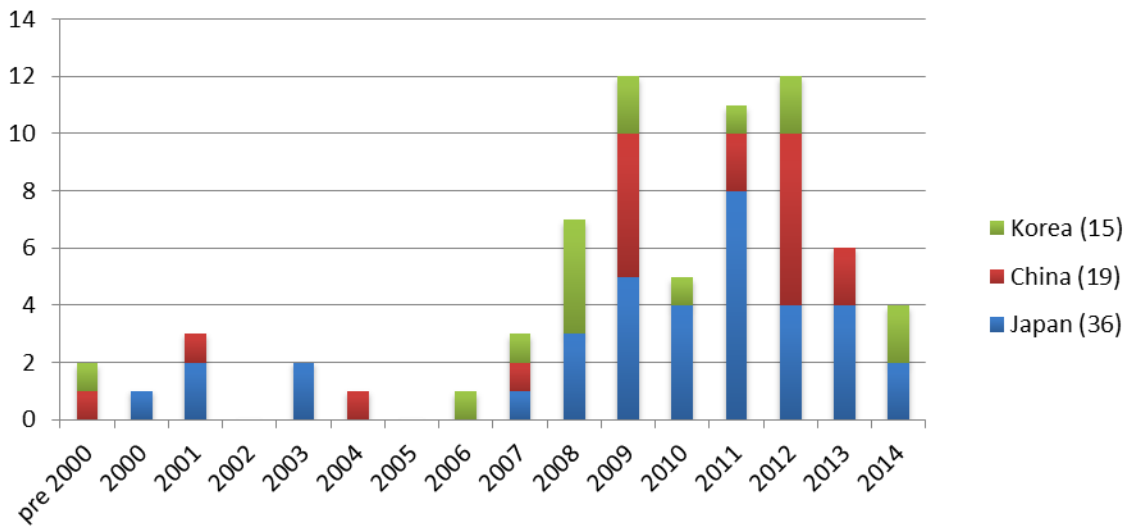
Figure 2. 1. Publication year and number of selected studies (n=70)
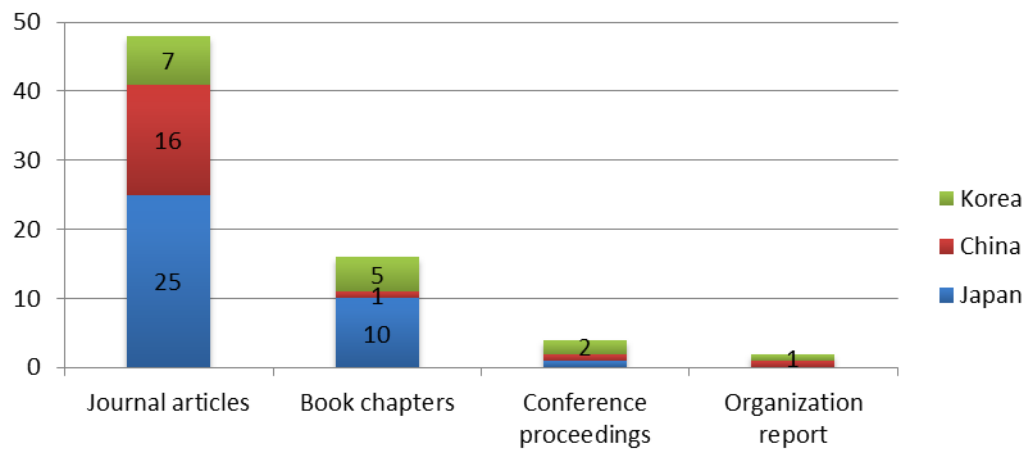
Figure 2. 2. Publication type and number of selected studies (n=70)

Research in each country covers diverse aspects of community forest management (Table 2.2). Traditional forest-related knowledge is a common topic in the three countries along with traditional or indigenous management systems. Biodiversity conservation and ecological features of traditional community forests are also commonly addressed in all three countries. Although the community forestry literature generally focuses on social dimensions of forestry, the studies that focus on ecological features of community forests, such as ecological effects of village groves

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and biodiversity conservation in satoyama, are included in this review because they demonstrate different research approaches in studies of community forest management.

Table 2. 2. Research focuses and disciplines involved in studies of Korea, China, and Japan

	Research Focuses (no. of studies)*	Disciplines Involved (no. of studies)
Korea (n=15)	Traditional forest-related knowledge (TFK) (5) Landscape patterns and planning based on fengshui principles (4) Ecological effects/functions of village groves (3) Sustainable forest management (SFM) (3) Reforestation and resource management (3) Transformation/restoration of socio-cultural systems of village groves (2) Traditional village groves management system (1)	Forest Sciences (8) Environmental Studies (3) Landscape Architecture (2) History and Culture (1) International Development and Cooperation (1)
China (n=19)	Community-based management (6) Sustainable livelihood development of rural community (6) Biodiversity conservation in traditional forests (5) Traditional forest-related knowledge (TFK) (4) Indigenous forest management (4) Conservation policies and relationship with government (4) Conflict management in the Nature Reserve (1)	Forest Sciences/ Forestry Economics (8) Environmental Studies (4) Geographical Sciences (3) Botany (3) Economics (1)
Japan (n=36)	Satoyama conservation dynamics with new commons traditions (10) Traditional forest-related knowledge (TFK) (7) Biocultural diversity in satoyama (4) Sustainable livelihoods and resource management (4) New approaches (e.g. social forestry, participatory approach, recreational approach) (4) Landscape patterns (4) and public perception of agricultural landscape (2) Ecological features of fengshui forests (3) Biodiversity conservation in satoyama (3) Effectiveness of collective management and nested institutional approach (2) Adaptive co-management and social capital (1)	Agricultural Sciences (11) Environmental Studies (6) Global Environmental Studies (6) Forest Science (4) International Relations and Cooperation (3) Geographical Sciences (1) Sustainability Science (1) Frontier Science (1) N/A (3)

* Number of studies is overlapping to indicate all relevant research interests.

Major research trends, specific concerns, and author disciplines vary slightly in each country. For example, forest sciences are the major fields of study in Korea and China, while agricultural sciences are the major areas in Japan. It is possible that the emphasis on satoyama, generally conceived as an agricultural practice, could influence the field of studies in Japan. Further, each country's socioeconomic and political context may contribute to the different research foci. For instance, Chinese scholars might be interested in community-based management and sustainable livelihood development because of China's high population in forest communities and the rapid economic growth and globalization being pursued in this country.

The top ten words that occurred most frequently varied among countries (Table 2.3, Figure 2.3). In Korea, 'forests,' 'villages' and 'landscape' were the most frequently used words. Similarly, 'forests' and 'villages' are used most frequently in Chinese studies followed by 'managing' and 'community.' But, in Japan, the most frequently used word is 'satoyama,' followed by 'forests' and 'landscaping.' The list of counted words can provide a proxy or indication of research interests by country. For example, satoyama is identified as a key word and major research topic in Japan, while interests around village groves in Korea and fengshui forests in China are more diverse. Other key terms are used, such as 'bibo forests' instead of village groves, and 'sacred forests' for fengshui forests. Bibo means adding a new landscape element to unproductive or degraded landscapes (Hong et al. 2007), and the study of bibo woodlands is focused on ecological functions and restoration. Sacred forests are also known as 'culturally protected forests' (Gao et al. 2013) with limited or prohibited use, based on spiritual and cultural beliefs of local people, and related to research on ethnic minority communities in China.

Table 2. 3. List of the most frequently used words in studies in Korea, China, and Japan

Korea			China			Japan		
Word	Count	Weighted Percentage (%)	Word	Count	(%)	Word	Count	(%)
forests	1461	2.56	forests	2466	2.74	satoyama	1825	1.21
villages	709	1.24	villages	1280	1.42	forests	1757	1.16
landscape	607	1.06	managing	798	0.89	landscaping	1638	1.08
traditions	407	0.71	community	732	0.81	managing	1048	0.69
ecology	379	0.66	traditions	538	0.60	nature	911	0.60
managing	283	0.50	nature	501	0.56	lands	887	0.59
cultures	250	0.44	local	501	0.56	village	809	0.54
knowledge	250	0.44	development	385	0.43	tradition	779	0.52
resources	230	0.40	protect	385	0.43	community	618	0.41
winds	213	0.37	fengshui	354	0.39	systems	531	0.35

Korea   China   Japan

Figure 2. 3. The words most frequently mentioned in studies in Korea, China, and Japan

Local terms for community forest systems and definitions varied among countries (Table 2.4), reflecting how community forest systems in East Asia are based on traditional land use practices and local perceptions and beliefs about the form of cultural landscapes. In Korea, village groves refer to forests near villages planted by

local people based on cultural guidelines such as native beliefs and fengshui theory (Hong et al. 2007; Hong and Kim 2011; Lee and Krasny 2015). Similarly, the Japanese term satoyama refers to semi-cultivated forests adjacent to villages, used in a restrictive sense as secondary woodlands and in a more abstract sense 'landscape' or 'systems' including settlements, rice paddies, grasslands, and woodlands (Takeuchi et al. 2003; Morimoto 2011; Yokohari and Bolthouse 2011). Meanwhile, fengshui forests have not just developed in China but also in Korea and in a certain region of Japan (e.g., Okinawa). Fengshui, which literally means wind and water, has long been used as a traditional paradigm for landscape planning in East Asia (Choi 1991; Yuan and Liu 2009; Youn 2009; Bixia et al. 2013) to optimize the site selections and conditions for villages, temples and tombs. Chinese fengshui forests are culturally protected man-made or natural forest patches, having symbolic meanings related to good fortune, wealth and the health of local people (Yuan and Liu 2009; Hu et al. 2011; Juanwen et al. 2012). The application of fengshui forests to other countries shows different emphases, for example, the literature on fengshui forests in Korea emphasized its function in repairing a defective landscape, and in Japan, was more focused on its practical use in protecting against strong winds and tides in small islands (Whang and Lee 2006; Chen et al. 2008). The term 'bibo forest' is discussed along with village groves by villagers in Korea (see above), while the term 'ho:go' is used for Japanese fengshui forests, meaning a forest belt to protect and embrace a house, a village and coastline by planting trees (Chen et al. 2008). Compared to Chinese fengshui literature, 'bibo' and 'ho:go' were found more often in the studies of Korea and Japan respectively.

Table 2. 4. Local terms used for community forest systems in Korea, China, and Japan

	Community forest system	Key source references
Korea	Village groves (Maeul soop) – small forest patches planted and managed by villagers adjacent to villages, exist a variety of forms by location and function	Kim et al. 2008; Hong & Kim 2011; Youn 2009; Lee 2014
	Bibo forests - village groves emphasizing function to repair a defective landscape based on fengshui	Wang & Lee 2006; Hong et al. 2007; Lee 2008; Koh et al. 2010
China	Fengshui forests – culturally protected man-made or natural forest patches with symbolic meanings (geomancy), located in villages, tombs, and temples	Yuan & Liu 2009; Hu et al. 2011; Coggins et al. 2012; Juanwen et al. 2012
Japan	Satoyama - semi-cultivated forests near villages as timber mountain, or landscape including rice paddies, grasslands, woodlands and streams etc.	Takeuchi et al. 2003; Morimoto 2011; Yokohari & Bolthouse 2011
	Fengshui woods/trees (Ho:go) - a forest belt to embrace and protect a house, a village, several villages, or the coastline by tree planting	Chen et al. 2008; Chen & Nakama 2010; Bixia et al. 2013

Disturbances in community forests in Korea, China, and Japan

Below we review how the studies in each country recognized and described

disturbances (see Table 2.5).

(1) Korea

Studies talked about frequent natural disturbances such floods and strong

winds as the reason for human planted traditional village groves. One recent study

(Lee 2014) focused on Typhoon Rusa, a large infrequent disturbance that impacted

seashore villages. Human activities, including industrialization, economic

development, westernization, urbanization, and globalization, were emphasized as

driving forces of physical and institutional changes and disappearance of traditional

village groves over the last century. Among these disturbances, urbanization and

globalization are the most frequently used words in Korean studies in the word

frequency analysis. Urbanization is explained as changes in the rural lifestyle, the

shrinkage of villages, and an increasingly aging society, and linked to a trend of devaluing traditional values (Hong and Kim 2011; Youn 2009). Meanwhile, globalization is discussed within the expansion of increasingly globalized market economies that make labor-intensive forest systems less competitive in a global world (Yu et al. 2014). Such changes challenge forest dependent communities to adapt to new circumstances while exacerbating the loss of traditional community forests. Specific historical events, such as colonization and the Korean War, were also cited as leading to the demise of traditional management systems (Oh et al. 2004; Chun and Tak 2009; Lee 2014).

In sum, both frequent and infrequent natural disturbances were recognized in Korean studies, but gradual social changes were mostly responsible for recent changes in traditional village groves.

(2) China

Similar to Korea, frequent disturbances, such as droughts and soil erosion, were discussed as the practical reason for establishing fengshui and traditional forests in China (Yuan and Liu 2009; Gao et al. 2013). Large infrequent disturbances were also found, for example, catastrophic downstream flooding of the Yangtze River in 1998 (Melick et al. 2007). In addition to natural disaster affecting traditional forests, political development was identified as a recent influential disturbance in forest management systems.

Recently, China has experienced more rapid changes than at any other time in its history and any other country in East Asia. Most studies talked about serious challenges from the outside world, such as rapid globalization, as well large impacts on local forest-related communities under development pressure from government (Yuan and Liu 2009; Long and Zhou 2001; Juanwen et al. 2012; Jinlong et al. 2012; Pei et al. 2009; Gu et al. 2012; Luo et al. 2009; Melick et al. 2007; Kui 2009; Chen et

al. 2012; Song et al. 2004; Yang and Wu 2012). Changes in government policies and regulations, compulsory protection policies, and a powerful development model based on modern scientific knowledge and technologies were described as outside interventions (Long and Zhou 2001; Juanwen et al. 2012; Jinlong et al. 2012; Luo et al. 2009; Chen et al. 2012). These institutional changes are associated with China's recent history, including collectivization between 1949 and 1978, de-collectivization between 1978 and 2009, and subsequent economic and land reforms (Long and Zhou 2001; Yang and Wu 2012). Accompanying these changes, community forest management systems evolved from clan systems to the People's commune system (run by central and local government), and to local government systems modified by traditional systems (Long and Zhou 2001). Thus, the changing historical context is necessary to understand growing disturbances and tensions observed in community forests systems in China. Conflicts among government and local communities over the direction of community forest management often resulted in damages to protected resources or inefficient management of nature reserves (Juanwen et al. 2012; Gu et al. 2012; Kui 2009). Although both positive and negative perspectives on government intervention exist (Melick et al. 2007), such intervention was most frequently mentioned as broad-reaching disturbances to forest dependent communities that led to modifications in traditional management systems. Internal socio-cultural changes were also discussed, such as youth migration, aging communities, and decline in interest in traditional cultures among younger generations, which interacted with the loss of traditional forests (Yuan and Liu 2009; Juanwen et al. 2012; Jinlong et al. 2012; Gu et al. 2012). At the local level, such gradual erosion in traditional socio-cultural systems could threaten communities' resilience while making them vulnerable to outside social-ecological changes (Jinlong et al. 2012; Melick et al. 2007).

In sum, China has experienced both inside and outside socio-political disturbances that might lead to forest degradation and even large scale deforestation. Unfavorable policy interventions, along with general erosion of traditional culture, were frequently described as abrupt changes in the wake of rapid social and economic changes.

(3) Japan

Similar to Korea and China, fengshui woods and trees are planted in certain regions of Japan for the purpose of protecting houses and villages from summer typhoons and winter monsoons (Chen and Nakama 2010; Chen et al. 2008; Bixia et al. 2013). Large infrequent disturbances, including tsunamis and the nuclear power plant accidents caused by major earthquakes, were included in a recent study of satoyama calling for a radical reconsideration of the relationship between humans and nature (Katsura 2014).

Researchers have long examined the changes of traditional satoyama landscapes in Japan (Takeuchi 2001; Fukamachi et al. 2001). Studies emphasize the degradation of traditional forest systems in relation to gradual disturbances driven by technological, demographic, and socio-economic changes. Technological development refers to the energy revolution and introduction of chemical fertilizer in the early 1960s, which disrupted traditional management practices (Takeuchi et al. 2003; Fukamachi et al. 2001; Kumar and Takeuchi 2009; Bolthouse 2013; Shimizu and Nakatsuji 2014; Knight 2010). Additionally, an aging and diminishing population in rural communities has greatly altered the structure of satoyama management systems (Hasegawa et al. 2013; Shimizu and Nakatsuji 2014; Cetinkaya 2009; Knight 2010), and economic growth after World War Ⅱ led to large-scale development projects, such as dam building and wetland filling, causing habitat loss and fragmentation in satoyama as well as fengshui forests (Chen et al. 2008; Kobori and Primack 2003).

More generally, the breakdown of the functional relationship between common pool resources and resource users has resulted in the loss of traditional satoyama landscapes (Takeuchi 2010; Yashiro et al. 2013). Interestingly, abandonment (underutilization) of forest resources was often discussed in Japanese studies as an ongoing problem that was as serious as overexploitation (Fukamachi et al. 2001; Hasegawa et al. 2013; Katoh et al. 2009; Morimoto 2011; Watanabe 2011), because frequent human disturbances are considered essential for biodiversity conservation in satoyama (Yokohari and Bolthouse 2011; Morimoto 2011).

In sum, frequent disturbances were regarded as inescapable changes in Japan, and researchers emphasize proactive rather than reactive responses. Compared to Korea and China, Japanese studies focus more on practical and functional changes in common pool resources.

Table 2. 5. Examples of disturbances found in studies of community forest management in Korea, China, and Japan

		Korea	China	Japan
Disturbances	Frequent	Floods and strong winds	Droughts and soil erosion	Typhoons and monsoons
	Large infrequent	Typhoon Rusa in 2002 (Lee 2014)	Yangtze River Floods in 1998 (Melick et al. 2007)	Tsunami and nuclear power plant accidents (Katsura 2014)
	Gradual	Urbanization Globalization Development	Inside social-cultural change, e.g. youth migrate, aging, generation gap	Demographic change Socio-economic change Technological change
	Abrupt	Specific historical events like the Korean War and colonization	Outside (political) interventions, e.g. compulsory protection policy, powerful development model	Specific historical event like World War Ⅱ

Factors discussed in the literature for adaptive capacity of local communities

We report next on how studies address factors that could influence the capacity of local communities to face disturbances, including self-organization, knowledge, diversity, and learning (see Table 2.6).

(1) Korea

In the Korean village grove management systems, we found evidence of self-organization, local knowledge, and diversity, but not of learning. Self-organizing efforts were found in the traditional forest management systems as well as current village groves restoration projects. The traditional forest management organization, Songgye, was created by villagers to secure the communal use of forests in the late Chosun Dynasty from 1392 to 1910 (Chun and Tak 2009). Songgye refers to community-based grassroots movements for sustainable use of forest resources and became a civic tradition in Korea, and that still play a significant role in maintaining and restoring village groves (Chun and Tak 2009; Yu et al. 2014).

Local knowledge is inherent in traditional village groves management practices in the form of rules and regulations to protect and manage common pool resources, including forest patrols and policing, preventing and combating fires, logging, shifting cultivation, fodder collection, and building ancestral tombs in the forest lands (Chun and Tak 2009). Not only maintenance but also construction of village groves is believed to be based on traditional ecological knowledge from long-time observations and accumulated experiences of villagers. Recent research on ecosystem services and ecological benefits of village groves (e.g., Koh et al. 2010) has explained the structure and function of village groves in the form of scientific knowledge. Thus, both local and scientific knowledge were found in the Korean community forest literature.

Diversity is also an important element in village grove management systems. According to a recent study on the transformation of the Songgye system (Yu et al.

2014), a small village with higher network connections with other villages' Songgye systems could better organize cooperative transformation in times of change. The authors found that some villages participated in several Songgye systems and their cross-institutional links benefited the systems' adaptation. In addition, diversity and redundancy in social networks and shared institutional memory may have enabled villages to pursue some forms of collective action. Similarly, ecological diversity has been researched in village groves, but the relations between ecological and institutional diversity have not yet been pursued.

(2) China

Similar to Korea's Songgye, the Chinese Cuiguimingyue system is a traditional, self-organized institutional arrangement to manage culturally protected, i.e. fengshui forests (Yuan and Liu 2009). Fengshui forest management systems are closely related to local knowledge in the form of rules and regulations. Examples include knowledge about routine forest utilization, land tenure and use-rights arrangements, benefit-sharing mechanisms, customary regulations, and forest-related beliefs (Jinlong et al. 2012). Fengshui forests and associated collective knowledge have contributed to the protection of old-growth forests, which are essential to biodiversity conservation, as well as human-nature harmonization and equitable resource access through benefit-sharing schemes (Juanwen et al. 2012). Meanwhile, Chinese literature reported tensions between recently introduced scientific knowledge and traditional knowledge systems. In a study of knowledge-driven institutional changes, Yang and Wu (2012) found two types of changes: voluntary institutional change based on local people's self-taught and accumulated experiences, and imposed change based on the knowledge of local and external scholars, experts, and government officials, among others. Imposed knowledge-driven institutional change was often regarded as more progressive and rational, while voluntary institutional

change was neglected and even suppressed during recent decades in China. Thus, traditional knowledge and its applications appear to be vulnerable to shifting circumstances. Although traditional knowledge still plays a vital role in some ethnic groups in China, struggles and tensions are found in using outside scientific knowledge along with traditional local knowledge.

Diversity is often discussed in the context of biodiversity (Hu et al. 2011; Gao et al. 2013). Social and cultural diversity are also recognized in the studies of ethnic minority groups employing indigenous management practices. In some cases, struggles and tensions break out among multiple stakeholders. As a result, research on sustainable forest co-management is getting increasing attention in the Chinese literature.

Related to learning, the importance of educating younger generations of ethnic minority groups to maintain their traditional management systems is discussed by Gu et al. (2012). A more specific case of adaptive learning was only found in the efforts of older generation to learn to adapt to changing circumstances such as camera flashes and the presence of women tourists in sacred forests (Gu et al. 2012).

(3) Japan

Japan's civic traditions are expressed in the concept of satoyama, a mixed use landscape that depends on collaborative management by local residents. In self-organizing satoyma systems, members are common pool resource users and stewards guided by community regulations (Hasegawa et al. 2013). They formulate strict management rules that are enforced by rotational patrolling and severe punishment schemes, while allowing members to access their satoyama for grasses, firewood and charcoal (Kijima et al. 2000; Yashiro et al. 2013).

Traditional knowledge can be characterized as information about a variety of components of satoyama ecosystems (e.g., wild edible plants and use of medicinal

plants) and learning by doing practices (e.g., harvest practices) (Cetinkaya 2009). It encompasses information, traditions, practices and informal institutions. Such knowledge is important in defining the identity of local communities and provides links to the communities' history, land, and environmental philosophy (Cetinkaya 2009). Many studies recognized the importance of various knowledge systems not only for community forest management but also for community development.

The importance of well-structured social networks and a nested institutional approach is also recognized in the satoyama studies (Yashiro et al. 2013; Henocque 2013). In particular, governing the commons as complex adaptive systems is studied in relation to the concept of adaptive co-management and resilience (Yashiro et al. 2013). Recent involvement of diverse groups, such as local governments, corporations, NGOs, and urban residents, is discussed in formulating a new framework of common pool resource management, along with developing new traditions in the satoyama landscape.

Another trend in satoyama studies is linking citizens and specialists. The 'generalist' citizens and the 'specialist' academics can teach each another and work together, for example, in gathering natural history information (Kobori and Primack 2003). Such educational links may provide evidence of learning and the integration of diverse knowledge systems.

Table 2. 6. Examples of adaptive capacity factors found in studies of Korea, China, and Japan

		Korea	China	Japan
Adaptive Capacity	Self-organization	Traditional village grove management system organized by local people (e.g. Songgye)	Traditional fengshui forest management system organized by local people (e.g. Cuiguimingyue)	Civic traditions in satoyama management by local people
	Knowledge	Traditional knowledge: cultural practices, rules and regulations in songgye Scientific knowledge through research on ecosystem services of village groves	Traditional knowledge: cultural practices, rules and regulations in cuiguimingyue Tensions between voluntary local knowledge and imposed scientific knowledge	Traditional knowledge: community regulations, learning by doing practices, information on satoyama ecosystems Efforts to link general knowledge and academic knowledge
	Diversity	Cross-institutional links among villages	Ethnic minority communities and co-management interests	Diverse group involvement in satoyama management
	Learning	-	Importance of educating younger generation Older generations efforts centered around learning to live with change	Educational use as new benefits of satoyama

Discussion

Similarities and differences in the community forestry literature

Previous literature reviews in Asia, Africa, and South America have focused on the effectiveness or benefits of community forestry relative to the environment, economies, and societies, and how community forestry contrasts with centralized and industrialized forestry (e.g., Pagdee et al. 2006; Lund et al. 2009; Casse and Milhøj 2011; Bowler et al. 2011). In Asia, Nepal, the Philippines, and India are considered to

develop community forestry encouraged by international donors and researchers (Charnley and Poe 2007). Our review focuses on community forest management traditions that have been maintained in East Asian countries, including South Korea, China, and Japan, where there has been a growing literature in community forestry since 1997. Consistent with global interest in traditional ecological and local/indigenous knowledge for natural resources management (Inglis 1993; Berkes 2012), research in these countries has focused on traditional forest-related knowledge (e.g., Cho 2008; Chun and Tak 2009; Pei et al. 2009; Cetinkaya 2009; Cetinkaya et al. 2012; Youn 2009; Juanwen et al. 2012; Jinlong et al. 2012), but no study has focused on the interconnectedness between traditional knowledge and adaptive capacity. Reflecting interest in biodiversity conservation movements, research in these countries has also focused on the biological and ecological values of protected community forests (e.g., Lee 2008; Kieninger et al. 2009; Katoh et al. 2009; Koh et al. 2010; Hu et al. 2011; Gao et al. 2013).

However, the three countries have different research trends not only among themselves but also compared to other parts of the world. Overall, Korean studies focused on the traditional landscape planning principles and their application in modern cities and villages, while Chinese studies were concerned with traditional forest conservation, community development, and attempting to build co-management systems with multiple stakeholders. Studies in Japan mostly addressed conservation dynamics in traditional agricultural landscapes along with efforts to find a new functional relationship with the commons.

Various disciplines involved in these studies reflect different interests and values among the three countries. While a number of studies are conducted in the field of Landscape Architecture in Korea, Economics is the second major field in Chinese studies, and in Japan, Global Environmental Studies and International Relations

demonstrate interest in community forestry research (see Table 2.2). Even when the same issues, such as sustainable and traditional forest management systems, are considered, the three countries show different viewpoints and research approaches. Korean and Japanese researchers address such issues from the perspective of resource management, taking conceptual considerations and empirical research findings into account (cf. Chun and Tak 2009; Knight 2010; Morimoto 2011; Park and Youn 2012), while Chinese studies are conducted for livelihood development in specific rural communities mostly using empirical evidence (cf. Song et al. 1997; Song et al. 2004; Gu et al. 2012; Chen et al. 2012; Chen et al. 2013). Given that these countries are located nearby and directly influence each other, such diversity in research topics and methods could stimulate further development of community forest studies and practices.

In comparison with other parts of the world, traditional management systems in the three countries show different premises and approaches. Even the term community forestry is not much used in the East Asia studies, since these countries have their own terms, such as 'village groves,' 'fengshui forests,' and 'satoyama' (see Table 2.4). Although current community forestry movements are influenced by participatory democracy (Baker and Kusel 2003) and by the global trend towards increased local control over natural resources through community-based management (Armitage 2005), the formation of community forests in East Asia goes back to ancient times to deal with natural disturbances and harmonize the lives of people in nature. In this process, local people have developed their own rules and regulations to protect community forests and to control people's access to common resources. Thus, the strength of community forestry in this region lies in its long history and traditions of managing forests by local people, directly influenced by cultural practices and beliefs, such as fengshui. The breakdown of connection between the forest and people,

along with the loss of cultural practices, seem to be the most serious problem threatening the continued existence of traditional systems (Luo et al. 2009; Hong and Kim 2011; Hasegawa et al. 2013). Community forestry problems mentioned in the literature of other regions, such as the distribution of its benefits, power devolution, and equity issues (Agarwal 2001; Thoms 2008), are less discussed in the papers from East Asia.

Challenges and opportunities for adaptive capacity of local communities

We did not find studies that directly measured adaptive capacity of forest-related communities in East Asia. Instead, our review uncovered continuing and emerging challenges in traditional community forest systems in South Korea, China, and Japan, and the potential capacity of local communities to deal with cultural, socio-economic, and political change. Although aspects of disturbance differ among the three countries, they share industrialization and development pressures, aging communities, and globalized market economies. The dynamics of East Asian societies, often viewed in the context of development of modern capitalism in Confucian culture (Tu 2008), are reflected in social tensions between generations, central and local government, and rural and urban development that could pose further challenges to traditional forest management systems. Social stresses and tensions are considered as slow-moving variables that could lead to either acute catastrophe (cf. Walker and Salt 2012) or to innovation in traditional systems based on the ability of social actors to adapt to change (cf. Armitage 2005).

Although not directly mentioning adaptive capacity, the literature addresses the role of indicators of adaptive capacity (cf. Folke et al. 2003; Armitage 2005; McCarthy et al. 2012), including traditional ecological knowledge and civic traditions of self-organization in contemporary community forestry. Self-organized traditional

forest management systems in the three countries are effective in managing small

scale disturbances, as villagers quickly detect small changes and take appropriate

actions (Juanwen et al. 2012), reflecting the importance of decentralized, flexible

institutions in adapting to disturbances found in other regions (Colding et al. 2003).

Further, villagers' site specific traditional knowledge and past experience of floods,

tsunamis, and other disasters help in maintaining and adaptation in forest systems

while enhancing livelihoods. Such results have been found in other regions (e.g.,

Agarwal 2001; Colding et al. 2003; Berkes 2007), including in Africa and South Asia

where sacred forests are protected by the local communities through forest caring

practices (Kokou et al. 2008; Singh 2013). Finally, scientific research on ecosystem

services and biological diversity is active in this region, encouraging complementarity

of knowledge systems while creating space for experimentation and adaptation.

Although learning is another key ingredient for adaptive capacity in social-ecological

systems (Gunderson et al. 2006), mention of learning to live with change and

uncertainty was limited in the reviewed articles.

Conclusion

This review synthesized the community forestry and related adaptive capacity

literature in three East Asian countries. Knowledge about the various traditional forest

management systems, including village groves in Korea, fengshui forests in China,

and satoyama in Japan, extends our understanding of community-based conservation

efforts and traditions of this region, and adds to understandings gleaned from studies

of community forestry in the West and sacred forests in other parts of Asia and Africa.

Although this review could not quantitatively assess adaptive capacity in local

communities, we characterized the indicators of adaptive capacity in East Asia

including traditional ecological knowledge, diverse knowledge systems, and traditions

of self-organization. It is noteworthy that these indicators are often discussed in terms of biodiversity conservation or sustainable forest management, but not in terms of adaptive capacity in this region. An understanding of local conditions that could determine adaptive capacity and potentially adaptation options is important in light of growing social, economic, and political pressures (Keskitalo 2013), including in East Asia. Whether local communities can choose proactive or reactive adaptation options depends not only on the capacity of people but also the site-specific context, such as the existence of infrastructure and financial resources, and on government environmental and community development policies. Further research is required to identify ways in which adaptive capacity can be increased focusing on endogenous assets like human and social capital and exogenous drivers such as incentives and institutions.

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CHAPTER 3

THE ROLE OF SOCIAL LEARNING FOR SOCIAL-ECOLOGICAL SYSTEMS

IN KOREAN VILLAGE GROVES RESTORATION[2]

Abstract

Recently, social learning has been recognized as a means to foster adaptation
to changing conditions, and more broadly, social-ecological systems resilience.
However, the discussion of social learning and social-ecological resilience in different
cultural contexts is limited. In this study we introduce the Korean Village Groves
Restoration Projects (VGRP) through the lens of social learning, and discuss
implications of the VGRP for resilience in villages impacted by industrialization and
decline of traditional forest resources. We conducted open-ended interviews with
VGRP leaders, government and NGO officials, and residents in four villages in South
Korea, and found that villages responded to ecosystem change in ways that could be
explained by the characteristics of social learning including interaction, integration,
systems orientation, and reflection. However, the processes of learning varied among
the four villages, and were associated with different levels of learning and different
learning outcomes related to changes in village groves management and governance.
The cultural and historical context can be used to help understand social learning
processes and their outcomes in the Korean cases.

Introduction

The importance of learning – and in particular social learning – finds support among researchers in the field of environmental management as a means to avert past management failures in complex social-ecological systems (Folke et al. 2003, Carlsson and Berkes 2005, Blackmore 2007, Armitage et al. 2008). Social learning has multiple definitions, which can be categorized into two broad categories: individual learning that occurs through reciprocal interaction with others and the environment (Bandura 1977, 1986) and a variety of individual and organizational collaborative learning processes, such as sustained interaction between stakeholders, on-going deliberation, and the sharing of knowledge in a trusting environment, that are specifically directed at a resource management or governance outcome (Roling 2002, Keen et al. 2005, Blackmore 2007, Pahl-Wostl et al. 2007, Cundill and Rodela 2012). De Laat and Simons (2002) used the term collective learning rather than social learning to refer to multiple individual and social processes that in addition to individual learning, have an explicit outcome such as a practice innovation or adaptation to a changing environment (Mittendorff et al. 2006). The use of the term collective learning helps to address Reed et al.'s (2010) critique of the social learning literature, i.e., that it fails to distinguish between learning processes and outcomes. However, the term social learning persists in the natural resource management literature in referring to learning at the individual and organizational level as well as the collective, resource management outcomes of such learning based on a shared understanding and new insights into problems.

Recently, scholars have explored the importance of social learning for social-ecological systems resilience, or the ability of a system to absorb disturbance and reorganize itself in the face of change (Folke et al. 2002, Gunderson and Holling 2002, Berkes et al. 2003, Berkes and Turner 2006, Fazey et al. 2007, Plummer and Armitage

2007, Krasny et al. 2010). A system in its general sense is an integrated whole whose essential properties arise from the relationship between its parts (The Open University 1999, as cited in Keen et al. 2005), while the term social-ecological system is particularly used to emphasize the integrated concept of 'humans-in-nature' (Berkes and Folke 1998). Within the systems resilience context, social learning is described as an iterative process that enhances the flexibility of management structures and a system's ability to respond to change, for example, through critical reflection and multiple-loop learning (Armitage et al. 2008, Wilner et al. 2012). Modifications made in an on-going process of reflection and collective action in resource management are expected to contribute to social-ecological resilience (Plummer and Armitage 2007), and the outcomes of such social learning processes are expected to go beyond personal transformation directed toward the evolution of social structures (Wenger 2000). However, given that there is limited empirical research on the extent to which these expectations are appropriate, it is important to understand the extent to which outcomes of social learning processes might influence social-ecological system resilience.

In addition, most studies of social learning within environmental management and social-ecological systems have focused geographically on Europe and North America with only a small number being conducted in Asia (Rodela 2013). In this study, we investigated the role of social learning in the context of management of small-scale traditional village grove restoration projects (VGRP) in South Korea. In particular, we asked: 1. To what extent do the VGRPs exhibit evidence of social learning processes, including interaction, integration, systems orientation and reflection (Plummer and FitzGibbon 2007)? 2. What are the outcomes of the social learning process in the VGRP, as evidenced by changes in single, double, or triple loop learning (Armitage et al. 2008)? Our definition of social learning draws from

natural resource management scholars and includes learning through interactions with others and the environment coupled with collective action directed at resource management or governance.

Literature Review

Social learning processes and outcomes

Social learning has been discussed as critical to addressing complex "resource dilemmas" (Blackmore 2007), often using an adaptive co-management approach (Armitage et al. 2008). Within the context of adaptive co-management, Plummer and FitzGibbon (2007) proposed an analytical framework that separates social learning as relates to adaptation, from social capital as relates to collaboration. Social learning consists of five elements: interaction, systems orientation, integration, reflection, and multiple loop learning (Table 3.1). Plummer and FitzGibbon (2007) applied this framework to the analysis of three adaptive co-management cases, which although focused on watershed management, are similar in their small-scale and ongoing collaborative processes among local leaders and stakeholders to our VGRP cases. Because of these similarities and our interest in a framework that allowed us to investigate the presence of both adaptive and collaborative processes in resource management, we decided to adapt Plummer and FitzGibbon's (2007) framework for use in this study.

Whereas Plummer and FitzGibbon's (2007) criteria are appropriate for the Korean village grove cases, their work fails to distinguish between social learning as a process (of people learning from each other) and its outcomes (the learning and associated action that happens as a result of social interactions) such as improved problem-solving capacities for participants (Merriam and Caffarella 2007, Cundill and Rodela 2012). In Muro and Jeffrey's (2008) compound model of social learning

processes and outcomes, communication and interaction among different actors are the key process features that may lead to learning outcomes such as the generation of new knowledge, the acquisition of technical and social skills, and the development of trust and relationships. Separated from these outcomes, they suggested social learning's potential contributions to collective action and social change. Although this work helps to better understand social learning claims that link learning processes, outcomes and contributions to sustainable resource management, the confusion between learning processes and outcomes persists (Reed et al. 2010).

Table 3. 1. Social learning processes and outcomes (Modified from Armitage et al. 2008; Plummer and FitzGibbon 2007).

Characteristics		Descriptions
Social Learning Processes	Interaction	Social learning occurs through interactions and communications with other interested entities. Deliberative or face-to-face interactions are highlighted.
	Systems Orientation	The process of social learning involves making connections between people and the environment.
	Integration	Innovation comes from the integration of diverse perspectives, approaches, and sources of information and knowledge.
	Reflection	Action orientation involves modifying procedures through diagnosis, designing, doing, and evaluating.
Social Learning Outcomes	Single loop learning	Fixing errors from routines
	Double loop learning	Correcting errors by examining values and policies
	Triple loop learning	Correcting errors by designing governance norms and protocols

One possibility for distinguishing between processes and outcomes is to recognize that single, double, and triple loop learning per definition are linked to the

underlying processes causing changes in actions, and thus consider them separately from the other elements of social learning (e.g., integration) that are not specifically linked to management or governance outcomes. In the context of resource management, scholars have adapted Argyris and Schon's (1978) multiple loop learning in organizational contexts to define single loop learning as incremental changes in actions without questioning the underlying assumptions, double loop learning as changes resulting from examining the assumptions that underlie our actions, and triple loop learning as changes that result from challenging the values and norms that underpin assumptions and actions (Keen et al. 2005, Pahl-Wostl 2009). Maarleveld and Dangbegnon (2002) describe multiple loop learning in terms of what is learned rather than how learning occurs whereas other authors applying multiple loop learning to resource management contexts go a step further in talking about not just learning, but also management outcomes of multiple loop learning. For example, Cundill (2010), in a study of multiple cases of adaptive co-management in South Africa, found that existing criteria used in monitoring social learning (e.g., engagement of and deliberation among relevant parties) failed to explain institutional innovation outcomes of some cases, whereas triple loop learning offered insight into the processes that led to innovation. This author suggests that triple loop learning could be used with other social learning criteria to understand outcomes, provided the two approaches to learning are not conflated. In a paper describing social learning in wildlife management, Diduck et al. (2005) also related multiple loop learning to innovative change, but focused on single loop learning practice adaptations and double loop learning such as modifying precepts of theories-in-use, rather than triple loop learning. Going a step further, Armitage et al. (2008) refer to single and double loop learning as outcomes and give examples of multiple loop learning, including hosting public open houses to gather information used to prepare "options" for a fishery

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(single loop) and double loop learning incorporating complexity, systems orientation, and public involvement in fisheries management planning, and developing and codifying principles guiding cooperation among heterogeneous actors (double loop). However, in other studies of adaptive co-management, multiple loop learning has been used as evidence of social learning (Fernandez-Gimenez et al. 2008, Plummer and FitzGibbon 2007) rather than explicitly linked to outcomes.

In this study, single, double and triple loop learning are translated to corresponding changes in resource management. We separate them as linked to outcomes of social learning, while Plummer and FitzGibbon's (2007) remaining elements (interaction, systems orientation, integration, reflection) are considered as characteristics of the social learning process. Using this framework, we hoped to understand different dimensions of social learning in-depth and as well as the role of social learning in improving resource management within a small-scale, adaptive co-management context.

Cultural contexts in the study of social learning

Although social learning has gained prominence in the resource management literature, only a small minority of studies have explored cultural influences (e.g., Rist et al. 2007, Wildemeersch 2007, Pahl-Wostl et al. 2008) or focused on Asian regions. For example, Marschke and Sinclair (2009) studied the instrumental and communicative aspects of social learning in fishing communities in Cambodia, and working in Japan, Mochizuki (2007) identified success factors of social learning in the pursuit of sustainable agriculture, including the combination of bottom-up and top-down approaches, visionary leadership provided by environmentalists, and the development of trust between environmentalists and farmers. Working in Indonesia, Armitage (2003) explored community-based conservation by linking traditional

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resource management practices to adaptive management principles, and found that mutual assistance and mutual learning in traditional practices worked as the basis of social learning in local communities. Meanwhile, Wildemeersch (2007) compared cases of social learning in Belgium and Vietnam, focusing on differences in scale and in socio-political traditions. In the Belgium cases, social learning was introduced as a new approach to environmental governance in direct multilateral negotiation, whereas in Vietnam social learning was implemented with more respect for hierarchy and tradition in expert-layperson relationships. This contrast raises questions about how social learning concepts and practices developed in one cultural setting find their way into other settings and the influence of power dynamics on learning outcomes when bringing in different knowledge holders.

Pahl-Wostl et al. (2008), for example, investigated the interdependence between social learning and culture at different scales to consider not only heterogeneous actors in a group but also the cultural differences among groups. These authors argued that in order to achieve management paradigm shifts, basic changes in belief and behavior systems are not enough; more radical changes, deeply rooted in a cultural change, are required. In this process, social learning is expected to play a role by building the capacity for communication across cultural boundaries and leading to changes in social structure. Moreover, Niewolny and Wilson (2009:259) argued that social learning discourse is framed by socially and culturally structured relations of power and that social learning does not only occur "just inside the head," but in relations of people in socially and culturally organized settings. Thus, contextual factors such as power relations and cultural differences and their influence on the subsequent learning outcomes need to be addressed both theoretically and empirically in the study of social learning (Cundill and Rodela 2012).

Background of Korean Village Groves

In Korea, villagers traditionally planted village groves (*Maeul-soop*) based on cultural guidelines (e.g., native beliefs, feng-shui, and Confucianism) when they founded a new community. Village groves were cooperatively owned, managed, and conserved by villagers and played an important role in a village's social activities by serving as a meeting and resting place. However, their main purpose was to regulate water and wind for the villages. Still today, village groves have ecological as well as socio-historical value. For example, recent research on ecosystem functions of village groves revealed they act as zones for disaster mitigation and microclimate control, and as biodiversity conservation patches (Lee et al. 2007, Hong et al. 2007).

Although many village groves have been degraded and even destroyed during the past several decades of industrialization, more than a thousand village groves remain in South Korea today providing ecosystem services to the nearby communities. However, they are threatened by recurring floods, fires, insect disease, and more severe natural disasters such as typhoons. In addition, increased human pressure has caused long-term and irreversible ecological shifts and an overall reduction in village groves' ecological resilience. Although village grove social systems have responded to ecological crises in the past, we have little information on how villages today respond to the loss of ecological resilience. Recently, the non-governmental organization *Forest for Life,* which since 1998 has been collaborating with the Korean government and companies to preserve forest resources, initiated efforts to restore degraded and destroyed village groves across South Korea.

Methods
Strategy of inquiry

A multiple case study was used to answer the research questions. The case study strategy provides an opportunity to collect comprehensive data to develop a better understanding of a social phenomenon (Walton 1992). In particular, it is appropriate when the contextual conditions are relevant to the phenomenon but the boundaries between the phenomena and context are not clear (Yin 2003). Investigating multiple cases permits comparisons of the social learning processes and outcomes across multiple sites, while increasing the robustness of the study.

Selection of the cases

Purposeful sampling was used to identify information-rich village grove restoration cases through informal interviews with key informants in the restoration projects of the Korean NGO, *Forest for Life*. Among 28 cases, four villages were selected based on the presence of village groves that: (a) recently participated in the VGRP supported by *Forest for Life,* (b) represented a common property not owned by one person or family, and (c) showed a level of involvement of local people sufficient to attract other villagers' attention and interest.

The suitability of the chosen sites, labeled A-D, was confirmed through a preliminary study in 2009. All four cases incorporate community-based village groves management practices, but show different levels of village resident self-organizing and of local government involvement in the restoration projects, and represent different rural ecosystems (Table 3.2). The villages have a relatively high number of elderly people and maintain the traditions of collective social action consistent with agrarian societies (Figure 3.1).

Table 3. 2. Ecological contexts, socioeconomic and cultural considerations, and organizations leading restoration project in four study village groves (VG).

	Case A	Case B	Case C	Case D
Ecological context & restored size	Coastal and mountain ecosystems; restored size 3, 042m^2	Deciduous broad-leaved forests; restored 12,720m^2 of 12,720m^2 VG	Riverside pine groves; restored 13,372 m^2 of 191,229m^2 VG	Pine groves; restored 6,540m^2 of 21,864m^2 VG
Social & cultural consideration	Relatively steady population; dependent on city; strong social movements; population 7358*	Increase in aging population; dependent on agricultural products; strong traditional beliefs; population 158	Mixed with newcomers; partly dependent on agricultural products; impacts of urbanization; population 535	Decrease in population; dependent on agricultural products; traditional organization for VG management; population 830
Leading organization	Led by community-based non-profit organization; cooperated with local government and local NGO; self-organizing networks	Major role of village committee; existence of VGRP bureau composed of local government, local people and advisory committee	Led by community-based non-profit organization; interference of national government institutions; problems with collective resource management	Major role of local government; minor role of traditional community-based management system

*The population is based on the administrative district of village groves in 2011.

Data collection

Data on the processes and outcomes of social learning were collected using a combination of semi-structured interviews, document review, and field visits. The first author conducted a total of 26 interviews in person and over the phone with key actors, village residents, NGO staff, scientists, and government officials who were

involved in the projects (Table 3.3). Key actors were defined as the individuals who played a lead in the VGRP; in cases A and C the key actor was a female and a male active in local governance, in case B the key actor was the village head, and in case D, the key actor was a government official. The first author began by interviewing individuals who played an active role in the restoration projects in each village, who in turn made recommendations regarding villagers to select for additional interviews. In Cases A and B, contact was first made through visiting a local community center where a number of individuals were eager to answer the interview questions; thus in these cases a group interview was conducted. Number of interviewees varied for each village, depending on specific conditions such as levels of literacy and attendance at the group meeting, as well as saturation. The goal was to solicit a deeper understanding of the cases from engaged and knowledgeable stakeholders, rather than to interview a large number of people for representative sampling (Patton 2002). Semi-structured interviews were conducted using open-ended questions based on the five social learning constructs identified above. Interviews ranged in length from 30-90 minutes allowing interviewees sufficient time to tell a story about their personal experience.

Table 3. 3. Interviewees for each village grove case.

	Case A	Case B	Case C	Case D	Whole
Interviewees	1 key actor; 3 village residents; 1 NGO staff; 1 local government officer	1 key actor; 8 village residents; 1 scientist; 1 teacher	1 key actor; 2 village residents	1 key actor; 1 local government officer	1 NGO staff; 1 social scientists; 2 ecological scientists
Total	6	11	3	2	4

Documents, including project proposals, interim and final reports, news articles, web logs, field notes and photos, and published literature, were reviewed in each case. All collected information was compiled and organized into a database. Audio-recorded interviews were transcribed and text, audio, digital photos, and PDF files were coded using QSR NVivo 10 software (QSR International Pty. 1999-2012).

Data analysis

Pattern matching logic (Yin 2003) was used to compare the empirically based and predicted patterns. Preliminary concepts of social learning gleaned from the literature (see Plummer and FitzGibbon 2007, Armitage et al. 2008) were used to label data and identify patterns. For example, interview responses and sections of documents about town meetings, workshops, and face-to-face interactions were grouped into the theme of 'interaction,' and the information about using expert knowledge and/or traditional knowledge was grouped under the theme of 'integration.' In this process, multiple data sources were analyzed by comparing identified codes in the literature with themes and patterns that emerged across data. New emergent themes and patterns also were identified for further analysis. After the initial analyses revealed preliminary evidence of social learning outcomes in two villages (A and B), additional interviews in these villages were conducted to gain deeper understanding of these outcomes.

We followed Yin's (2003) suggestions about how to ensure study quality by determining construct validity, internal validity, external validity and reliability. Construct validity was satisfied using multiple sources of evidence, such as interviews, documentary evidence and physical artifacts. Also the draft of case study analysis was reviewed by three key informants including two social scientists and one staff member of the leading NGO. For internal validity, we used pattern matching logic and for

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external validity, multiple cases were investigated using replication logic. To increase the reliability of the study, we used the same case study protocol in all four villages.

Figure 3. 1. Satellite images of village groves in Cases A, B, C, and D in a clockwise direction.

Results

We first present evidence of the interaction, integration, systems orientation, and reflection of social learning process characteristics in the four villages (Table 3.4). Then we explore evidence of multiple loop learning to examine the contributions of social learning to the management of the village grove social-ecological systems (Table 3.5).

Social learning processes in village groves restoration projects

(1) Interaction

Interaction refers to deliberative or face-to-face interactions, for example, through workshops with natural resource users during environmental decision-making

processes (Rist et al. 2007, Plummer and FitzGibbon 2007, Reed et al. 2010). In all

four cases in our study, interaction occurred through town meetings and workshops

during the VGRP. Village committees, charged with jointly making decisions

regarding any issues confronting the village, held town meetings to discuss the

problems of village groves with local residents and later to introduce the *Forest for

Life* restoration project. All key actors or individuals who took leading roles in the

VGRP in each village attended the workshops. Local government officers, local NGO

staff and landscape architects also participated in the workshops. The town meetings

and workshops focused on exchanging information and sharing perspectives while

permitting considerable dialogue among interested actors. According to a *Forest for

Life* staff person in charge of the restoration project at the national level, the number of

meetings was important for successful communication. She mentioned that "certainly

the villages that had several workshops showed more successful features, greater

understanding [of the restoration projects], and continuous management efforts after

the projects." Local people seemed to prefer direct over internet-based means of

communication, so that face-to-face interactions including both formal workshops and

informal town meetings commonly took place in all cases. For example, one

interviewee remarked "this is the first project we did together [for village groves], so

we met as much as we can. No telephones, no emails; the best way is seeing each

other face to face whenever needed. Because of that, I think, we had little problems,

proceeding smoothly as planned."

   (2) Systems Orientation

   Systems orientation refers to the interplay between social and ecological systems

(Keen et al. 2005, Keen and Mahanty 2006, Dyball et al. 2007). In all four cases,

villagers recognized the importance of the socio-cultural elements of the restoration

project, as evidenced by them recounting the history of the groves (sometimes using artifacts such as a historic map) and by their wanting to incorporate cultural features in the VGRP. For example, villagers in Case B mentioned a big fire 300 years ago as the reason for village grove construction, and Case C villagers talked about how groves were built 200 years ago as part of an irrigation and flood control project. In Case D, a traditional management system 'Sasan-Songgye' (Chun and Tak 2009) to secure the communal use of village groves dating back to the late Chosun Dynasty persists. Further, it seems that the division between social and ecological systems itself is artificial and arbitrary to villagers. Villagers commonly regard the village grove as a symbol of their home and their fate in Korea. No predetermined boundary between people and the environment is mentioned in discussions of village groves. One resident from Case D said that "for outsiders, this [village grove] looks 'green' and good, but to us [villagers] this is the place of our daily life, just part of our life like air."

Not only ecological concerns but also human interests are addressed throughout the VGRP. Villagers are interested in renewing cultural connections to their village groves through traditional ceremonies, cultural events, and artifacts (e.g., a totem pole and stone tower) in conjunction with the plantings that occur as part of the restoration projects. However, the extent of these efforts varied across the four cases. In Case B, villagers were very interested in recreating a turtle shaped stone that was previously used as an altar of worship, the loss of which in 1988 had prevented them from holding cultural ceremonies in their village grove. One local government scientist recounted how excitement around restoring the turtle stone fostered more active engagement in the village grove restoration, which she hadn't observed when the focus was solely on trees: "They are very excited about the revival of their culture through the [restoration] project. When the turtle stone was being returned to its place,

if I remember right, almost 98% of villager came out and joined. Without cultural items, it could be hard to stimulate such active community involvement."

Similarly, the revival of an annual cultural festival was included in the restoration project of Case A. In Case D, human interests were slightly acknowledged such as in villagers' demand for a pavilion nearby the village grove, but its building was not a main concern of the project.

(3) Integration

The term integration refers to weaving together diverse perspectives, approaches, and ideas to reveal the nature of the complexity and to maximize learning through differences (Dyball et al. 2007, Plummer and FitzGibbon 2007). As government officers, NGO staff, local residents, scientists and landscape architects were involved in the Korean restoration projects, multiple perspectives on village groves were revealed. For example, the landscape architects' main concern was the visual effects of restoration, while NGO staff were more interested in the community-wide impacts. One villager in Case A said that "Up to now, I thought without question that this type of work [restoration] should be done by local or city government. But after the project I came to better appreciate different roles of community, local government and scientific expertise." The NGO *Forest for Life* further recognized the benefits of and need for multiple knowledge sources in recommending that the project utilize scientists' ecological knowledge and landscape architects' technical expertise. In addition, outsider knowledge was sought out and integrated when key actors from Case A visited similarly restored seaside forests in Japan, in order to incorporate the Japanese's advanced experiences and knowledge. In Case B, local people's practical knowledge of the village grove in times past and how it changed over the years played

a role in restoration, whereas in Case D, those involved in the restoration drew on their knowledge of traditional management practices.

Table 3. 4. The characteristics of social learning processes similar to those discussed in Plummer and FitzGibbon (2007) present in Korean village groves restoration projects.

	Case A	Case B	Case C	Case D
Interaction	Town meetings, workshops	Town meetings, workshops	Town meetings, workshops	Town meetings, workshops
Systems Orientation	Relationship between people and village grove was recognized and human interests were emphasized	Relationship between people and village grove was recognized and human interests were strongly emphasized	Relationship between people and village grove was recognized but not pursued	Relationship between people and village grove was recognized and human interests were slightly acknowledged
Integration	Expert and outsider knowledge applied to restoration project	Expert and local experiential knowledge applied to restoration project	Expert knowledge applied to restoration project	Expert and traditional knowledge applied to restoration project
Reflection	Some reflection and modification of process was evident	Some reflection and modification of process was evident	Some reflection was evident but no modification	Little evidence of reflection

(4) Reflection

Reflection means carefully rethinking "the value of what we know and how we know it" through the sharing of experiences and knowledge (Dyball et al. 2007:183). Evidence of reflection regarding both technical and fundamental issues was exhibited in the cases. As an example of technical issues, the size of trees was mentioned by a

staff member of *Forest for Life* as changing directions of the restoration project. "We did not really care about the size of trees; we simply thought that the bigger one is better. However, at the workshop, one old man from [other village] disagreed with the idea of big size trees and said that 'we need a young plant which can grow up with us together. Because of strong winds in our region, trees need to be adapted to such environment, while we develop intimate relationships with those trees.'"

After that, specific guidelines on the size of trees were included in the manual for restoration projects. Case A experienced a similar issue when some villagers wanted the groves to be restored to previous conditions with big size trees. Their different ideas on the restoration process led to reflective thinking on project goals regarding whether they wanted a professionally designed park or to be more engaged in designing and managing their own village groves.

A more fundamental difference in understanding of restoration goals between local government and villagers occurred in Case B. While local government initially limited restoration goals to physical features of the groves, villagers in Case B regarded spiritual aspects of village groves as embodied in replacing the stone turtle as the subject of restoration. Local officials and project leaders recognized their different views on restoration and with the help of a local government official who supported the villagers' point of view, adjusted the project from more narrow ecological restoration to incorporate restoration of cultural features. After the project, villagers in Case B showed more interest in their village grove and visited other villages to get insights on sustainable use and management of village groves.

In Case C, disputes over property rights brought out divided perspectives on the value of village groves. More specifically, the restoration of the village grove and its designation as a national monument led to a decrease in land prices in the area surrounding the grove due to restrictions on development. The leader of the restoration

project commented: "There is a fundamental difference between the two points of view [ecological value versus economic value]. I think it is hard to overcome this gap without intentional learning experiences." While such dissension certainly raised some degree of reflection, the actors in Case C did not undertake shared actions to modify their practice. Also in Case D, villagers showed some evidence of reflection regarding planting practices and cost-cutting issues, but no critical reflection on the project itself. When asked about reflective moments related to disputes in Cases C and D, some interviewees did not want to answer the questions or just said that the project went smoothly without any big problems.

Outcomes of social learning processes

Reflection is a key process in multiple loop learning (Wilner et al. 2012). Because we found evidence of reflection only in Cases A and B, we limited this aspect of the study to these two cases.

(1) Single loop learning

Single loop outcomes were investigated through evidence of changes in village grove management practices. Informants in both cases A and B clearly described examples of adapting management practices based upon trial and error experience. In Case A, for example, villagers learned how to canvass residents' opinions regarding village grove issues (e.g., landslide damage prevention and typhoon relief efforts); the information they collected during three consecutive years of the restoration project was used by the project leader to forge agreement on the proposed restoration plan. One staff member of a village organization related how the survey improved their methods for gathering information from villagers. "First time we got the survey forms, approximately one third by visiting door-to-door, the other one third by mailing for

long distance residents, and the last one third by an outsourcing company. But second time, we did it differently. We put forward this issue as one agenda item at the town meeting and gathered 360-370 survey forms in one night. Because we did it before, the second time was much easier."

In Case B, examples of adapting management practices included deciding to utilize villagers' manpower as much as they could, in response to a perception that they had spent too much money using construction equipment. They also learned how to deal with diseased and dying trees from observing failures in the conservation of three rows of spindle trees (*Euonymus fortunei*), which were registered as a local monument. At first, villagers relied on external experts' knowledge and local government resources to protect these trees. However, after the trees died, villagers replaced the dead trees with other spindle trees from a nearby hillock. Afterwards, they were less dependent on outside resources and utilized their resources to care for village groves.

(2) Double loop learning

We used evidence of changed policies and goals as well as changes in stakeholder behavior (cf. Armitage et al. 2008, Pahl-Wostl 2009) as the evidence of double loop learning outcomes. In Case A, results of the restoration project inspired change in local government policy. The project leader of the village organization in this case remarked that "the local government did not pay attention to what we did in the beginning of the project. However, when they saw changed behaviors of citizens who voluntarily took care of the restored site with shovels, they decided to support our efforts with the city policy, at least here in this city. So, they allocated some local budgets for installing leisure facilities in this site."

After the restoration project, some residents organized a social gathering for the management of restored sites. These formal and informal behavior changes were facilitated by changed views on the value of village groves and on the power of collective action. One staff member of the village organization mentioned that the most difficult part of the project was changing people's perspectives on the importance of the groves, and that after the restoration people became more engaged, which seemed to lead to other tangible results such as citizen's active involvement and support of local government.

In Case B, the project goal was changed from ecological restoration to cultural and ecological restoration based upon a compromise between local residents and local government. One local government scientist who participated in planning the project recounted: "I was more interested in ecological features of village groves. At first, I just planned where to plant trees and what to plant in village groves through the project. But now, after meeting people who have different perspectives and after learning about why villagers built village groves, [I realized that] there is something more than ecological meanings in village groves. Cultural meanings are strongly embodied in village groves."

Such changed views on the part of key actors influenced the direction of the project, from ecological restoration to cultural and ecological restoration. However, unlike Case A where local government changed policies to incorporate funding for village grove restoration, double loop learning outcomes in Case B did not lead to changes in government policies.

(3) Triple loop learning

We found evidence of triple loop learning outcomes, defined as changes that result from challenging the values and norms that underpin assumptions and actions, only in

Case A, which instituted a new structure of governing systems for reconstructed village groves. After two years' experience with the restoration project in various sites in this city through which villagers, local government, and *Forest for Life* learned how to work together, citizens in Case A gained enough confidence to start rebuilding seaside village groves in a vacant space created by Typhoon Rusa. The leader of the village organization confirmed their willingness to engage and their pride in the collaborative work as follows: "We are very proud of what we have done. We also have confidence in doing another work, because we did it before…we could finish the former project because we did it together." The active involvement of local people coupled with the typhoon disaster made Case A unique among the restoration cases across Korea.

Local government of Case A had originally planned a parking lot in the empty space. Instead, influenced by the nationwide restoration movement, the local government partnered with *Forest for Life* to support construction of a new village grove by local residents and professional landscapers. One local government officer remarked, "Usually in such cases, the area is used as a parking lot ... It is good to see that many people enjoy the site having a rest time in the grove. After that, we (local government) have a responsibility to manage the area, along with the help of the Community Center, and financially support it through the parks and landscape management budget of the local government." The local government assumed property rights for what prior to the typhoon had been private land, registered the grove as a park, and set up a new governing structure to manage the park that encouraged inclusion of villagers' views and collaboration with a community organization. Change in the underlying governance system in Case A provided an example of triple loop learning that was unique among the four cases.

Table 3. 5. Social learning outcomes with the evidence of changes related to multiple-loop learning in two village groves restoration projects.

	Case A	Case B	Case C	Case D
Single loop learning	A problem with the size of trees was solved by communication and compromise; means of collecting survey forms adapted	Learning how to deal with sick trees; villagers' manpower and resources were used when needed	N/A	N/A
Double loop learning	Local government policy was changed	Restoration goal was revised	N/A	N/A
Triple loop learning	A new type of village grove was created along with new governing structure	(No evidence found)	N/A	N/A

Discussion

In applying the framework of social learning processes and outcomes to village grove restoration in four Korean villages, we found varying evidence of social learning elements and outcomes, which can be related to differing social and ecological changes in the four villages and to aspects of Korean culture.

The nature of social learning in Korean village groves restoration

The finding that interaction as well as integration of multiple perspectives and knowledge occurred in this study suggests that, similar to Plummer and FitzGibbon's (2007) and other studies, social learning processes in the Korean VGRP are consistent with a broader literature in communicative action (Habermas 1987), and communicative learning through interaction (van der Veen 2000). However, the Korean cultural and historical context was important in understanding social learning,

and was evident not only in the integration of traditional knowledge, but also in how such knowledge may have influenced systems thinking. Korean villages have a long history of linking social and ecological processes in village forest management. According to Chun and Tak (2009:2024), "Songgye [traditional Korean village forest management system] was not simply an organization for stewarding local forests, but it played an essential role in the social life of the local community. It wove the social fabric of the village to keep the community united and to help each other in various agro-forestry activities." In our study, linking of social with the ecological elements of the village groves was most evident in Case B, where the focus of the project was the restoration of a cultural symbol (stone turtle) that had once served a role in cultural activity in the village. This interweaving of social and cultural aspects is similar to that of the *satoyama* system in Japan (Takeuchi et al. 2003), *muyong* system in the Philippines (Butic and Ngidlo 2003), and *kebun* system in Indonesia and Malaysia (Christanty et al. 1986).

The more limited evidence of critical reflection in the Korean VGRP might be explained in part by cultural factors. Similar to Asian country in the comparative study of social learning in the North and the South (Wildemeersch 2007), the Korean villagers in the cases with less critical reflection (C and D) might feel uncomfortable in situations where they are asked to solve problems or modify procedures by reflecting on conflicting perspectives, due to high respect for traditions and authority. When asked about reflective moments related to disputes, some interviewees refused to answer the questions (Case C) or responded that everything was going okay with them (D). Several villagers also said that they did not know many things like scientists did so they just followed experts' advice on project implementation. Although interactions with local government, the NGO, and expert group enabled villagers to realize the value of village groves, Korean villagers still relied on authority in many

such interactions.

Despite high respect for authority, similar to many Western countries, Korea has a tradition of civil society, for example in the Songgye village forest management system. Although the Songgye systems and civil society more broadly were eroded during the Japanese occupation in the early 20th century and afterwards through industrialization and urbanization, the VGRP spearheaded by the NGO *Forest for Life* beginning in 2003, and involving significant participation of village heads and residents in some villages, may be evidence of an increasing role of civil society in Korea. An increasing level of civil society activity may have not only enabled the VGRP but also created the conditions that fostered social learning, including integration and critical reflection (cf. Plummer and FitzGibbon 2007, Whitelaw and McCarthy 2008, Olsson et al. 2004, Maloney et al. 2000). For example, in Case B, the local government scientist transformed her thinking about the goals of the project (from ecosystem to cultural value based), and in Case A, critical reflection among government officials enabled changes in land use (from planned parking lot to village grove) and governance systems (from private property to local park).

The role of social learning for social-ecolgocial systems resilience

Social learning incorporates not only reflection, but also a planning process and action that lead to desirable changes and sometimes transformative outcomes in resource management (Keen et al. 2005, Dyball et al. 2007, Wilner et al. 2012). In the face of change, social learning is expected to enhance the flexibility of management structures and systems' ability to respond to change for systems resilience, for example, through multiple loop learning (Plummer and Armitage 2007, Loeber et al. 2007, Armitage et al. 2008). Although learning processes and their associated outcomes start at the individual level and lead to changes in individual understanding,

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they may scale up and result in local or system-wide change (Reed et al. 2010, Rodela 2011).

We found evidence of more transformative changes or double loop learning outcomes at the individual level in Cases A and B, in which VGRP participants, including villagers, NGO staff, and external experts, changed their perspectives on the benefits of collective action and on the value of village groves. However, systemic level changes were not easy to observe in this study. Only in Case A was there evidence of more significant changes in the social-ecological system, as evidenced by the villagers self-organizing efforts to restore two village groves and create a new one following a typhoon. Their efforts resulted in a new governance structure for reconstructed village groves that encouraged inclusion of villagers' views. In that polycentric governance systems are an attribute of resilient social-ecological systems (Walker and Salt 2006), this result suggests that at least in some cases, the changes that occur through VGRPs may contribute to social-ecological systems resilience. However, a need exists to explore the differences among the cases with a focus on enabling factors that could influence larger system-wide changes and resilience.

In the resilience context, changes at smaller scales such as those observed in the Korean village groves can enable, yet may be constrained by, transformations at larger scales, (Gunderson and Holling 2002, Folke et al. 2010). Studying stewardship practices in urban areas, Krasny and Tidball (2012) have hypothesized that small-scale, self-organized restoration or civic ecology practices, such as the Korean VGRP, may result in positive, expanding feedback loops between social capital, natural capital and ecosystem services, and thus may have impacts that scale up through the larger social-ecological systems in which they are embedded. The changes at the level of a village – village A in our study – suggest shifts not only in the physical aspects of the village groves, but also in associated organizational and institutional arrangements.

Triggered by the typhoon disaster, social and ecological changes in Case A show the possibility of system-wide shifts for 'deliberate transformation' that involve processes of breakdown and recovery for desirable changes while paying attention to the linked and nested systems (Folke et al. 2010).

Conclusion

The term social learning can easily lead to confusion as it means very different things to different people. In the field of environmental management, social learning means not just collaborative learning processes through interaction and communication, but also the management outcomes of such processes based upon a shared understanding and common interests. In applying natural resource management frameworks of learning processes and outcomes to Korean village groves restoration efforts in four different villages, we found that multiple elements of social learning were present, but did not always lead to management outcomes, viewed through the lens of multiple loop learning. The findings of this study showed different dimensions of social learning in the cultural and historical context of Korea.

By distinguishing social learning outcomes from the characteristics of learning process, we hope to shed light on the vague notion of social learning. In particular, focusing on multiple loop learning as an indicator of the outcomes of social learning can provide insights into the linkage between perspective transformations and social changes in nested systems. Although it is often expected that social learning will lead to sustainable behaviors or social actions (Pahl-Wostl et al. 2008), the empirical evidence presented in this study shows that such changes cannot be guaranteed. Further research on enabling/disabling factors based upon contextual factors is needed to develop more effective social learning interventions and foster substantive learning outcomes.

Our study within the Korean context suggests conditions for social learning that could benefit studies of social learning more broadly. It is notable that the VGRP was evidence of a national movement linking civil society activity to environmental stewardship, bearing similarity to a civic environmental movement in the West characterized by collaboration among communities, interest groups, and government agencies, and offering an alternative to more adversarial forms of environmental activism (Sirianni and Friedland 2001). Whereas the ability of Korean villagers collaborating with the national NGO to restore local village groves is impressive, it remains to be seen whether local VGRPs are part of a larger restoration movement linked to increased civic society activity in Korea, and whether they will have significant implications for larger systems transformation. Further studies are needed to explore impacts of VGRPs more broadly and deeply for the systems resilience.

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CHAPTER 4

THE ROLE OF LOCAL PEOPLE FOR ADAPTIVE CO-MANAGEMENT

IN KOREAN VILLAGE GROVES[3]

Abstract

Adaptive co-management has been proposed as a means to navigate social-ecological dynamics for resilient systems. However, our understanding of how local people, their relational structures and functional roles in networks contribute to the establishment of adaptive co-management is limited in locally-based resource management. This study introduces the Korean village groves restoration projects to investigate the role of local people, focusing on bridging organizations and contributions to managing village groves. I performed qualitative network analysis and content analysis using data collected from key informant interviews, document reviews, and field visits in the four village groves restoration projects. Along with relational patterns of local people, multiple functions of bridging organizations, such as accessing critical resources, identifying common interests, addressing conflicts, building local capacity, and enhancing mutual trust among villagers, varied among the four villages. The findings give insights on local civic efforts in the Korean context thus contributing to our understanding of emergent adaptive co-management and further ongoing engagement in local resource management.

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[3] This chapter will be submitted to a journal, with M. E. Krasny as a co-author.

Introduction

Dating back to at least the 18th century, villagers in Korea have planted and managed village groves as a form of self-governed commons (Kim and Jang 1994; Yu et al. 2014). Responding to natural disturbances such as strong winds and floods, villagers planted these small forest patches adjacent to their villages and along river banks and maintained them following village rules and regulations based on cultural practices and beliefs (Chun and Tak 2009). In this process, villagers acted as 'stewards,' who protect and manage groves, and as 'knowledge carriers,' who hold traditional forest-related knowledge and memory (Hong and Kim 2011).

More recently, changes and disturbances have brought new challenges to both village groves and villagers. Many groves were destroyed and degraded during industrialization and development, while villages are experiencing an aging, declining population and devaluing of traditional culture (Lee and Krasny 2016). Considering village groves' historical, cultural, and ecological value, better management and policy tools are needed to deal with change in the village grove social-ecological system.

For resilient social-ecological systems, not only immediate responses to change but also long-term adaptive strategies to cope with ongoing disturbances, such as through adaptive co-management, are critical (Berkes and Jolly 2001; Fabricius et al. 2007). Adaptive co-management emphasizes not just learning-by-doing or adaptation, but also collaboration, including the importance of bringing together different actor groups and of horizontal and vertical linkages in accessing diverse information, knowledge, and resources (Olsson et al. 2004a; Berkes 2009; Plummer 2009). Further, by occupying central or bridging positions in networks, actors and actor groups can facilitate or block the flow of information, knowledge, experiences and resources, and thus have an impact on management outcomes (Prell et al. 2009; Crona and Parker 2012; Kowalski and Jenkins 2015; Berdej and Armitage 2016).

Because villagers have traditionally managed village groves, considering their role is essential in creating the conditions necessary for adaptive co-management. Further, the types and numbers of organizations and agencies involved in village grove restoration have recently increased, demanding that co-management encompass diverse groups. Different village grove management outcomes among villages (Lee and Krasny 2015) also raises the question of how and by whom village groves are being managed. In fact, the effectiveness of resource management may depend on the structural position and functions of actors or actor groups within a village grove management network (cf. Bodin et al. 2006; Crona and Hubacek 2010).

This study aims to investigate how local people, their relationships with each other, and their roles contribute to the development of adaptive co-management of village groves in Korea. We first identify actors and actor groups and their relational networks, and then explore the roles of key actors, focusing on bridging organizations and contributions to the management of village groves. More specifically, we ask:

a. How do local people connect with each other in village groves restoration projects? Who are the key actors or actor groups who bridge to others in the networks?

b. What functions do those key actors and actor groups in bridging positions perform in the restoration projects? How do bridging organizations contribute to the development of adaptive co-management of village groves?

Prior to addressing these questions, we briefly review the literature on adaptive co-management and the role of local people, highlighting bridging roles of individuals and organizations. We then present four cases of village-based bridging organizations in the context of Korean village grove restoration projects. The findings have implications for researchers and practitioners interested in adaptive co-management by

local people and who seek to explore the contributions of local stewardship groups to more flexible and resilient management systems.

Literature Review

Below I review the features and challenges of adaptive co-management with particular reference to comparisons with adaptive governance. I then draw on studies of social networks and resource management to discuss the functional roles and structural positions in networks of local people engaged in adaptive co-management.

Adaptive co-management

In a world characterized by rapid change, uncertainty, and complexity, scholars of environmental management have turned to adaptive co-management, which is expected to improve our understanding of and ability to respond to complex social-ecological feedbacks including when change is abrupt and disorganizing (Folke et al. 2002; Olsson et al. 2004a; Armitage et al. 2009). Adaptive co-management is the combination of the iterative learning characteristic of adaptive management and the linkage characteristic of collaborative management (Olsson et al. 2004a; Armitage et al. 2007). The process of adaptive co-management includes learning-by-doing, integrating multiple knowledge systems, emphasizing flexibility of management structures, and advancing collaboration through power sharing at multiple scales (Armitage et al. 2007). Using an evaluative framework that encompasses evidence for linking, shared understanding and action, improved decision-making, and learning, Plummer and FitzGibbon (2007) demonstrated adaptive co-management to varying extents in three stream management cases. Others have pointed out the limitations of adaptive co-management in addressing 'super wicked problems' (Gondo 2011; Baird et al. 2016) and in pointing to the lack of outcomes monitoring among small-scale

management practices needed to provide the information necessary for adaptation (Silva and Krasny, 2014).

Adaptive co-management is sometimes used interchangeably with adaptive governance, or as a mechanism for making adaptive governance operational (Folke et al 2005a; Cundill and Fabricius 2010; Plummer et al. 2013). Although close functional relationships between adaptive co-management and governance exist, adaptive co-management can be thought of as a suite of nested processes based on collaboration and learning specifically for resource management objectives (Folke et al. 2005a), while governance represents "the set of regulatory processes through which political actors influence environmental actions and outcomes" (Lemos and Agrawal 2006, p.298). In short, adaptive governance focuses on a range of human interactions among actors, networks, organizations, and institutions (Gunderson and Light 2006; Chaffin et al. 2014), whereas adaptive co-management focuses on the interface of people and resources (Plummer and Armitage 2007; Armitage et al. 2009) and pays less attention to embedded socio-political contexts that shape and are reflected in resource management (Armitage et al. 2007). Thus, political, economic, cultural, as well as ecological contexts within which management takes place need to be considered in understanding the outcomes of adaptive co-management.

The role of local people in adaptive co-management

Scholars have recognized the potential as well as the challenges of involving multiple actors in governance and other aspects of adaptive co-management (Olsson et al. 2004b; Folke et al. 2005a; Berkes 2009; Plummer et al. 2013). One way to understand these challenges is through studies of the diverse roles of actors and how they share power and responsibility (Plummer et al. 2013). Actors assume various roles in adaptive co-management. For example, actors can be carriers of site-specific

knowledge and ecological memory over generations, and thus can detect changes and provide valuable information about social-ecological changes at the local level (Colding et al. 2003; Agrawal 2008; Yuan et al. 2012). Actors in local communities can also shape the capacity of ecosystems to sustain ecosystem services (Folke et al. 2005b; Reyers et al. 2013; Krasny et al. 2014). For example, Krasny and colleagues (2014) emphasized the role of community gardening, tree planting, and other urban stewardship volunteers in providing ecosystem services by creating green infrastructure, and also proposed that the act of stewardship itself could be considered a cultural ecosystem service. The involvement in such volunteer environmental stewardship or civic ecology practices can be understood as a form of individual expression of a desire to play an active role in one's community and local environment (Campbell 2014; Fisher et al. 2015).

Drawing on the work of Olsson et al. (2004b) and Folke et al. (2003), Plummer (2009) presented social roles of actors and actor groups within the process of adaptive co-management as knowledge carriers, interpreters, networkers, stewards and leaders, visionaries and innovators, entrepreneurs, and followers. In addition to such functional roles, structural positions of actors and actor groups shape patterns of adaptive co-management. Structural positions include bridging and boundary organizations that facilitate collaboration among multilevel actors and adaptation through information flow in networks (Hahn et al. 2006; Olsson et al. 2007; Berkes 2009; Plummer et al. 2013; Berdej and Armitage 2016). Bridging organizations connect actors or groups who would otherwise not be linked (Bodin and Crona 2009), whereas boundary organizations link researchers and decision makers (Cash and Moser 2000). Both types of organizations seek to link actors or groups across sectors and hierarchical levels, but bridging organizations are considered to have a broader scope (Hahn et al 2006; Olsson et al. 2007; Crona and Parker 2012) because they involve local people

and communities. Such networking also triggers additional functions, including building trust, addressing conflict, accessing information and resources, sense-making, social learning, and building visions and goals (Hahn et al. 2006; Berkes 2009). The network position of actors and actor groups can influence the flow of knowledge, information, and resources (Granovetter 1973; Klijn and Edelenbos 2007; Crona and Parker 2012), including by blocking new ideas and initiatives (Prell et al. 2009; Bodin and Crona 2009). Thus, bridging organizations as well as bridging functions by individual actors or groups are important to understand opportunities and challenges of local people in developing, facilitating, and sustaining adaptive co-management systems.

Background of village groves restoration projects

In this study, we focus on four Korean village groves restoration projects, all supported by the Korea Forest Service (KFS) between 2004 and 2007. Among 1335 groves remaining in South Korea, 77 had been restored as of 2015, mostly in southern and eastern Korea. These restoration projects aim not just to recover the ecological status of village groves but also to renew sociocultural values embedded in community forest systems, and to provide ecosystem services to nearby communities and local people.

Village groves were established mostly during the late Chosun Dynasty when villagers secured the communal use of forest resources and established their own rules and regulations based on cultural principles from Confucianism and feng-shui (Chun and Tak 2009). In response to loss of village groves as a result of the Japanese occupation and Korean War, and more recently industrialization, urbanization and globalization (Lee and Krasny 2016), a civic movement emerged in the late 1980s. This movement reflected growing interest in quality of life and green spaces and led to

environmental restoration efforts. According to an analysis of forest related news articles, Korea's forest management has shifted from extensive reforestation in the 1960s and management of planted forests in the 1970s, to reflection on management failures in the 1980s, and an emphasis on environmental issues, amenity value, and outdoor activities in the 1990s (Chun 2005).

Since its founding in 1998, *Forest for Life* has developed a positive reputation for its work in forest conservation and the restoration movement, and has worked closely with a wide range of partners including KFS and local citizens through its fourteen regional branches across the country. Starting in 2004, the NGO *Forest for Life* became involved in the village groves restoration projects and assumed the role of management implementation organization for KFS until 2007. Whereas KFS provides financial resources to local villages, *Forest for Life* acts as an 'intermediary institution' (cf. Lee 1998) by selecting restoration sites, delivering financial resources, conducting restoration workshops, and providing expert advice to local communities based on their resources and networks. A key *Forests for Life* staff member mentioned, "we are just intermediaries in the projects and the main actors are local residents and local NGOs" (personal communication, July 2, 2009). *Forest for Life* has developed specific guidelines for local collaboration in village groves restoration, which were adopted as formal guidelines by KFS. For example, the guidelines encourage the participation of locally-based non-profit organizations and local people in the restoration process, and reviving cultural ceremonies and local festivals traditionally held in village groves (KFS VGRP Guidelines 2013). Also, KFS and an advisory committee consisting of university researchers and civil society actors decide on potential restoration sites each year, and the villages where villagers demonstrate shared agreement with multiple participants on their own restoration goals and willingness to participate are selected for actual restoration projects (KFS 2015). In

short, KFS and *Forests for Life* are national actors in village grove restoration but consider the role of local governments and civic society groups critical to achieve restoration outcomes.

Methods

This study adopts a case study approach to investigate functional relations of local people in the context of Korean village groves restoration projects. The case study strategy is widely used in studies of social-ecological systems given complexities and unclear boundaries between contexts and the phenomenon being investigated (Yin 2003; Schouten et al. 2009). Among the many local villages participating in village groves restoration projects, I purposefully chose four villages to understand the restoration projects in depth based on three criteria: (1) restoration projects associated with *Forest for Life*, (2) demonstrated level of involvement of local people sufficient to examine social relations among them; and (3) village groves were a common property not owned by one person or a family. The local village, defined here as a small group of people who share a common place, rules-in-use, norms, and resources like village groves, serves as the unit of analysis (Table 4.1). Additional information on village selection and field methods are presented in referred to as A, B, C, and D and detailed field methods are described in Lee and Krasny (2015). Here, I present methods and analysis focused on network sociograms and functions of bridging actors and actor groups.

Data collection

I collected qualitative data using a combination of document reviews, key informant interviews, and field visits. First, I conducted an extensive review of related documents, including policy briefs, formal and informal project reports, newspaper

articles, websites, published literature, field notes, and photos. Documents about the village groves restoration projects funded by KFS are easily accessed because of the principle of public access to official records in Korea. Data collection initially focused on information related to village groves restoration projects broadly, followed by a specific search on the four cases. To gather accurate information on the condition of four sites, I conducted one-three field visits per site.

Table 4. 1. Social and ecological conditions in villages A, B, C, and D.

	Village A	Village B	Village C	Village D
Ecological context and restored size	Coastal and mountain ecosystems; restored size 3,042m^2	Deciduous broad-leaved forests; restored 12,720m^2 of 12,720m^2 VG	Riverside pine groves; restored 13,372 m^2 of 191,229m^2 VG	Pine groves; restored 6,540m^2 of 21,864m^2 VG
Social and cultural consideration	Relatively steady population; dependent on city; strong social movements; population 7358*	Increase in aging population; dependent on agricultural products; strong traditional beliefs; population 158	Mixed with newcomers; partly dependent on agricultural products; impacts of urbanization; population 535	Decrease in population; dependent on agricultural products; traditional organization for VG management; population 830
Leading organization	Led by village-based organization; cooperated with local government and locally-based NGO; self-organizing efforts awarded 'best citizen autonomy'	Major role of village restoration committee and local government; existence of VGRP bureau composed of local government, local people and advisory committee	Led by village-based organization; interference of national government institution; different views to village grove management among local people	Major role of local government; minor role of traditional community-based village grove management system

*The population is based on the administrative district of village groves in 2011.

To develop a rich understanding of the cases from knowledgeable informants, I conducted a total of fourteen semi-structured interviews in person and over the phone with village project leaders of each site, government officials, NGO staff, ecologist, sociologist, and village grove expert. These key informants have firsthand knowledge and experiences about the restoration projects in the four villages. Number of interviewees varied for each village, depending on specific conditions such as the level of participation and accessibility (Table 4.2).

Table 4. 2. Interviewees for each village case.

	Village A	Village B	Village C	Village D	Whole
Interviewees	1 project leader; 1 local government officer; 1 local NGO staff	1 project leader; 1 local government officer; 1 village grove expert	1 project leader	1 project leader; 1 local government officer	1 NGO staff; 2 social scientists; 2 ecological scientists
Total	3	3	1	2	5

Data analysis

I compiled the data and organized them into an NVivo database for network sociograms to display how specific actors and actor groups are related to each other. Audio-recorded interviews were transcribed and text, digital photos, and PDF files were coded to map and measure networks of local people using QSR NVivo 11 Plus software (QSR International Pty Ltd.). Although network data are predominantly collected using quantitative surveys with large data sets, relational data can also be generated by qualitative methods like observations, interviews, and archival research (Heath et al. 2009; Edwards 2010). Several scholars have converted narrative interview data into numerical data for network analysis to examine both networks and

contexts in which networks are embedded (Mercer 2007; McKether et al. 2009; McKether and Friese 2016), and also to identify underlying data structure through clear data visualization (Contandriopoulos et al. 2017). In this study, every actor 'names' (e.g., individual names and organization names) and 'relationships' (e.g., who works for whom, who financially supports whom, who cooperates or collaborates with whom, etc.) emerging from the interviews, project reports, news articles, and field notes were coded in textual data and then converted into a format readable in NVivo using vertices (names) and edges (connections) that can also be represented in a visual network sociogram. I jointly analyzed both individual actors and actor groups so as to maintain meaningful structural features of the data (cf. Borgattie and Everett 1997; Everett and Borgatti 2013). The individual actors and actor groups are embedded in organizational structures carrying out social roles based on their positions.

Network analysis was focused on the measures of centrality including degree and betweenness centrality. Degree centrality was calculated by counting the number of 'names' that were directly connected to an actor or actor group, and betweenness score was calculated as a proportion of the shortest paths between two other actors or actor groups, based on the Brandes (2001) algorithm. Degree centrality is generally used to determine which 'names' are popular in spreading information and influencing others, while betweenness centrality is used to describe bridging organizations and bridging ties in networks (e.g., Prell et al. 2009; Crona and Parker 2012; Berdej and Armitage 2016). However, this study has a limitation in that network analysis could not capture the entire network because of the potential for 'missing data' in each village (cf. Kossinets 2006). Thus, network sociograms did not show all possible connections and network flows, but presented connections and relationships that were prominent in the data collected.

I was interested in not only network structure, but also functional roles that actors and actor groups played in networks, especially bridging organizations. I analyzed interview transcripts, project reports, news articles, websites, published literature, and field notes using qualitative content analysis, which implied the iterative and reflexive analysis of documents (Altheide 1987). I created thematic categories for meaningful variables and patterns both a priori and through the coding process to examine functions of bridging entities. Codes generated from the literature included trust-building, sense making, learning, networking, conflict resolution, and common vision (e.g., Hahn et al. 2006; Berkes 2009), whereas emergent codes included problem-solving, capacity-building, bonding ties, and traditional knowledge.

I used methodological triangulation (cf. Patton 1999) of document reviews and non-participant observation fieldwork combined with key informant interviews to help ensure validity. I also used member checking of interview narratives and confirmed preliminary results with one local and two national members in the village groves restoration projects (cf. Creswell 2012).

Results

Below I first describe relational patterns of local people and identify influential and bridging actors and actor groups in the four village groves restoration projects through network sociograms. Next, I focus on bridging organizations, describing their functional roles and contributions to of village groves management.

Networks in the village groves restoration projects

Multiple actors and actor groups are involved in the restoration projects in each site, some of which act as bridging individuals and organizations (Tables 4.3-6). Network structure for restoration efforts varied among villages (Figures 4.1-4).

In village A, six organizations (KFS, local government, *Forest for Life*, two locally-based NGOs, and one village-based citizen organization), three local groups (volunteer groups, senior citizens and landscape architects), and two individuals who authored the project report were identified as active actors and actor groups in the restoration project (Table 4.3). Among them, a village-based citizen organization, Village Residents' Association, showed the highest level of degree and betweenness centrality, followed by an individual actor Mrs. Park (Table 4.3, Figure 4.1). Mrs. Park initiated the restoration project in this region in collaboration with a locally-based environmental NGO. She pointed out that it was also important to collaborate with the district-level Village Residents' Association for successful restoration since village residents directly influenced and were influenced by the management of village groves in their district. In fact, the Village Residents' Association had local connections with volunteers, senior citizens and other groups who planted trees and took care of the restored grove. Local government also supported the project financially and helped with administrative procedures related to the restoration work. Here, Mrs. Park, who was a former member of city council, was influential in changing local government from mere spectators to supporters of citizens' environmental activities, based on her position between government and civil society. The Village Residents' Association developed further links through Mrs. Park, such as with landscape architectures who carried out landscaping work, and with national institutions like *Forest for Life* and KFS to access external resources. By integrating connections of Mrs. Park and the Village Residents' Association, village A was able to involve multiple individuals and effectively accomplish the restoration project. Village A was also able to facilitate the involvement of eight landowners in order to get all residents' agreement on the project. In short, through their structural positions in the network, the Village Residents' Association and Mrs. Park had ample opportunities to influence others and

control the flow of information and resources for the restoration project (cf. Bodin and

Crona 2009).

Table 4. 3. Actors/actor groups and centrality measures, village A.

| #	Actors/Actor groups	Degree Centrality	Betweenness Centrality
1	**Village Residents' Association** – Citizen organization that addresses issues related to resident welfare	7	**37.67**
2	**Mrs. Park** – Member of locally based environmental organization and former member of city council	6	**35.67**
3	Forest for Life – National NGO dedicated to preserving forests	3	18.00
4	Local Forest for Life – Local branch of Forest for Life	4	11.33
5	Local government – The Donghae city government	3	3.33
6	Local NGO – Locally-based environmental organization	2	0.00
7	Senior citizens – A group of elders living near the groves	1	0.00
8	Local government official – Public official in charge of city park management	2	0.00
9	Korea Forest Service – National government managing forests and forest resources	1	0.00
10	Local volunteers – Civic volunteering group with local NGO	2	0.00
11	Landscape architects – Locally-based working groups	1	0.00
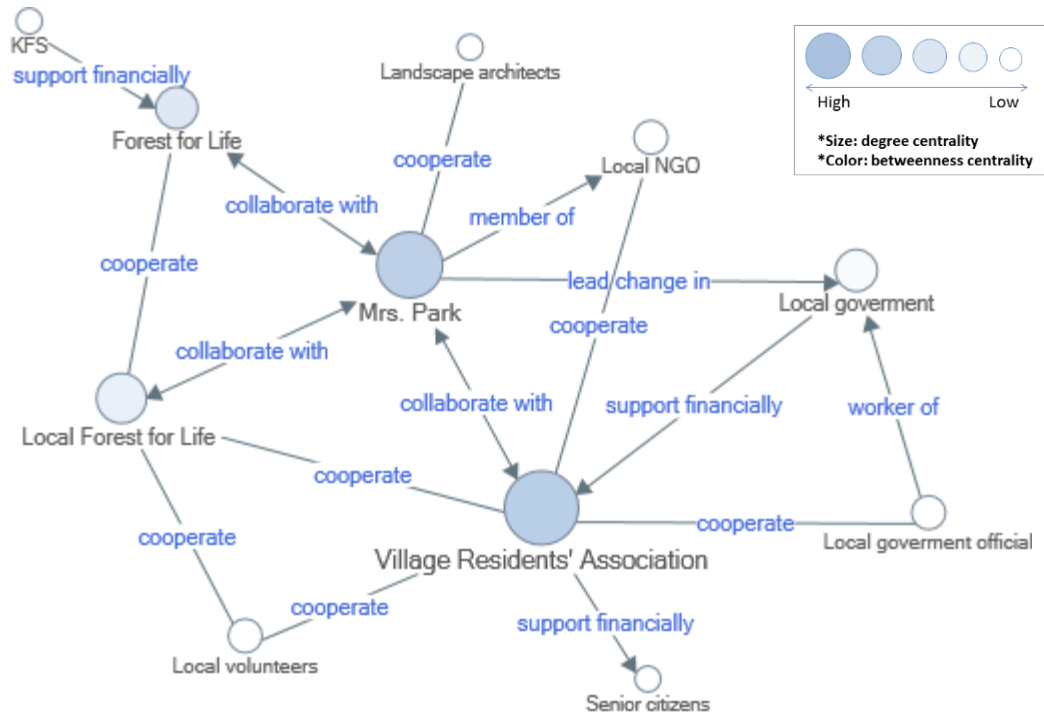
Figure 4. 1. Village grove network sociogram, village A. Larger size nodes represent individuals or organizations with higher relative degree centrality (more connections in the network) and darker node color represents higher betweenness centrality (more communication paths between two others in network).

In village B, four organizations (KFS, local government, *Forest for Life,* and one village-based citizen organization), two groups of people (village grove volunteer experts and landscape architects), and four individuals were identified as active actors and actor groups involved in the restoration project (Table 4.4, Figure 4.2). More individual names showed up than in the other villages, which might be related to the fact that this village was the smallest of the four cases. During the interviews, villagers mentioned other people's names instead of their positions or associations as in the other three cases. Prior to the restoration project, a newly composed Village Restoration Committee with 11 members was formed, to meet the KFS requirement that restoration funds must be awarded to a local group. Among them, three individuals' names stood out in the reviewed documents and interviews as the former (Mr. Jeon and Mr. Lee) and current village heads (Mr. Park). The Village Restoration Committee showed relatively high degree centrality and multiple connections with other villagers. However, the highest betweenness centrality was found in Mrs. Seong who worked for local government as a forestry adviser. She proposed village B restoration project to KFS, in consultation with village grove experts at a local cultural center, who had researched and published a book on village groves funded by local government (Park and Lee, 2007). Mrs. Seong also reached out to local people to assess village needs and conditions, and connected villagers to *Forest for Life* and KFS. Mrs. Seong and the Village Restoration Committee also included the restoration of cultural ceremony in the project, which triggered active participation of villagers who for years had expressed interest in cultural revival of forest-related ceremonies. In

this process, Mrs. Seong was 'between' local government and villagers and was able to deliver villagers' opinions to local policymakers.

Table 4. 4. Actors/actor groups and centrality measures, village B.

| #	Actors/Actor groups	Degree Centrality	Betweenness Centrality
1	**Mrs. Seong** – A specialist adviser working for the local government	5	**35.67**
2	**Village Restoration Committee** – Citizen organization that addresses village grove issues	6	**29.67**
3	Forest for Life – National NGO dedicated to preserving forests	2	16.00
4	Mr. Jeon – A farmer and the former head of the village	4	7.33
5	Village grove experts – Volunteer researchers in a local cultural center	3	3.33
6	Korea Forest Service – National government managing forests and forest resources	1	0.00
7	Local government – The Jinan county government	2	0.00
8	Mr. Lee – A farmer and the former head of the village	3	0.00
9	Mr. Park – A farmer and the current head of the village	3	0.00
10	Landscape architects – Locally-based working groups	1	0.00
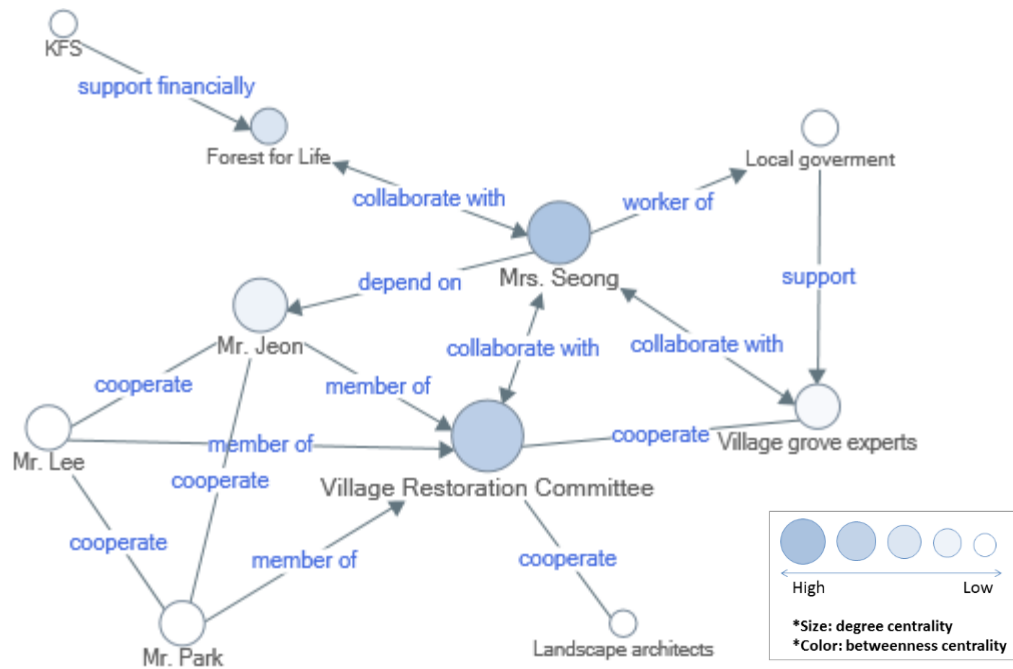
Figure 4. 2. Village grove network sociogram, village B. Larger size nodes represent individuals or organizations with higher relative degree centrality (more connections

in the network) and darker node color represents higher betweenness centrality (more communication paths between two others in network).

In village C, *Forest for Life*, two national government agencies (KFS and Cultural Heritage Administration), five local groups (Local Youngmen's Association, local businesses, local forestry association, local government, and landscape architects), and two individuals were associated with the restoration project (Table 4.5, Figure 4.3). Local Youngmen's Association, composed of relatively young people (40s and 50s) in rural areas who do community service, showed high degree and betweenness centrality, followed its secretary-general Mr. Lee, who proposed the project to KFS, thus connecting local groups with each other and to *Forest for Life* and KFS. The Association tended to form these connections across sectors and levels with regard to resource sharing and funding. For example, it involved the local forestry association, which provided volunteer workers, and local businesses which provided financial resources for a festival held in the village grove. They also had links with the national government agency, Cultural Heritage Administration (CHA), which investigated traditional village groves across the county that might be protected as natural monuments. When CHA finally decided to include village grove C as a natural monument, one village resident, Mr. Ryu, turned in a petition opposing CHA's designation. As stated in a local news article, Mr. Ryu insisted that there was a mistake in the location and history of village grove C, known to have been established in 1849~1863 according to historical records, but he argued that most of the trees were planted after 1945 since original village grove was cut down during the Japanese colonial rule. Restoration project manager Mr. Lee, who helped secure the village grove CHA's natural monument designation, pointed out that the reason why some local people objected to the designation was not related to historical or natural values, but to the groves economical land value. He explained that after designated as the

natural monument, certain development projects could be restricted by law and thus,

some residents would be affected by land price declines.

Table 4. 5. Actors/actor groups and centrality measures, village C.

| #	Actors/Actor groups	Degree Centrality	Betweenness Centrality
1	**Local Youngmen's Association** – Citizen organization for community services and local development	5	**52.00**
2	**Mr. Lee** – Self-employed and the head of local organization	3	**40.00**
3	Forest for Life – National NGO dedicated to preserving forests	3	16.00
4	Cultural Heritage Administration – National government preserving and promoting cultural heritage	3	16.00
5	Korea Forest Service – National government managing forests and forest resources	1	0.00
6	Local businesses – Locally-based steel mill, etc.	1	0.00
7	Mr. Ryu – A village resident and the member of the Korean Senior Citizens Association	1	0.00
8	Landscape architects – Locally-based working groups	1	0.00
9	Local forestry association – Locally-based organization of forestland owners	1	0.00
10	Local government – The Pohang city government	1	0.00
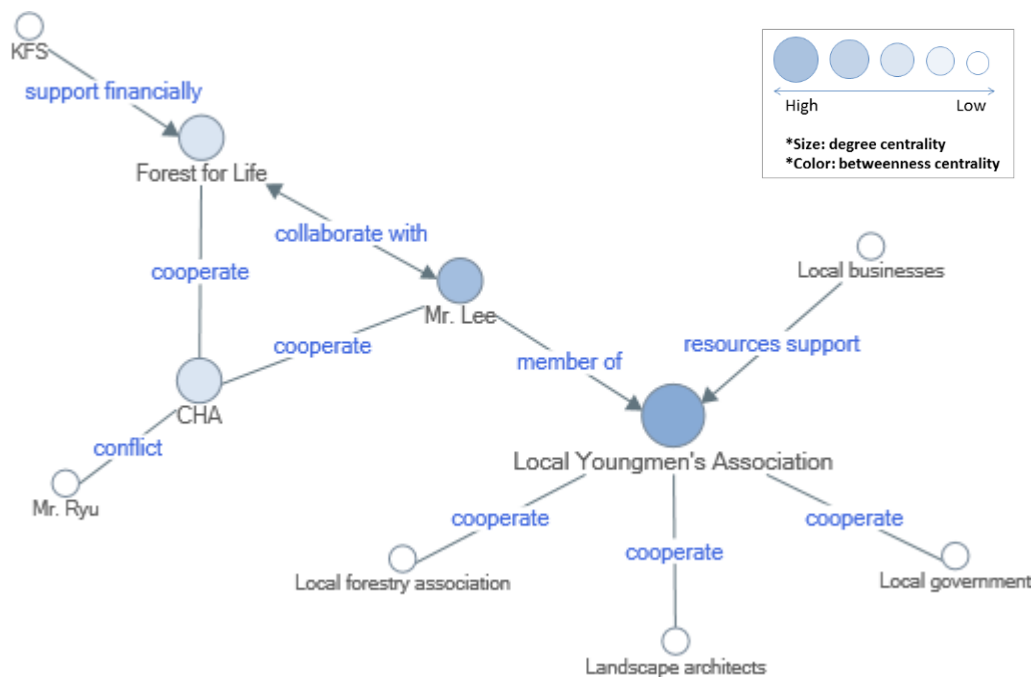
Figure 4. 3. Village grove network sociogram, village C. Larger size nodes represent individuals or organizations with higher relative degree centrality (more connections

in the network) and darker node color represents higher betweenness centrality (more communication paths between two others in network).

Meanwhile, village D presented fewer connections and fewer actors and actor groups compared to other villages (Table 4.6). Four organizations (KFS, local government, *Forest for Life*, and one traditional village grove citizen organization) and two individuals who authored the project report were identified as actors and actor groups involved in the restoration project (Table 4.6, Figure 4.4). Among them, relatively high degree and betweenness centrality was found in a local government official, who knew about KFS's projects from his work and proposed the restoration project to KFS. He collaborated with the traditional village grove stewardship organization, which had been managing village D grove since 1895. (Similar traditional village grove steward organizations have disappeared in many other villages (Chun and Tak 2009; Yu et al. 2014)). However, this traditional citizen organization did not hold a high score for betweenness centrality as citizen organizations did in other cases. *Forest for Life,* which showed the second highest betweenness centrality score, had links with the local government official who enabled local villagers to access external funds and restoration information. However, unlike Mrs. Seong in village B, the village D local government official did not develop any voluntary relationships but limited his work to dealing with village grove management administrative procedures. In light of the reduction of households from 240 to 80 over the past few decades in village D, along with changed lifestyles and declining dependence on forest resources for livelihoods, local government and government officials gradually assumed an active role in village grove management supporting the efforts of the traditional steward organization. Although village D grove was also designated as the natural monument, there was no disagreement among local people as in village C.

Table 4. 6. Actors/actor groups and centrality measures, village D.

#	Actors/Actor groups	Degree Centrality	Betweenness Centrality
1	**Local government official** – Public official in charge of traditional village grove	4	**13.00**
2	**Forest for Life** – National NGO dedicated to preserving forests	2	**8.00**
3	Traditional village grove steward organization – Citizen organization that manages village grove since 1895	3	1.00
4	Local government – The Yecheon county government	2	0.00
5	Local leader – The former head of the traditional citizen organization	2	0.00
6	Korea Forest Service – National government managing forests and forest resources	1	0.00
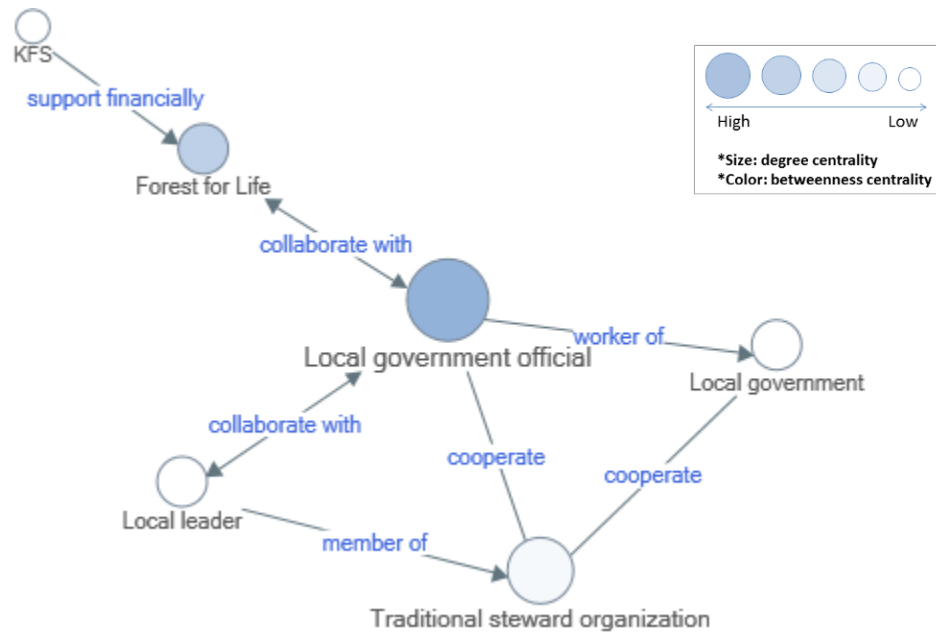
Figure 4. 4. Village grove network sociogram, village D. Larger size nodes represent individuals or organizations with higher relative degree centrality (more connections in the network) and darker node color represents higher betweenness centrality (more communication paths between two others in network).

Functions of bridging organizations in the village groves restoration projects

In the previous section, I described the network sociograms of four villages in the village groves restoration projects and identified influential actors and actor groups using measures of degree and betweenness centrality. Here, I focus on the functions

and contributions of bridging organizations to the management of village groves (see Table 4.7 for a summary). I draw from Berkes (2009) and Hahn et al. (2006) who claimed that bridging organizations could provide a variety of services in networks such as building trust, helping address conflicts, accessing needed resources, and identifying common interests and a vision. In the context of Korean village groves restoration projects, each village's citizen organizations played the certain role of bridging organization, sometimes with the help of key individuals who also played bridging roles. Multiple functions of citizen organizations varied in each village are of focus in this section.

The opportunity given by KFS and *Forest for Life* for external funds and new restoration information was mainly sought through village-based citizen organizations. A major bridging role of citizen organizations in all four villages was providing a way to access information and resources. The Village Residents' Association in village A and the Local Youngmen's Association in village C were particularly good at pursuing resources and support through bridging linkages. In village A, the Association received national government funds twice for village groves restoration in two different sites. In village C, the Local Youngmen's Association was supported not just by national government but also by local businesses which provided funds for a cultural festival in the village grove. Meanwhile, the Village Restoration Committee in village B and traditional steward organization in village D supplied professional information and new ways to manage village groves through newly formed linkages. Although villages B and D have protected their village groves for a long time, villagers have received little outside help and support thus far. Active bridging individuals also were found in all four villages (local NGO leaders in villages A and C, and local government officials in villages B and D). Using their positions between local villagers and non-local institutions, these individuals were able to help citizen

organizations to initiate their restoration projects and access needed information and resources.

Bridging organizations also offered an arena for identifying common interests among local people and articulating goals consistent with KFS and *Forest for Life*'s vision for village groves restoration. For example, *Forest for Life* emphasized social and cultural aspects of village groves (Forest for Life, 2004), which were reflected in three restoration projects through the revival of cultural ceremonies (village A and B) and local festivals (village C) by citizen organizations. This process was not unidirectional from national institutions to local ones, but rather involved multidirectional influencing of network actors. For example, in village A, the Village Residents' Association and a local NGO leader developed specific restoration goals and a new village grove was planted along the ocean in a space where buildings had been destroyed by a typhoon. Their plan to create a new seaside village grove was accepted by *Forest for Life* and KFS, expanding KFS's original intentions to restore existing village groves. The local NGO leader said:

At first, they (Forest for Life and KFS) didn't listen to us. They said that the trees could not survive in such conditions. So I and villagers in a mini bus went up to the office of Forest for Life when they were screening proposals to show we are willing to do that, and we can do that, because we have an experience (with the first restoration project). Unlike the other teams, we were a group of people and when they asked questions, one of villagers stood up and answered instead of the presenter. We also collected photos and documents to prove that village grove existed, before the Japanese colonial period. We absolutely amazed them, and I think they saw a vision from us (village A NGO leader, July 30, 2009).

Another function of bridging organizations performed by citizen organizations was addressing conflicts in villages B and C. In village B, the Village Restoration

Committee solved the conflict with the help of the local government official, who played a mediator role in village B. This governmental official described:

> *Local government did not allow doing any other things except planting trees within the village grove. Villagers already complained about the situation that they do actual management of village grove but the local government claims the land rights. They easily give up when local government says no, adding one more complaint about the government. So I persuaded and negotiated with the person in charge, on behalf of those villagers. I think it is necessary for local villagers to keep knocking on the door of government (village B governemt official, July 22, 2009).*

Through combined bridging efforts of the local government official and the Village Restoration Committee, villagers were able to gather to voice their opinions and influence local government decisions.

In village C, residents disagreed about the involvement of the national government in its designating the grove as a natural monument. Although diverse project participants demonstrated agreed interests and actions to restore the village grove, they could not reach an agreement regarding further directions for village grove management. The Local Youngmen's Association did not assume additional roles like resolving the conservation versus development conflict, perhaps due to their limited experiences and capacities. The Association director reflected:

> *After newspaper reports (about the natural monument designation), local bigwigs complained seriously. But you know, when committee members (of Cultural Heritage Administration), all experts and knowledgeable people, decided that, is there anything we can do? (village C association director, July 31, 2009).*

It is also noteworthy that bridging organizations that had handled conflicts or problems successfully were able to provide additional roles in networks, such as

helping build local capacity. For example, in village A, the Village Residents' Association was able to improve problem-solving capacity of local people while addressing shared versus personal property rights issues of village groves. To get private landowners' agreement on the restoration projects, the Association reached out to them using all available connections and methods, and the second attempt ended in a much shorter time than the first try in two different projects. That experience gave local people an opportunity for collaborative learning-by-doing and helped them to take further conservation actions. As a result, their self-organized collective efforts and practices were recognized by the Korean government, which bestowed the 'best citizen initiative' award to the Village Residents' Association.

Lastly, bridging ties of citizen organizations were likely to facilitate overall communication and help to build mutual trust among local people. When asked about the biggest change through the restoration projects, several villagers in village B mentioned "stronger relationship of local people." Although closer relationships could help to enhance mutual trust, the balance between bonding and bridging ties is also critical for new projects. For example, a volunteer cultural interpreter in village D, where the traditional steward organization has developed traditional *Sasan-songgye* village grove management systems (Yu et al. 2014; Lee and Krasny 2015), explained:

> *One hundred twenty years ago (in 1892), Russian mine workers destroyed our village grove looking for gold, because our village name means 'gold.' Villagers had a big fight with them and accidently killed two of them. So some villagers were sent to jail. To save their lives, our ancestors cut the trees in their sacred village grove to raise money. After that, we keep our village grove by organizing 'Sasan-songgye' (in 1895). Through annual meetings of Sasan-songgye, we still decide when and how to manage our village grove. Only the first son of each household can be the member of Sasan-songgye (village D cultural interpreter, July 26, 2013).*

Table 4. 7. Summary of findings on main functions of bridging organizations in four villages.

	Village A	Village B	Village C	Village D
Bridging organizations	Village Residents' Association (Citizen organization that addresses issues related to resident welfare)	Village Restoration Committee (Citizen organization that addresses village grove issues)	Local Youngmen's Association (Citizen organization for community services and local development)	Traditional steward organization (Citizen organization that manages village grove since 1895)
Multiple functions of bridging organizations investigated in village groves restoration projects (Based on Berkes 2009; Hahn et al. 2006)				
Accessing needed resources	-Accessing external funds and support	-Accessing expert information and practices	-Accessing external and internal funds and resources	-Accessing new information and resources
Identifying common interests	-Interests in the revival of cultural ceremony in village grove in line with restoration vision -Interests in building a new village grove accepted by KFS	-Interests in the revival of cultural ceremony in village grove in line with restoration vision	-Interests in holding a local festival in village grove in line with restoration vision	
Addressing conflicts	-Addressing shared versus personal property right issues successfully by learning-by-doing	-Addressing different views on restoration plans between local government and villagers with the help of the local government official	-Addressing different perspectives among local people regarding central government intervention for VG management	
Building local capacity	-Improving problem-solving capacity of local people	-Building local capacity to negotiate		
Enhancing mutual trust		-Developing and maintaining strong bonding ties of villagers		-Holding traditional knowledge and bonding ties through *Sasan-songgye,* but less accessible to bridging ties

Through a long history of collectively managing village grove, the traditional steward organization in village D had developed strong bonding ties among villagers and local knowledge about the village grove. However, villagers exhibited fewer changes in management practices relative to other villages, perhaps as a result of fewer bridging ties of their stewardship organization with outside organizations and limited external sources of information.

Discussion

By conducting an in-depth, qualitative analysis of networks in Korean village groves restoration projects, this study adds the case of small-scale resource management in Korean villages impacted by industrialization and depopulation to the existing literature about network structure and functional roles of bridging organizations in resource management (see Hahn et al. 2006; Olsson et al. 2007; Marin and Berkes 2010; McDowell 2012; Kowalski and Jenkins 2015; Berdej and Armitage 2016). The results also demonstrate the roles of individuals and organizations in local adaptive-co management. Below we focus on the bridging roles of village-based citizen organizations and emergent adaptive co-management through local civic efforts.

Bridging roles of local citizen organizations

Bridging organizations can vary in size and degree of formalization, from a few individuals to formal organizations with diverse stakeholders (Crona and Parker 2012). In the Korean cases, bridging organizations were generally existing or new village-based citizen organizations, which provided opportunities for local people to participate in the formal process of managing village groves. Citizen organizations contributed to building governance networks with multiple stakeholders, thus bringing

local people's interests, experiences, and knowledge into the decision-making process. Although traditionally village groves were managed by local people, their voices are often neglected in the contemporary forest management systems of Korea where top-down and expert-oriented approaches are prevalent especially in government-funded projects. However, based on self-organized traditions of village groves management (Chun and Tak 2009; Lee and Kransy 2016), citizen organizations were able to redirect top-down approaches, creating citizen-led village groves restoration movements.

Our results also help us to better understand the role of local people in adaptive co-management systems through functional roles of bridging organizations (cf. Olsson et al. 2004b; Plummer 2009). In the restoration projects, bridging organizations mainly supplied a platform to communicate and exchange information and resources, while addressing conflicts and in some cases enhancing mutual trust among villagers (see Table 4.6). These organizations tended to act as 'networkers' by connecting diverse actors and facilitating their interactions, 'interpreters' by making information and knowledge accessible to villagers, and 'followers' by making the projects work and reinforcing values (cf. Plummer 2009). Some bridging organizations also worked as 'knowledge retainers' holding the traditional and local knowledge and collective memory of village groves to be used in times of change (cf. Folke et al. 2003). These various bridging roles performed by citizen organizations could improve adaptive co-management arrangements in integrated and inclusive ways with multiple village groves restoration stakeholders. While co-management arrangements in Asia appear to be characterized by multi-faceted networks in which the role of community organization is limited (Wilson et al. 2006; Berkes 2009), this study provides empirical evidence of diverse ways local citizen organizations in Korea enhance bridging linkages.

In addition to the roles played by bridging organizations, key individuals played leadership (village A) or mediatory roles (village B) in the restoration projects. Similarly, in a wetland management case in Sweden, a new municipal organization and local individuals served as bridging entities, although the local leader was particularly influential in bringing about changes in management providing transformational leadership (Olsson et al. 2004b; Hahn et al. 2006; Olsson et al. 2007). In rural communities in Korea with a rapidly aging population and close bonding ties, the ability of local people to access external information and resources seems to be critical for adaptive co-management. Thus, active individuals in the restoration projects show more boundary-spanning than transformational leadership in the Korean villages (cf. Tushman et al. 1981; Bodin and Crona 2009).

Adaptive co-management through local civic efforts

In reviewing community forest studies in India, Ruitenbeek and Cartier (2001) describe emergent adaptive co-management, or adaptive co-management initiated by villagers, instead of imposed or introduced from the outside. Similarly, village grove restoration and other 'civic ecology practices' can be considered as a form of emergent adaptive co-management initiated by local residents with support from larger government agencies and NGOs (cf. Krasny and Tidball 2015). In a case of emergent adaptive co-management of wetlands in Sweden, Olsson et al. (2004b) showed how one individual who was monitoring water quality problems could bring in other people and organizations and eventually transform governing systems. Similarly, local citizen organizations and active individuals in the village groves restoration projects showed the potential of local civic efforts in the Korean context to collaborate with different agencies and organizations, while participating in decision-making through their actual work in locally grounded resource management.

Although the Swedish wetland case does not focus on cultural components of adaptive co-management, Barthel et al. (2010) has described how social-ecological memories, which are tied to cultural planting traditions, play a role in management of allotment gardens in Sweden. In Korean villages, reviving or maintaining traditional rituals (villages A, B, and C) and holding cultural festivals within village groves (village C) are significant factors that triggered villagers' attention and encouraged their participation in restoring groves. Similar to traditional and indigenous communities (Folke et al. 2005b), Korean villagers could strengthen their identity as stewards with positive feedbacks through cultural rituals and collaborative practices in managing village groves over long periods of time. Such cultural identities and strong ties among Korean villagers built upon daily engagement in caring for village groves might help local people to become involved in the restoration projects and initiate civic efforts. Thus, linking culture with management (cf. Barthel et al. 2010; Fabricius et al. 2007) needs to be considered as a way to enhance voluntary processes within the system that enable emergent adaptive co-management (Ruitenbeek and Cartier 2001).

Further, through citizen-led village groves restoration, social and cultural infrastructure can be built to sustain environmental practices and promote democratic society (cf. Kempton et al. 2001). Given that the restored groves (77 among 1335 VGs) are still a small portion of remaining village groves, it is important to know about the direct and indirect benefits that citizen-led restoration can bring to local villages and Korean society in general. According to Fisher et al. (2015), volunteer tree planters in New York City were able to enhance civic identity through a hybrid and collaborative arrangement between the government and the civil society, while changing the social and environmental landscapes of place. Similarly, collaborative networks in village groves restoration projects could be another opportunity for local people to build civic identity and change village groves governance processes. Such

changes can be propagated through existing and emerging forest conservation networks at local and national levels, while restoring the physical environment of village groves occurs in limited local areas. Considering that poorly developed civil society had led to failure of adaptive co-management (Plummer et al. 2012), the development of civic identity through citizen-led village groves restoration movement may provide a basis for further citizen engagement of management of local resources.

Conclusion

      This study investigated the changing roles of local people in small-scale village groves management. Based on local people's relational structures and functions in the restoration projects, I found that influential individuals and local citizen organizations were able to create and strengthen bridging linkages with multiple stakeholders and adapt to ongoing demographic and environmental changes. Although each case showed different types and degrees of functional roles, citizen-led bridging organizations contribute to achieving conservation outcomes and improving village groves governance processes.

      An important lesson learned from the cases is that the successful restoration projects were built around strengthening the capacity of local people. When local people were not empowered or did not have the capacity to deal with conflicts, the emergence of adaptive co-management as well as desired management outcomes could not be guaranteed. It is noteworthy that locally based restoration projects could improve not just the local environment but also encourage civic engagement through local and national collaboration. In this process, the roles of a national government and a national NGO were also important by providing enabling conditions for emergent adaptive co-management. Policy also needs to play a role by protecting the conditions

for emergence that might start with building local capacity to adapt to change or lead change if necessary.

Although it is beyond the scope of this study, influential individuals and bridging organizations can abuse their positions by controlling information and resource flow. If they are not aware of a critical resource for their networks, or their choices are based on biased preferences, they could unfavorably affect the whole network and management outcomes (Bodin and Crona 2009). Such negative linkages and influences are also important in sustainable management systems, and should be taken into account in future studies.

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CHAPTER 5

CONCLUSION

Korean village groves, *maeul-soop* (Korean: 마을숲), are an example of local resource management and retain community forest management traditions. Resilient social-ecological systems of village groves are explored through three independent chapters using key concepts, including adaptive capacity, disturbance, social learning, multiple-loop learning, adaptive co-management, and bridging organization. The main findings and implications of this dissertation are:

(1) This dissertation synthesized the community forestry and related adaptive capacity literature in three East Asian countries (Chapter 2). Findings on the traditional forest management systems, including village groves in South Korea, fengshui forests in China, and satoyama in Japan, extend our understanding of community-based conservation efforts and traditions of this region. Through systematic review, the indicators of adaptive capacity are characterized including civic traditions of self-organization, traditional ecological knowledge, and diverse knowledge systems. These indicators are often discussed in terms of biodiversity conservation or sustainable forest management, but not in terms of adaptive capacity in this region. Thus, this dissertation provides extensive contextual information for further research on adaptive capacity in this region associated with continuing and emerging challenges in traditional community forest systems.

(2) This dissertation clarified the vague notion of social learning by distinguishing

social learning outcomes from the characteristics of learning processes (Chapter 3). Focusing on multiple-loop learning and its multiple level changes as an indicator of the outcomes of social learning, this dissertation provides insights into the linkage between changes at smaller scales and transformations at larger scales or larger system-wide changes in nested systems that can contribute to social-ecological systems resilience. Both researchers and practitioners may benefit from using the social learning processes and outcomes framework to develop more effective social learning interventions and foster substantive learning outcomes. This dissertation within the Korean context suggests conditions for social learning that can benefit studies of social learning more broadly.

(3) This dissertation added the case of small-scale local resource management in Korean villages to the existing literature about network structure and functional roles of bridging organizations in resource management (Chapter 4). Various roles of influential individuals and citizen-led bridging organizations in the village groves restoration projects contribute to our understanding of emergent adaptive co-management and citizen involvement in locally-based resource management. Active citizen participation was triggered by cultural features in restoration projects based upon civic traditions in village grove management. The findings have implications for both researchers and practitioners interested in local emergent adaptive co-management initiatives and who seek to explore local stewardship or civic ecology groups and their contributions to more flexible and resilient management systems.

(4) This dissertation presented qualitative approaches to literature reviews

(Chapter 2) and network analysis (Chapter 4). Considering that research in community-based forest management often uses case studies, a qualitative systematic literature review is appropriate for broader analyses of the three countries' relevant but disparate literatures. Qualitative network analysis using network sociograms is suited to provide an in-depth understanding of underlying relational structures as well as functional roles of actors and actor groups in small-scale local resource management. Thus, researchers may get ideas on how to conduct research with qualitative data and benefit from adopting and using such methods based on relevant research questions.

(5) This dissertation concluded that local efforts to restore village groves could change Korean village groves from cultural landscapes to dynamic social-ecological systems. This occurs when multiple stakeholders become engaged in restoration in response to social and ecological stresses and disturbances. In this process, local people can serve not just as simple stewards, but also as agents of change through social learning for communicative and collective action. Such action encompasses adapting to change as well as local emergent adaptive co-management initiatives to redirect cultural and ecological processes. Thus, this dissertation has implications for small-scale local resource management similarly impacted by industrialization and depopulation in rapidly changing conditions.