



# **Social-Ecological Coevolution and its Implications for Protected Area Management: Case Study in Natma Taung National Park, Myanmar**

**Pyi Soe Aung**

Born on: 26.04.1984 in Pyinmana

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Supervisors

**Prof. Dr. Jürgen Pretzsch**

Chair of Tropical Forestry, Technische Universität Dresden

**Prof. Dr. Goddert von Oheimb**

Chair of Biodiversity and Nature Protection, Technische Universität Dresden

**Prof. Dr. Eivin Røskaft**

Department of Biology, Norwegian University of Science and Technology

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## **ABSTRACT**

The conflict between protected area and local people is a major challenge for conservation in developing countries. The conventional top-down approach has failed mainly due to the exclusion of local people in conservation. A new management approach that promotes local participation and reduces conflicts is necessary to achieve both conservation and development objectives. Using the case of Natma Taung National Park (NTNP) in Myanmar, this study investigates the relationship between the protected area and local indigenous people living in and around the park. The social-ecological coevolution model is applied to explore the inter-linkages between the protected area and local people. The empirical analyses focus on three main thematic areas: local land tenure system, livelihood dependency on forest resources, and traditional ecological knowledge (TEK) of local people. The comparative study design is used to analyse similarities and differences among the three indigenous communities living inside, bordering, and outside the national park. Based on this information, four management scenarios are developed and evaluated by using multi-criteria decision analysis.

Results indicate that local people mainly follow the traditional land tenure system rather than formal government regulations. However, local compliance with the traditional land tenure system are declining, particularly among the households located inside and at the borders of the park. Major drivers for this decline include top-down regulations by the national park, improved road access, and increased market demand for permanent cash crops. Regarding local livelihoods, the majority of households greatly rely on forest products for their sustenance. Despite restrictions from the national park, households inside and bordering the park have more forest income than those located outside the park. Thus, the contribution of forest income to poverty reduction is higher among households inside the park than those bordering and outside the park. However, the effect of forest income on reducing inequality is higher among households outside the park than those inside and bordering the park. Regarding traditional ecological knowledge (TEK), local people use different



types of ecological knowledge and management practices that are important for conservation and sustainable use of natural resources. Local TEK can be grouped into four different categories: resource-use practices, rules and regulations, customs and rituals, and taboos and totem. Although the awareness of these practices is still high, local compliance has declined within the last decade. The compliance rate is lower in TEK associated with normative belief systems than the TEK adopted based on instrumental perspectives. This particular trend is mainly influenced by changes in local religious beliefs, the introduction of alternative livelihood opportunities, and the degradation of environmental resources.

Results from the three case studies support to evaluate the four management scenarios with different levels of local participation. Multi-criteria decision analysis indicates that collaboration with local stakeholders under the co-management scenario received the highest ranking scores to achieve effective conservation, sustainable livelihoods, and social justice. To improve the current management system of NTNP, the study recommends five key management strategies: (i) formalising customary tenure institutions to increase legitimacy of conservation regulations, (ii) developing target-specific rules to sustain local livelihoods and reduce people-park conflicts, (iii) incorporating traditional ecological knowledge and management practices to enhance local participation in conservation and reduce management costs, (iv) integrating adaptive monitoring and feedback mechanisms to improve resilience and adaptive capacity against unforeseen social-ecological changes, and (v) promoting integrated planning and management at regional level to improve collaboration among government organisations.

Regarding theoretical aspects, the thesis highlights that effective conservation will not be achieved unless management institutions are in line with the social system and the natural environment. To develop effective management strategies, it is important to understand not only the ecological conditions of the protected area but also the socio-cultural context of local people. The thesis also emphasises that social characteristics such as local institutions, knowledge, and belief systems play important roles in maintaining the resilience of the target social-ecological system. Such characteristics are not static, but changing over time in response to the dynamic changes in government regulations, market conditions and local cultural belief. Understanding the pattern of transformation within the social-ecological system is essential to achieve long-term conservation goals and minimise social conflicts in the future.

**Keywords:** social-ecological system; land tenure; forest dependency; traditional knowledge; adaptive co-management; protected area; Myanmar

## ZUSAMMENFASSUNG

Der Konflikt zwischen Schutzgebieten und Einheimischen ist eine große Herausforderung für den Naturschutz in Entwicklungsländern. Der konventionelle Top-Down-Ansatz ist vor allem aufgrund des Ausschlusses der lokalen Bevölkerung in den Naturschutz gescheitert. Ein neuer Managementansatz, der die lokale Beteiligung fördert und Konflikte reduziert, ist erforderlich, um sowohl Erhaltungsziele als auch Entwicklungsziele zu erreichen. Diese Studie untersucht die Beziehung zwischen dem Schutzgebiet „Natma Taung Nationalpark“ (NTNP) und den einheimischen Ureinwohnern, die in und um den Park leben. Das sozial-ökologische Koevolutionsmodell wird angewendet, um die Wechselbeziehungen zwischen dem Schutzgebiet und der lokalen Bevölkerung zu untersuchen. Die empirischen Analysen konzentrieren sich auf drei Hauptthemenbereiche: Das lokale Landnutzungssystem, die Abhängigkeit des Lebensunterhalts von Waldressourcen und das traditionelle ökologische Wissen (TEK) der lokalen Bevölkerung. Ein vergleichendes Studiendesign wird verwendet, um Gemeinsamkeiten und Unterschiede zwischen den drei indigenen Gemeinschaften zu analysieren, die innerhalb, an und außerhalb des Nationalparks leben. Basierend auf diesen Informationen werden vier Managementszenarien entwickelt und mithilfe einer multikriteriellen Entscheidungsanalyse bewertet.

Die Ergebnisse zeigen, dass die Bevölkerung vorwiegend dem traditionellen Landbesitzsystem statt den formellen staatlichen Vorschriften folgt. Die lokale Einhaltung des traditionellen Landbesitzsystems ist zurückgegangen, insbesondere bei den Haushalten innerhalb und an den Grenzen des Parks. Zu den Haupttreibern für diesen Rückgang zählen Top-down-Vorschriften des Nationalparks, eine verbesserte Straßenanbindung und eine erhöhte Nachfrage nach dauerhaftem Erntegeld. In Bezug auf den Lebensunterhalt vor Ort ist die Mehrheit der Haushalte in hohem Maße auf Waldprodukte angewiesen. Trotz Einschränkungen durch den Nationalpark haben Haushalte innerhalb und außerhalb des Parks ein höheres Einkommen aus dem Wald als Haushalte außerhalb des Parks. Der Beitrag des Einkommens aus dem Wald zur

Armutsbekämpfung ist bei Haushalten innerhalb des Parks höher als bei Haushalten außerhalb und an der Grenze des Parks. Die Auswirkung des Einkommens aus dem Wald auf die Verringerung der Ungleichheit ist jedoch bei Haushalten außerhalb des Parks höher als bei Haushalten innerhalb und an der Grenze des Parks. Um die nachhaltige Bereitstellung von Waldeinkommen und die damit verbundenen Ökosystemleistungen zu erreichen, wenden die Menschen vor Ort unterschiedliche Kenntnisse und Managementpraktiken an, die in vier verschiedene Kategorien unterteilt werden können: Praktiken der Ressourcennutzung, Regeln und Vorschriften, Bräuche und Rituale sowie Tabus und Totems. Obwohl das Bewusstsein für diese Praktiken immer noch ausgeprägt ist, ist die Einhaltung lokaler Vorschriften in den letzten zehn Jahren zurückgegangen. Die Befolgungsrate ist bei TEK, welches mit normativen Glaubenssystemen assoziiert ist, niedriger als bei TEK, welches auf instrumentellen Perspektiven basiert. Dieser besondere Trend wird hauptsächlich durch Veränderungen der lokalen religiösen Überzeugungen, die Einführung alternativer Existenzgrundlagen und die Verschlechterung der Umweltressourcen beeinflusst.

Die Ergebnisse der drei Fallstudien unterstützen die Bewertung der vier Managementszenarien mit unterschiedlicher lokaler Beteiligung. Multikriterielle Entscheidungsanalysen zeigen, dass die Zusammenarbeit mit lokalen Stakeholdern im Rahmen des Co-Management-Szenarios die höchsten Bewertungen erhielt, um einen wirksamen Schutz, eine nachhaltige Lebensgrundlagen sowie soziale Gerechtigkeit zu erreichen. Um das derzeitige Managementsystem von NTNP zu verbessern, werden in der Studie fünf zentrale Managementstrategien empfohlen: (i) Formalisierung der üblichen Amtszeitinstitutionen, um die Legitimität der Erhaltungsbestimmungen zu erhöhen, (ii) Entwicklung zielspezifischer Regeln zur Aufrechterhaltung der Lebensgrundlagen vor Ort und zur Verringerung von Konflikten zwischen Menschen und Parks. (iii) Einbeziehung traditioneller ökologischer Kenntnisse und Managementpraktiken, um die lokale Beteiligung am Naturschutz zu verbessern und die Managementkosten zu senken, (iv) Integration adaptiver Überwachungs- und Rückmeldungsmechanismen, um die Widerstandsfähigkeit und Anpassungsfähigkeit gegen unvorhergesehene sozial-ökologische Veränderungen zu verbessern, und (v) Förderung einer integrierten Planung und Management auf regionaler Ebene, um die Zusammenarbeit zwischen Regierungsorganisationen zu verbessern.

In Bezug auf theoretische Aspekte hebt die Arbeit hervor, dass eine effektive Erhaltung nur erreicht werden kann, wenn die Management-Institutionen mit dem Sozialsystem und der natürlichen Umwelt in Einklang stehen. Um effektive Managementstrategien zu entwickeln ist es wichtig, nicht nur die ökologischen Bedingungen des Schutzgebiets zu verstehen, sondern auch den sozio-kulturellen Kontext der lokalen Bevölkerung. Die Dissertation betont auch, dass soziale Merkmale wie lokale

Institutionen, Wissen und Glaubenssysteme eine wichtige Rolle bei der Aufrechterhaltung der Widerstandsfähigkeit des sozial-ökologischen Zielsystems spielen. Solche Eigenschaften sind nicht statisch, sondern ändern sich im Laufe der Zeit als Reaktion auf sich ändernde formale Regelungen, Marktbedingungen und lokale kulturelle Überzeugungen. Das Verständnis der Transformationsmuster innerhalb des sozial-ökologischen Systems ist unerlässlich, um langfristige Erhaltungsziele zu erreichen und soziale Konflikte in Zukunft zu minimieren.

**Schlüsselworte:** social-ecological system; land tenure; forest dependency; traditional knowledge; adaptive co-management; protected area; Myanmar

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## ACRONYMS

AHP	ASEAN Heritage Park.
ASEAN	Association of Southeast Asian Nations.
BAU	Business As Usual.
BSPP	Burma Socialist Programme Party.
CBD	Convention on Biological Diversity.
CDF	Cumulative Density Function.
CF	Community Forest.
FAO	Food and Agriculture Organization.
FD	Forest Department.
FGD	Focus Group Discussion.
FGT	Foster–Greer–Thorbecke.
HCA	Hierarchical Cluster Analysis.
ICCAs	Indigenous and Community Conserved Areas.
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.
IUCN	International Union for Conservation of Nature.
KI	Key Informant.
LEK	Local Ecological Knowledge.
LUC	Land Use Certificate.
MA	Millennium Ecosystem Assessment.
MCDA	Multiple Criteria Decision Analysis.
NBSAP	National Biodiversity Strategy and Action Plan.
NCNPP	Nature Conservation and National Park Project.
NGOs	Non-Governmental Organizations.
NTFP	Non-Timber Forest Product.
NTNP	Natma Taung National Park.
NWCD	Nature and Wildlife Conservation Division.

PA	Protected Area.
PCA	Principal Component Analysis.
PIP	Participative Innovation Platform.
POWPA	Protection of Wildlife and Protected Areas Law.
SES	Social-Ecological System.
SLORC	State Law and Order Restoration Council.
SPDC	State Peace and Development Council.
TEK	Traditional Ecological Knowledge.
TLU	Tropical Livestock Unit.
UNDP	United Nations Development Program.
VFVLM	Vacant, Fallow and Virgin Land Management.

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of the Research

Protected area is one of the important tools to conserve biodiversity and ecosystem services (Dudley and Stolton, 2010). Empirical evidence has shown that protected areas contribute significant reduction in deforestation, habitat destruction, and loss of wildlife species compared to other land management options (Bruner, 2001; Nagendra, 2008). Due to the increasing awareness of conservation, the global coverage of protected areas has increased up to 15.4% of the total land area in 2014 (Juffe-Bignoli et al., 2014). The global community has also committed to increasing protected areas up to 17% of total land area and 10% of the coastal and marine area by the year 2020 (CBD, 2011). However, creating protected areas not only provides ecological benefits but also incurs social costs (Ferraro, 2002). Major impacts of protected areas include involuntary displacement of local people, limiting access to natural resources, and altering traditional livelihoods and associated cultural practices (Coad et al., 2008). Consequently, the conflicts between protected areas and local people have increased resulting in limited political and social support for conservation practices (Watson et al., 2014).

Being a signatory country to Convention on Biological Diversity (CBD), Myanmar has committed to establish protected areas up to 10% of the country's area by 2020 (Forest Department, 2015). As of 2018, Myanmar has established 42 protected areas covering about 5.81% of the country's total area. Due to political and economic constraints, about half of the protected areas are regarded as 'paper parks' without effective management system in place (M. Aung, 2007). Moreover, most protected areas in Myanmar are located in rural areas where local people greatly depend on forest resources for their livelihoods (Rao et al., 2011). Since protected areas restrict local use of forest resources, there is an increasing conflict between park authorities

and local people (Allendorf et al., 2006). This has further reduced the legitimacy of existing protected areas resulting in habitat degradation, resource extinction, and social conflicts (Rao et al., 2013).

To achieve effective conservation, Myanmar has transformed its protected area management strategies from strict protection approach towards more participative approaches. For instance, the National Biodiversity Strategy and Action Plan (NBSAP) was updated by including a set of action plans to promote local participation in conservation. This includes the implementation of co-management activities in protected areas, recognising the Indigenous and Community Conserved Areas (ICCAs), and designating buffer zones to support local livelihoods (Forest Department, 2015). The Protection of Wildlife and Protected Areas Law (POWPA) was also revised to support community engagement in protected area management. Although the government has initiated to promote local participation in conservation, there is still no proper guideline or management model in Myanmar to implement community-based conservation approaches. To complement this knowledge gap, this study takes Natma Taung National Park (NTNP) as a case study in order to propose management strategies that promote community participation in conservation and reduce people-park conflicts.

## 1.2 Justification

Community-based conservation is an emerging approach not only to achieve conservation objectives but also to reduce social conflicts (Berkes, 2004). Community-based conservation is an evolutionary process so that it should not be imposed directly by the state (Brecht et al., 2002). Instead, it should be fostered by creating favourable policies that recognise local institutions, resource needs, and cultural practices (Armitage et al., 2009). Previous studies have suggested that community-based approaches will be sustainable only if the conservation objectives are in compliance with the needs and interests of local people (Agrawal and Gibson, 1999), the management practices are embedded within the local institutional context (Barrett et al., 2001), and the effective trade-off mechanisms among multiple interest groups are in place (Adams and Hutton, 2007). Designing management strategies to meet these conditions requires understanding the holistic relationship between local people and natural resources (Berkes et al., 1998). Following this theoretical concept, this study aims to explore the relationship between protected area and local communities in order to propose management strategies that promote conservation and reduce social conflicts.

Natma Taung National Park (NTNP) is one of the most important protected areas in Myanmar due to the presence of unique ecosystems and cultural values. In 2014,

the park was included in the tentative list to nominate as a UNESCO Natural World Heritage Site (UNESCO, 2014). However, the nomination process was delayed due to the existing conflicts between the park and local people (Meyers, 2014). Particularly, the involuntary acquisitions of customary lands have created social conflicts between the national park and local people. The conflicts have become more common in recent years resulting in ecological degradation and unsustainable use of natural resources (Meyers, 2014). Therefore, it has become one of the government priorities to promote conservation and resolve the existing people-park conflicts in order to initiate the nomination processes (Forest Department, 2015).

Geographically, NTNP is situated in Chin State where the indigenous Chin people are living with their own unique traditions. Previous studies have shown that people living in Chin State have strong customary land tenure systems that have been handed down over several generations (Andersen, 2015). However, there is no scientific study that analyses how the national park has influenced the customary land tenure system and social institutions among the Chin people. This information is essential to design management strategies that reduce future land-use conflicts between the national park and local indigenous people. Since most protected areas in Myanmar are located in areas managed by indigenous people (Istituto Oikos and BANCA, 2011), results from this research can be replicated in other protected areas with similar land-use conflicts with local people.

Previous studies have indicated that rural people in Chin State mainly rely on shifting cultivation and forest resources for their livelihoods (P. S. Aung et al., 2015; Chan and Takeda, 2016). However, it is still unexplored how the national park regulations have influenced the livelihoods of local people. To facilitate trade-off between conservation and rural development, it is important to explore the relationship between different livelihood systems and local dependency on forest resources. This information is essential to promote the important role of forest conservation and to ensure the sustainable provision of ecosystem services (McElwee, 2010). The results can be used in revising the existing conservation regulations in order to minimise livelihood impact of protected areas and to reduce people-park conflicts.

As the Chin people are living closely related to forests, they possess diverse arrays of knowledge and practices regarding conservation and management of forest resources (Sakhong, 2003). Such knowledge is essential to enhance community engagement in conservation and reduce management costs (Ruiz-Mallén and Corbera, 2013). Therefore, it is important to explore different types of knowledge and practices that local people applies in managing important natural resources. It is also important to explore whether such knowledge and practices are still accepted by local people or not. This



information is crucial in developing management strategies that are adapted to local situations.

Despite having complex social and environmental issues, NTNP is officially recognised as an ASEAN Heritage Park (AHP). Therefore, the park is important not only for Myanmar but also for other ASEAN countries. As most ASEAN countries have similar ecosystems and cultural practices, selecting NTNP as a case study will provide an opportunity to replicate the analytical approaches in other protected areas across ASEAN region. Since NTNP is part of the AHP program, results from this study can further be applied in other AHPs with similar ecological context and social conflicts.

### **1.3 Research Objectives**

The overall objective of this research is to analyse the social-ecological relationship between protected area and local communities in order to develop management strategies that promote conservation and reduce social conflicts. Based on theoretical justifications and local research gaps, this study formulates four main specific objectives:

1. To analyse how local land tenure systems influence access to and control of ecosystem services.
2. To examine how local livelihood systems influence household dependency on forest products.
3. To explore how traditional knowledge systems influence local use and management of natural resources.
4. To propose adaptive management strategies that promote effective conservation and reduce social conflicts.

### **1.4 Scope of the Research**

This research applies the case study approach and adopts the Natma Taung National Park (NTNP) in Myanmar as a case study. The overall focus of this research is the NTNP and indigenous Chin ethnic communities living around the national park. The social-ecological coevolution model is applied as a theoretical foundation to analyse the relationship between the protected area and local people. Based on existing theoretical concepts (e.g. Berkes et al., 1998) and local research gaps, this research explores the three thematic topics that are important for understanding the relationship between

social system and natural environment: (i) land tenure system; (ii) local livelihood systems; and (iii) traditional ecological knowledge of local people. The empirical analyses focus on three village tracts located inside, bordering, and outside the park in order to highlight how conservation regulations influence on each thematic topic. Data analyses are conducted at three main levels. The first level includes an in-depth analysis of each case-study to explore social-ecological relationships in each particular context. The second level focuses on comparative analysis across the three cases in order to provide similarities and differences among different social-ecological context. The third level synthesises at the national park level to provide policy implications for protected management in Myanmar.

## 1.5 Structure of the Dissertation

This dissertation consists of eight chapters. The first three chapters describe research background including objectives, theoretical framework, and methods for data collection and analyses. The other five chapters present empirical results including interpretation, discussions, and critical reflections. A brief outline of each chapter is presented as follows:

**Chapter one** introduces research problems and justification and presents the main objectives, the scope of the research, and the structure of the dissertation.

**Chapter two** discusses the social-ecological system approach in protected area management with theoretical explanations regarding land tenure and property right institutions, the role of ecosystem services in local livelihoods, and traditional ecological knowledge and management practices. This chapter also discusses the overview of protected area management in Myanmar including the history of conservation initiatives, policy and legal framework, and current management practices.

**Chapter three** explains the research approach and methodology applied in the thesis. It first introduces the conceptual framework for this study with detailed explanations of its components. Later it explains the research design including justifications for case study selections. Finally, it discusses the methods for data collection and analytical processes to ensure the reliability and validity of the research outcomes.

**Chapter four** describes the study area based on document reviews and oral history analyses. This chapter is organised with two main sections. The first section focuses on the ecological settings of the Natma Taung National Park with detailed discussions on the park establishment processes, status and trends of crucial ecosystem services, and challenges in implementing park management activities. The second section focuses

on the socio-cultural settings of Chin ethnic people focusing on dynamic changes in political history, socio-economic conditions, and cultural practices.

**Chapter five** presents the empirical results from the three embedded case studies with detailed analyses of land tenure institutions, livelihood strategies and forest income, as well as the traditional ecological knowledge and management practices.

**Chapter six** discusses the similarities and differences between the three case studies with particular focus on local compliance with land tenure institutions, livelihood dependency on forest income, and the potential application of traditional ecological knowledge in protected area management.

**Chapter seven** presents the synthesis of case study results and management implications for Natma Taung National Park. It discusses the four management scenarios in accordance with the three sustainable criteria: biodiversity conservation, livelihood improvement, and social justice.

**Chapter eight** concludes the dissertation with a proposed management framework for NTNP. This chapter also discusses the theoretical contributions, the strength and limitations of the applied methods, and the outlooks for future protected area management in Myanmar.

## CHAPTER 2

# THEORETICAL BACKGROUND

### 2.1 Social-Ecological System Approach in Protected Areas

Protected area, as defined by International Union for Conservation of Nature (IUCN), is 'a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values' (Dudley, 2008, p. 8). This definition highlights that protected areas aim not only to protect nature and biodiversity but also to ensure the sustainable provision of ecosystem services to improve human well-being. It allows policymakers to look beyond the natural system and integrate social considerations in protected area management (Palomo et al., 2014). In addition to nature protection, several efforts have made in the past to integrate conservation objectives into the development agenda in order to meet sustainable development goals (Alpert, 1996; Wells and McShane, 2004). To achieve these dual objectives, conservation practices have been shifted beyond protectionist paradigm toward more people-centred approaches (Bajracharya and Dahal, 2008). However, practical evidence has shown several challenges in implementing people-centred approaches (Andrade and Rhodes, 2012; Bauch et al., 2014).

According to K. Brown (2003), there are three major challenges encountered in implementing people-centred approaches. The first challenge concerns identifying different values, knowledge, and interests of diverse stakeholders regarding particular resources. As values and knowledge are evolving and adapting to external changes (Berkes et al., 1998), a pluralist approach is necessary to understand the dynamics of knowledge and values over time. The second challenge is how to integrate diverse stakeholders' interests into conservation planning and implementation in a fair and justice way (K. Brown, 2003). This challenge has called for a greater deliberation and inclusion of local people in decision-making rather than simple passive participation.

The third challenge is how to create new institutional settings that are flexible and adaptable to manage complex environmental issues and accommodate diverse interests and values assigned to each resource. K. Brown (2003) concludes that neither state nor local institutions alone are sufficient to deal with complex environmental issues so that integrating both institutions is necessary to achieve effective conservation outcomes.

To overcome challenges in people-centred approaches, research on national resource management has focused more on social system analysis rather than the ecological science (Berkes et al., 1998; Ostrom, 2009). Conventional thinking of people as threats or stressors to the ecological system has changed and people are considered as an integrated part of the natural environment (Folke, 2006). Based on this assumption, a new conceptual model, namely Social-Ecological System (SES) approach, has evolved in natural resource management. The SES approach has emerged based on the assumption that both ecological and social systems are linked to each other so that harmonizing the two systems is necessary to achieve the desired outcomes (Norgaard, 1994; Berkes et al., 1998). This approach has been widely used in recent literature to analyse complex environmental issues. These include studies on sustainability science (Graaf et al., 1996; Kates, 2001); natural resource management (Anderies et al., 2004; Rammel et al., 2007); collective action (Ostrom, 2009); and protected area management (Palomo et al., 2014; Cumming et al., 2015).

The SES approach is rooted in two main theoretical perspectives. The first perspective is related to the theory of coevolution<sup>1</sup> between the social system and natural environment (Norgaard, 1994; Berkes et al., 1998). According to Norgaard (1994), the term "coevolution" implies that people try to adapt to the environmental changes by altering their knowledge, forms of social organisations, and technologies. At the same time, how people know, organise, and use technologies alter the characteristics of the evolving environment (Figure 2.1). Norgaard (1994) explains that the success of a society depends on its social system that sustains social organisations and rationalises individual actions in using environmental resources. Therefore, changes in characteristics of the social system—such as knowledge, value, or belief system—will influence how people apply selective pressures on particular resources in the environment. Consequently, resources that fit with the social system will be sustainable and the less fit ones will eventually extinct. Also, knowledge and value systems that fit with the natural system will continue to survive, and the rests will disappear. Norgaard (1994) argues that the coevolutionary development will not be achieved unless the reciprocal

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<sup>1</sup>The term "coevolution" was initially used in ecological science referring to the mutual relationships between butterflies and their food plants (Ehrlich and Raven, 1964). Later, it was adopted in social science to describe the reciprocal interactions between the social system and natural environment (Kallis and Norgaard, 2010).

changes between environment and society are complementary and beneficial to each other.

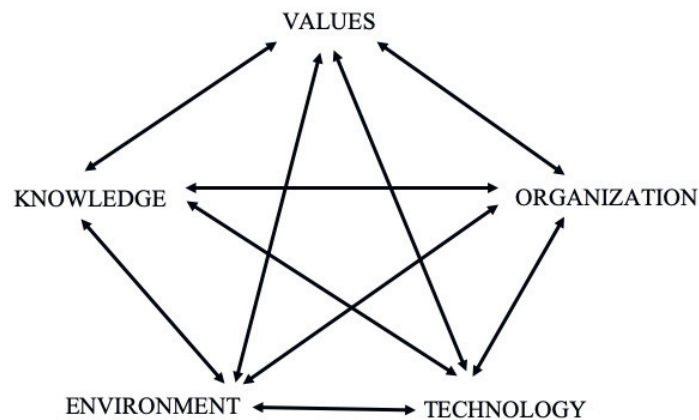


Figure 2.1: The coevolutionary process between social system and environment

Source: Norgaard, 1994, p. 27

The second theoretical perspective of the SES approach is the resilience thinking to understand and adapt with the dynamic changes of the social-ecological systems (Folke, 2006). The term 'resilience' in SES approach refers to the ability of a system to absorb disturbances while still retaining its primary functions and structural components (Walker et al., 2004). Unlike traditional problem-solving methods, SES approach focuses on maintaining the ability of the system to adapt to the changing social-ecological conditions (Folke, 2006). The resilience concept has evolved based on the assumption that the social-ecological system shares the characteristics of a complex adaptive system (Levin, 1998). A complex adaptive system is a conceptual model, which explains that the interactions among system components are complex and non-linear so that changes in a simple but powerful rule can transform the entire system into a new situation (Holland, 1995). As social-ecological systems are dynamic and unpredictable, it is difficult to establish rigid management approaches that aim to control a particular situation (Holling and Gunderson, 2002). A new problem or situation may evolve at any time so that the conventional resource management based on linear cause-effect thinking will not be effective in the long run (Berkes, 2004). Therefore, implementing SES approach requires a flexible and adaptive management system that emphasizes the dynamic interaction between the social system and natural environment (Armitage et al., 2009).

Adaptive co-management is a collaborative and learning-oriented process that aims to improve the resilience and adaptive capacity of the target social-ecological system (Armitage et al., 2009). It is an integrative governance system that combines adaptive management principles and co-management practices (Berkes, 2009). Adaptive

management is the concept of learning and doing where management principles are flexible and open to future options to modify and cope with dynamic changes (Williams, 2011). Unlike the traditional trial-and-error approach, adaptive management aims to overcome the challenge of complexity and unpredictability by allowing continuous learning and feedbacks during management processes (Allen and Garmestani, 2015). Co-management is the sharing of power and responsibilities between government authorities and local resource users (Berkes, 2009). The concept has evolved in response to the failures of traditional top-down planning and management practices (Berkes et al., 1991). It aims to improve the legitimacy of management practices through empowering local communities and maintaining social justice (Borrini-feyerabend et al., 2000). The key advantage of adaptive co-management is minimising resource-use conflicts by integrating diverse views and interests of stakeholders in decision-making processes (Plummer et al., 2012). It can also redress the 'problem of fit' between governance institutions and the biophysical environment by integrating local knowledge and practices that have evolved based on continuous learning and localised experiences (Olsson et al., 2004).

However, adaptive co-management is not a panacea and should not be used for every resource management issues. The decision to use adaptive co-management requires to consider several factors including type of resources, project duration, scale of conflicts, and the presence of options for negotiation (Plummer et al., 2012). For instance, adaptive co-management is not appropriate for managing rare resources, such as endangered species, which do not allow to learn experiences from management failures (Allen and Gunderson, 2011). In such cases, it is more suitable to provide absolute protection with minimum livelihood impacts. The project duration is also an important factor to be considered before choosing the adaptive co-management approach. Adaptive co-management is a long-term learning process so that the management outcomes will not be visible within a short period (Westgate et al., 2013). Therefore, it is not suitable for conservation projects which require tangible outcome within a limited time period. The essence of adaptive co-management is the collaboration and negotiation among the relevant stakeholders so that it may not be applicable if there is limited or no option for negotiation. For instance, in areas with high population pressure or with no alternative resource to meet local requirements, using adaptive co-management may escalate more conflicts than other management approaches (Allen and Gunderson, 2011).

The SES approach is an important tool to guide sustainable management of natural resources in the face of uncertainty and unexpected changes (Folke, 2006). It offers opportunities to analyse the dynamic linkages between the protected area and local people. On the one hand, it helps to enhance current conservation efforts by revealing



the bundle of ecosystem services that protected area is contributing to all stakeholders (Palomo et al., 2014). On the other hand, it allows uncovering existing institutions and social mechanisms that regulate the flow of these services (Rammel et al., 2007). Understanding existing resource management institutions allows to identify synergies and conflicts between conservation and development objectives, and provides opportunities for trade-off among stakeholders under common understanding (Berkes and Ross, 2013). Uncovering ecosystem services demand by local resource users offers options for management intervention that enable to reduce current pressures on ecosystems with minimum livelihood costs (Martín-López et al., 2012). Integrating local knowledge and management practices into formal management organizations can provide a platform for local participation in conservation and reduce management costs (Colding et al., 2003).

### 2.1.1 Land Tenure System and Property Right Institutions

Land tenure refers to the institutional relationship among people in relation to land and natural resources (FAO, 2002). It is an important social mechanism that regulates the linkages between society and environment (Berkes et al., 1998). It is constituted by rules that define particular rights for individuals over the land and related resources (Schlager and Ostrom, 1992). Such rules are developed by the state based on constitutional arrangements or evolved within the society based on local customs, norms, and belief systems (Ostrom, 2005). Land tenure systems are usually differentiated into two different types (FAO, 2002). The first type is the formal (*de jure*) system where the tenure rules are explicitly acknowledged and protected by the state. The second type is the informal (*de facto*) system where the tenure rules are not legally recognised and protected by statutory laws. Both types of land tenure systems may overlap each other particularly in areas protected and managed by local indigenous people (Fitzpatrick, 2005).

Land tenure is usually defined by using the property right concept. Property right is an enforceable authority to undertake particular actions in a specific domain (Schlager and Ostrom, 1992). It not only affects who may use what resource or not, but also provides incentives to the right holders to achieve effective protection of resources and to reduce management costs (Demsetz, 1967). Property right is usually described as the bundle of rights that can be classified into four different types (Schlager and Ostrom, 1992). The first type is the *private property* where the rights are assigned to a private party such as an individual, a household, or a corporate body. The second type is the *communal property* where the rights are assigned to all members of a community. The third type is the *state property* where the state authority exclusively holds the



rights. The fourth type is the *open-access* where specific rights are not assigned to anyone so that the land is free and open to everyone (Schlager and Ostrom, 1992). In practice, property rights may overlap with each other due to lack of implementation (Pradhan and Rajendra, 2002). For instance, reserved forests may be regarded as state property under formal regulations; however, without effective enforcement, they may be considered as open-access by local people (Luttrell, 2001).

A community may hold different rights over different resources within the same property regime (Pradhan and Rajendra, 2002). Therefore, analysing land tenure system requires to explore the bundle of rights associated with each property regime. Schlager and Ostrom (1992) classify five different types of rights that are relevant for common-pool resources. These include (1) *access right*, which permits to enter a defined physical boundary; (2) *withdrawal right*, which permits to obtain the products of a resource; (3) *management right*, which allows to regulate resource use patterns; (4) *exclusion right*, which allows to determine who will have access right; and (5) *alienation right*, which permits to sell or transfer the land and related resources. Schlager and Ostrom (1992) argue that different types of rights influence the interest and actions of resource users and the sustainability of particular resources.

Property rights will not be effective unless there are effective governance systems in place. According to Ostrom (1990), an effective governance system should define a clear boundary among resource users that indicates who has the right to use in which conditions and who do not have the right. It should adopt the principle of collective choice arrangements in formulating new rules if the existing ones are not compatible with local situations. It should also include effective monitoring systems together with graduated sanctions and conflict resolution mechanisms that are accepted by all members. Ostrom (2005) argues that governing common property based on these design principles should consider the complexity of local social-ecological systems and should be adaptive to rapid exogenous changes.

One important aspect of governing common property is to formulate rules that are legitimate and accepted by all affected individuals (Ostrom, 2005). According to Tyler (1990), people follow rules based on two main perspectives. The first one is the 'instrumental perspective', where people may comply with rules based on rational choice decisions. For instance, the decision to conduct the illegal activity is determined based on the potential benefits of rule-breaking and the severity of penalty if it is found out by the others (Sutinen and Kuperan, 1999). The second one is the 'normative perspective', where people may comply with rules based on their moral norms and legitimacy in the rule-making processes (Tyler, 1990). For instance, an individual may follow the rules if he/she perceives that the law is fair and appropriate and the

enforcement institutions are legitimate (Sutinen and Kuperan, 1999). The differentiation between these two perspectives allows resource managers to understand why people follow or reject particular rules and to develop rules that motivate local cooperation in resource management practices (Tyler, 2014).

Property right systems can be changed due to several reasons. First, property rights will be changed when the resource protection costs are higher than the resource-use benefits. For instance, degraded forest areas under collective ownership may become open-access when the benefits of using degraded resources become lower than the protection costs (Fitzpatrick, 2006). Second, conflicting situations among stakeholders may also induce land tenure changes. As the conflicts often attract government intervention, the common property may transform to state property due to the increased enforcement of state regulations (N. Wang, 2001). Third, changes in social norms and cultural belief systems also contribute to the transformation of local tenure rules. This is particularly common among indigenous communities where the traditional sacred forests have become open-access in response to the introduction of modern religious beliefs (Hundie, 2008). Fourth, property rights may also be changed due to changes in government policies and related legislation. For instance, the new economic policy to promote fishery products in Vietnam has induced privatisation of open-access lands for shrimp farming (Luttrell, 2001). The emergence of economic opportunities may require new legislations that do not fit with local tenure regulations. As the government often supports legal enforcement against private investors, most common property areas gradually become private property under concession agreements (Luttrell, 2001).

Understanding local land tenure systems is essential for protected area management. Most protected areas in the tropics are overlapped with communal lands previously managed by customary institutions (Rights and Resource Initiative, 2015). The existence of dual land tenure systems often creates conflicts between protected areas and local people, particularly when the management authorities try to restrict local rights over land and resource-use practices (Adams and Hutton, 2007). The displacements induced by protected areas often result in the reallocation of rights among affected communities (Brockington and Igoe, 2006). This, in turn, affects the well-being of local people by changing livelihood activities, income-generating opportunities, and the consumption patterns of natural resources (Mascia and Claus, 2009). Therefore, understanding how protected areas influence local property right systems is vital in developing conservation strategies that minimise social conflicts.

### 2.1.2 Ecosystem Services and Local Livelihoods

The term 'ecosystem services' is commonly used to demonstrate the flow of benefits from nature to society. The concept has evolved based on the assumption that natural ecosystems and related services are currently undervalued so that identifying all benefits that ecosystems contribute to society will reduce anthropogenic pressures on natural resources (Daily, 1997). Earlier definitions of ecosystem services highlight the important role of ecological processes and their linkages to human society. For example, Daily (1997, p. 3) defines ecosystem services as "conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life". Later definitions have become more anthropocentric focusing on benefits rather than the ecological components of the ecosystem. For instance, Costanza et al., p. 253 (1997) define ecosystem services as "the benefits human populations derive, directly or indirectly, from ecosystem functions". The Millennium Ecosystem Assessment (MA) simplifies this definition as "the benefits people obtain from ecosystems" (MA, 2003, p. 53).

Ecosystem services are generally classified into four different types (MA, 2003). The first type is *provisioning services* that include all products obtained from ecosystems including food, fibre, fuel, and genetic resources. The second type is *regulation services* that include all benefits obtained from ecological processes including climate change mitigation, water regulation, disease prevention, and pollination. The third type is *cultural services* that include non-material benefits obtained from the ecosystem such as education, recreation, or spiritual experiences. The fourth type is *supporting services* that provide the necessary conditions to produce the first three services (MA, 2003). Depending on each service type, the potential benefits of an ecosystem may differ across different actor groups (MA, 2003). For instance, the provisioning services may provide more benefits to local users who depend on the ecosystem for their livelihoods. However, the regulation services such as climate change mitigation or water regulation services may extend beyond local users providing benefits at regional and global scales.

One crucial aspect of the ecosystem service approach is the valuation of services that society benefits from the environment. Value in simple term is "the relative importance or worth of an object to an individual or groups in a given context" (T. C. Brown, 1984, p. 236). The value system is important because it shapes the choice for a particular product or service and thereby influences on individual behaviour to enjoy or consume it (MA, 2003). Value can generally be distinguished into two types (Farber et al., 2002). The first one is the intrinsic value, which measures based on the existence of an item without referencing to its utility. For instance, a particular species may have intrinsic

value in maintaining the health and integrity of the relevant ecosystem without any relation to human satisfaction (Farber et al., 2002). The second one is the instrumental value, which is measured based on its utility in meeting human preferences. This type of value system is fundamentally anthropocentric and may cover both the use and non-use values of a particular species or ecosystem (Goulder and Kennedy, 1997). The distinction between intrinsic and instrumental values is important in conservation planning (Farber et al., 2002). Most protected area managers are ecologists who give more preferences towards intrinsic values of species and ecosystems, whereas policymakers and local communities give more attention to instrumental values such as provisioning or cultural services. Understanding both intrinsic and instrumental values allows open discussions among stakeholders and provides options for negotiation between conservation and improvement of human well-being (McShane et al., 2011).

The connection between ecosystem services and human well-being has been well documented (Summers et al., 2012). For instance, Wunder (2003) conceptualises the role of forests in poverty alleviation in the tropics. The author differentiates poverty alleviation into two different types. The first type is poverty prevention where forests provide basic materials—such as food, water, shelter, and so on—to maintain a minimum standard of living, although it may be below the poverty line. In this concept, the ecosystem services from forests enhance local resilience by serving as safety nets and gap fillers to mitigate poverty without lifting people above the poverty line (Wunder et al., 2014). The second type is poverty reduction where forests provide additional income to lift people above the poverty line (Wunder, 2003). For instance, a study by Fonta and Ayuk (2013) in south-east Nigeria shows that about 10.4% of poor households have been lifted above the poverty line due to forest income. The conceptual distinction between the two aspects of poverty alleviation is important in developing pro-poor forest policies that aim to balance between conservation and livelihood improvement of rural poor (J. A. Fisher et al., 2014).

The degree to which an individual gets benefits from an ecosystem may differ across communities. For instance, Angelsen et al. (2014) found out that forest environmental income is higher in high-income households than the medium and low-income households. A study by P. S. Aung et al. (2015) also shows that better-off households receive more forest income than medium and poor households. According to Ribot and Peluso (2003), the ability to derive benefits from the environment not only depends on property right that an individual is assigned to but also is mediated by complex access mechanisms including capitals, markets, technology, labour, and social relationships. The choice of livelihood strategies also determines the types of benefits that households receive from the ecosystems (Scoones, 1998). Changes in livelihood strategies may also change the resource use patterns of individual households (Chilongo, 2014). These

particular changes may affect the distribution of income from ecosystem services across communities (Daw et al., 2011). Understanding the income distributive effects of ecosystem services is central not only to minimize the negative effects associated with natural resource dependence but also to optimize the benefit-sharing in a fair and justice ways (Fonta and Ayuk, 2013).

Ecosystem service approach is an important tool for protected area management. It helps resource managers to raise public awareness for conservation and sustainable use of natural resources. It also helps to identify the distribution of benefit among diverse stakeholders under different local circumstances. This information provides opportunities to integrate diverse needs and interests of stakeholders in conservation practices (Martín-López et al., 2011). The valuation of ecosystem services also supports resource governance and decision-making processes. Identifying the values of different service types helps to determine winners and losers among beneficiaries and provides justifications for trade-off among relevant stakeholders (Pritchard Jr. et al., 2000). Understanding the relative contribution of ecosystem services can provide incentives for conservation and sustainable use of natural resources (Costanza, 2000).

### **2.1.3 Traditional Ecological Knowledge and Management Practices**

Traditional Ecological Knowledge (TEK) is a form of knowledge that has evolved within the society based on long-term observations of the environment (Berkes, 2008). It plays an important role in maintaining the resilience of social-ecological systems by providing adaptive capacity to adjust social actions against disturbances (Walker et al., 2004). It also symbolises the co-evolutionary relationship between social and ecological systems (Norgaard, 1994) and provides a platform for local participation in conservation (Berkes, 2009). TEK has become a popular topic in most global frameworks for conservation. For instance MA (2005) recommends that the effective management of ecosystems typically requires “place-based” knowledge held by local resource managers. The Convention on Biological Diversity (CBD) also encourages to preserve, maintain and promote the wider use of traditional knowledge with the approval and involvement of the knowledge holders (CBD, 2011). The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) framework also recognizes the role of TEK in ecosystem service management and create opportunities for the inclusion of such knowledge in ecosystem and biodiversity assessments (Díaz et al., 2015).

The term Traditional Ecological Knowledge (TEK) is often used interchangeably with Local Ecological Knowledge (LEK) (Berkes et al., 2000; Olsson and Folke, 2001). According to Berkes (2008, p. 7), TEK is defined as "a cumulative body of knowledge,

practices, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment". Olsson and Folke (2001) argue that the term 'traditional' requires to indicate the time scale in order to clarify what is traditional and what is not. The authors have suggested using the term 'Local Ecological Knowledge (LEK)' to include recently generated knowledge (Olsson and Folke, 2001). However, Berkes (2008) argues that the term TEK differs from LEK mainly because the latter often lacks perspectives regarding historical evolution and cultural transmission.

TEK differs from modern scientific knowledge. Berkes (2008) explains that both traditional and scientific knowledge have evolved in similar patterns; both of which have emerged through observation of environmental phenomena, and thereby developing intellectual processes to interpret the complex natural system. In contrast to scientific knowledge, TEK also includes spiritual or religious dimensions. Moreover, TEK is integrated with moral and ethical context rather than rational deductive thinking (Berkes, 2008). According to Agrawal (1995), the distinction between traditional and modern knowledge system is arbitrary so that both systems should be treated as complementary rather than contradictory to each other. However, Raymond et al. (2010) argue that integrating both systems can face many challenges. On the one hand, most scientists often ignore TEKs that are based on spirituality or religious belief. On the other hand, traditional communities hardly accept the scientific knowledge on the first hand and prefer to keep own knowledge system to avoid abrupt changes (Raymond et al., 2010).

Berkes (2008) differentiates TEK into four levels. The first level relates to local empirical knowledge about the environment such as information on species identification, taxonomy, life histories, distributions, and behaviour. The second level includes knowledge related to land and resource management systems. It comprises a set of practices, tools, and techniques that are rooted in local understandings and experiences on ecosystem functions and processes. The third level includes social institutions related to resource management systems such as taboos, norms and codes of social relationship. The fourth level relates to local world-views or belief systems that shape social institutions and perceptions of the environment (Figure 2.2). The term TEK comprises all these levels as *knowledge-practice-belief* complex so that the analysis of TEK should include all these levels in order to understand the complex relationship between human and the environment (Berkes, 2008).

TEK has emerged among society in two different ways. The first one is the ecological understanding model, where TEK is generated by learning from ecological processes



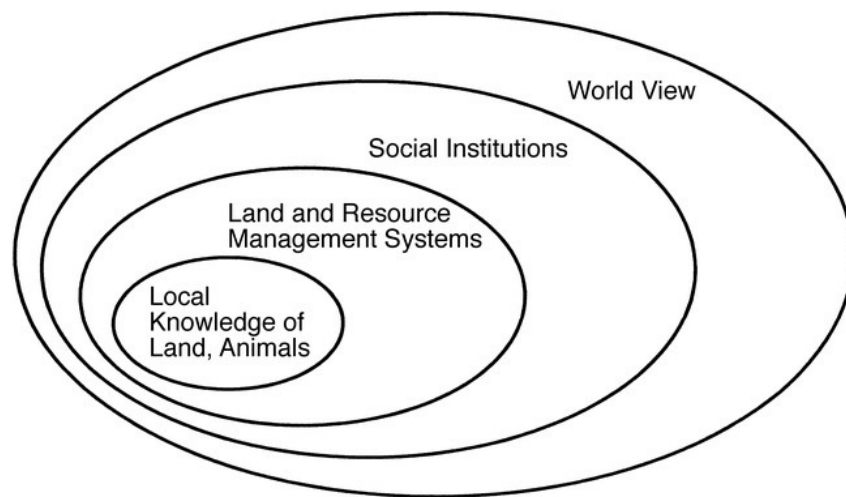


Figure 2.2: Levels of analysis in traditional knowledge and management systems

Source: Berkes, 2008, p. 17

among plants, animals, and other components of ecosystems (N. J. Turner and Berkes, 2006). In this model, TEK can also be generated among society by observing changes in ecological cycles and natural disturbances that occur within the environment. The second one is the depletion crisis model, where TEK has emerged in response to depletion of natural resources that people depend for their livelihood or in the face of environmental shocks and crisis (Berkes and N. J. Turner, 2006). In some cases, resource depletion may become trigger points for the people to redesign existing practices in order to minimise such experiences in the future. Both types of knowledge are transmitted by learning lessons from self-observations or other people through oral history and discourses among the society (N. J. Turner and Berkes, 2006).

In contrast to knowledge generation, TEK can be lost for several reasons. Firstly, people may lose TEK when local access to land and resource is restricted by formal regulations, as in the case of protected areas in many parts of the world (Brockington and Igoe, 2006). Secondly, people may no longer use TEK in relation to a particular resource when the resource itself is declined or lost in their surroundings (N. J. Turner and K. L. Turner, 2008). Thirdly, TEK may be lost due to the introduction of modern management techniques that replace traditional resource stewardship practices. For instance, traditional practices and social institutions among swidden communities in South-east Asia have changed due to the introduction of modern agricultural practices (Cramb et al., 2009). Fourthly, TEK may be lost due to modernisation and economic development, especially when younger generations have engaged more in market-oriented activities such as non-farm employment and migration that decrease their interactions with the environment (Gómez-Baggethun et al., 2010). Finally, TEK may be lost when people change their religious belief which influences local taboos,

norms, and ritual practices related to natural resource use and management practices (Osei-Tutu, 2017).

Several authors have indicated the important role of TEK in conservation and management of natural resources. For instance, Berkes et al. (2000) identify several TEK that are important for conservation and sustainable use of natural resources. These include monitoring the state of resources, total protection of certain species, temporary restriction of harvest, multiple species management, rotational farming, and succession management. The use of TEK also empowers local people to participate in conservation practices (Ruiz-Mallén and Corbera, 2013). It contributes to local livelihood by improving people's ability to manage essential resources in sustainable ways (Parrotta and Tropper, 2012). TEK related to places, timing, and methods of harvesting helps local resource users to make important decisions, such as whether to harvest or reserve the critical resources (Menzies, 2006). The use of TEK under formal management system also provides opportunities to respect value, knowledge, and priorities which may lead to positive local attitudes towards conservation initiatives (Ruiz-Mallén and Corbera, 2013).

Despite its relative importance, several limitations exist regarding the application of TEK in formal management practices. First, TEK is closely related to traditional societies who are considered as static and isolated from other societies (Rist et al., 2014). Due to improved infrastructure and technology, the intercultural communication among traditional societies has increased affecting the long-term applicability of existing TEK practices (Reyes-García et al., 2014). Second, TEK is generated in the immediate context of local livelihoods so that it is most suitable to be used for particular livelihood activities that have been practised for several generations (Agrawal, 1995). The adoption of TEK in its static form will be challenging when the livelihood activities are constantly changing due to modern agricultural technology and market improvement (Gómez-Baggethun et al., 2010). Third, TEK is generally location specific and characterized by particular communities living in specific geographic region (Menzies, 2006). This specific nature of TEK limits the dissemination and utilization by a broader public. The challenge for further replication has become a major obstacle for creating TEK based management practices (Agrawal, 1995). A more dynamic approach that integrates both historical and geographical perspectives is essential in assessing and application of TEK in formal management practices (Rist et al., 2014).



## 2.2 Overview of Protected Area Management in Myanmar

The concept of protected areas was initiated in Myanmar in relation to Buddhist religious belief. Traditionally, forests around the Buddhist monasteries were delineated as sanctuaries for wildlife and domestic animals. The first documented traditional protected area was the *Yadanabon* Wildlife Sanctuary designated by King *Mindon* in 1860 (M. Aung, 2007). Modern protected areas were introduced by the British colonial government with a special focus on the protection of wildlife for recreational hunting. In 1912, the Wild Birds and Animals Protection Act was enacted in order to protect endangered birds and other wildlife species. The law was later amended in 1936 to prohibit killing animals inside the wildlife sanctuaries. By the time Myanmar got her independence in 1948, about 11 protected areas had been officially designated as wildlife sanctuaries (M. Aung, 2007).

During the post-independence period after 1948, the protected area management was neglected due to complex political situations. It had regained its momentum after the initiatives of Nature Conservation and National Park Project (NCNPP) in the 1980s (FAO, 1985). The project was implemented from 1981 to 1985, with technical support from Food and Agriculture Organization (FAO) and financial assistance from United Nations Development Program (UNDP). It was designed as a preparatory phase to identify suitable areas for the establishment of national parks and to develop legal and administrative infrastructure for the subsequent management (FAO, 1985). The NCNPP introduced modern concepts of protected areas such as national parks in addition to the earlier concept of wildlife sanctuaries. In 1985, the Nature and Wildlife Conservation Division (NWCD) was formed under the Forest Department as a focal institution dedicated to protected area management and biodiversity conservation.

Myanmar Forest Policy (1995) provides a policy framework to establish and manage protected areas in Myanmar. The initial policy target was to establish protected areas up to 5% of the country's total area by 2010. The target was revised in the National Forestry Master Plan (2001-2030) to increase up to 10% of total land area by the year 2020. As of 2018, Myanmar has established 42 protected areas with a total area of 39,313 km<sup>2</sup> covering about 5.81 % of the country's area (Figure 2.3). Additional 19 sites (covering about 2.02% of the country's area) have been selected as proposed protected areas for the future.

The Protection of Wildlife and Protected Areas Law (POWPA) (1994)<sup>2</sup> is the main legal framework for the establishment and management of protected areas in Myanmar.

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<sup>2</sup>It was amended in 2018 and renamed as Conservation of Biodiversity and Protected Areas Law.

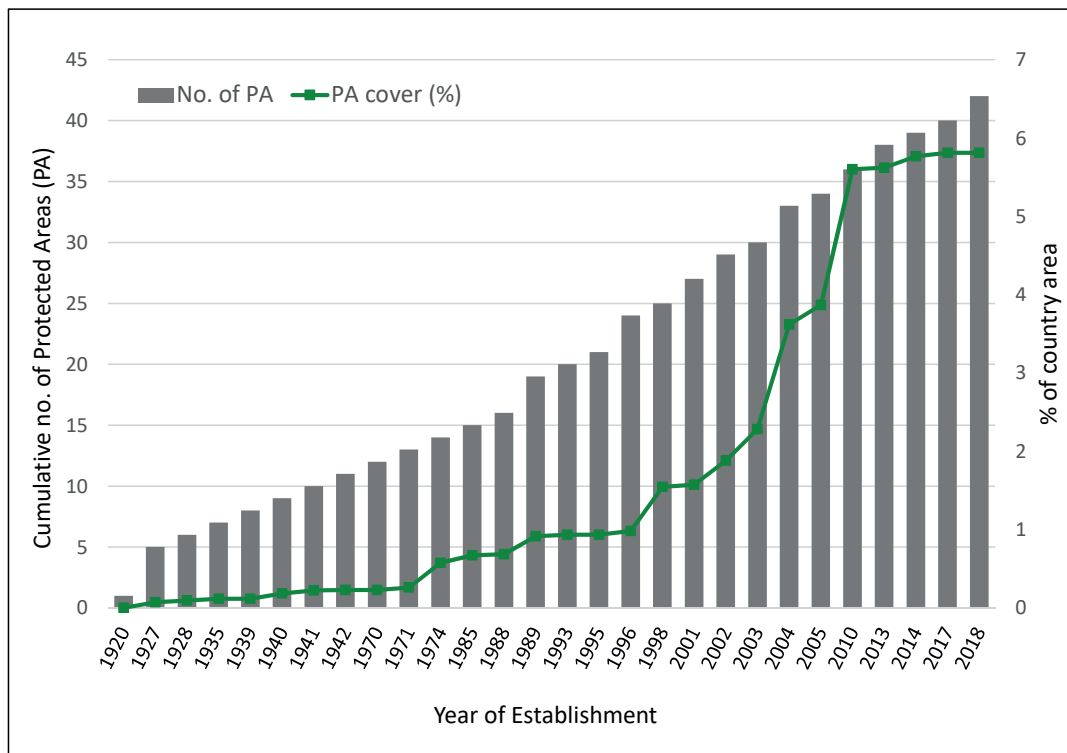


Figure 2.3: Number and percentage of protected areas in Myanmar

Source: Nature and Wildlife Conservation Division, 2018

It authorises the NWCD to establish protected areas on any land including the lands under private ownership. For instance, section 8 of the law states that:

The Minister may [...] in any land in which an individual or a private organization had the right of cultivation, right of possession, right of use and occupancy, beneficial enjoyment, heritable right or transferable right, with the approval of the Government and for the purpose of the objective of this Law, [...] designate protected areas according to the categories.

The POWPA Law restricts all human activities within the protected area, except for the recreation activities and scientific research. For instance, section 39 of the law prohibits all activities that destroy the ecosystem or any natural state in the protected area, including illegal encroachment, hunting, and collection of protected plant species. Regarding wildlife species, the law issues a list of threatened species, which are categorised into three groups: (1) completely protected species; (2) normally protected species; and (3) seasonally protected species. According to the law, killing, hunting, or wounding of protected wildlife species shall be punished with imprisonment of three to ten years depending on the nature of offences. Apart from prohibitions, the law also provides opportunities to implement actions that reduce resource dependency and minimise resource-use conflicts. Section 13 of the law permits to designate buffer zones inside or close to the protected areas to allow limited use of forest products by

surrounding communities. The law also permits to establish collaborative management between the government and local people with particular objectives to achieve both conservation and development outcomes.

Regarding management structure, all protected areas in Myanmar are under the direct administration of the Union Government. At the Union level, the Forest Department is the main government institution responsible for managing all permanent forest estates including reserved forests, protected public forests, and protected areas. Under the Forest Department, protected areas are managed by Nature and Wildlife Conservation Division (NWCD). At the site levels, the park wardens are assigned to operate day-to-day management activities under direct instructions from NWCD. Among the 42 protected areas, only 22 protected areas have management organizations in place. The remaining 20 protected areas are regulated under the authority of Township Forest Departments without proper management system in place (Figure 2.4).

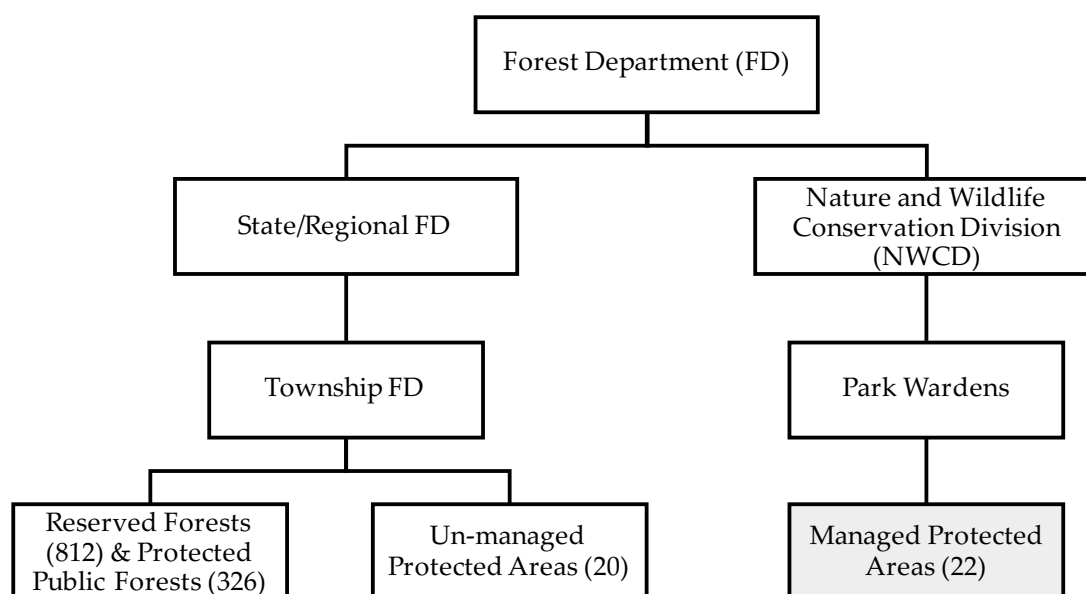


Figure 2.4: Organization structure of protected area management in Myanmar

Source: Forest Department, 2015

Protected areas in Myanmar are classified into six different categories in accordance with the IUCN classification. However, management practices are similar across all six categories. In all protected areas, the park wardens have to implement five main management activities: (1) regular patrolling and law enforcement; (2) conducting scientific research to monitor important species and ecosystems; (3) raising public awareness to increase people participation in conservation; (4) managing buffer zones to minimize land and resource use conflicts; and (5) promoting ecotourism in protected areas. Therefore, either a national park or wildlife sanctuary, there is no difference in terms of regular management activities and penalties for illegal offences.

Protected area management activities are being implemented with limited staff and budget allocation. As of 2018, NWCD employs only about 31% of its allocated staff to manage all protected areas in Myanmar<sup>3</sup>. The average budget allocation for each protected area is about 25 USD/km<sup>2</sup>/year (Emerton et al., 2015). This amount is relatively lower than the annual budget allocated in other protected areas in ASEAN countries<sup>4</sup> which ranges from 39 to 329 USD/km<sup>2</sup> (Figure 2.5). According to Emerton et al. (2015), NWCD would need additional 8.88 million USD per year to achieve fully-staffed, improved management and expanded protected area network.

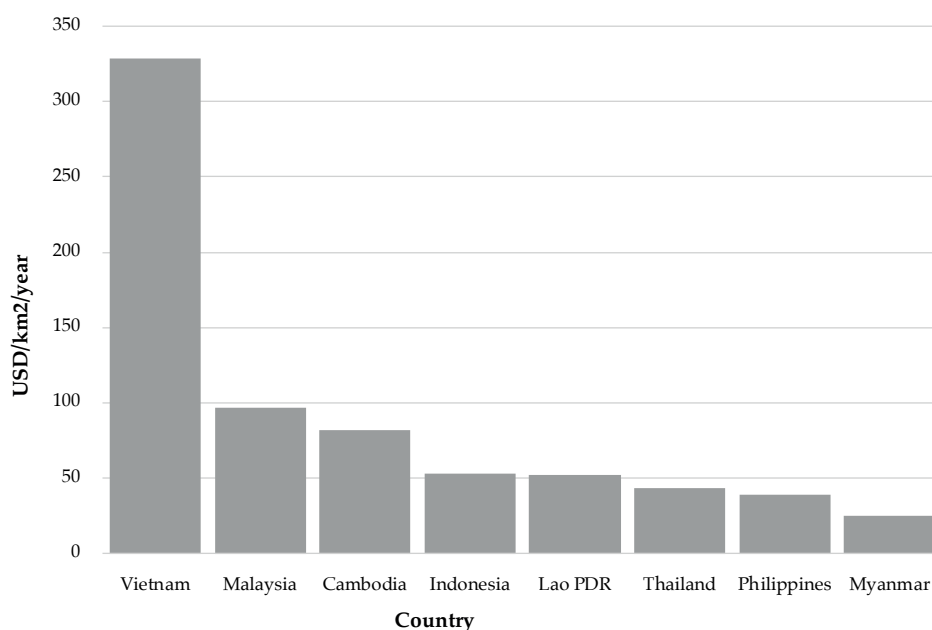


Figure 2.5: Budget allocation for protected areas in ASEAN countries

Source: Adapted from Emerton et al., 2015

Due to limited budget and staff allocation, the government has initiated to change the management strategy from complete protection towards more stakeholder inclusive approaches. In 2015, the National Biodiversity Strategy and Action Plan (NBSAP) was formulated to guide biodiversity conservation and protected area management in line with the CBD's Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets (Forest Department, 2015). After the development of NBSAP, the co-management concept has become an official government agenda for managing protected areas in Myanmar. The NBSAP provides a strategic framework to integrate local communities in biodiversity conservation and protected area management. For instance, target 11.3 of NBSAP aims to implement pilot co-management projects in five protected areas in order to provide incentives for conservation and to compensate for restricted access of

<sup>3</sup>Although the official staff allocation is 1,727, only 536 staff were employed at NWCD in 2018.

<sup>4</sup>Vietnam's state budget allocation is significantly greater than other Asian countries and is comparable to public budget allocations for PA in Europe and North America (Emerton et al., 2015).

natural resources (Forest Department, 2015). The NBSAP also encourages to identify and record traditional ecological knowledge and management practices in conservation areas inhabited by indigenous ethnic people. It includes formalisation of customary land tenures and the documentation of traditional knowledge to promote conservation and public awareness (Forest Department, 2015).

The new protected area law<sup>5</sup> also includes provisions to implement co-management and other community-based approaches in protected area management. For instance, section 13 (e) of the law authorises Forest Department to permit the implementation of co-management activities to achieve both conservation and sustainable development of local people. These include monitoring and law enforcement, buffer zone management, public awareness, research, and community-based ecotourism practices. Section 13 (g) also authorises to establish buffer zones inside or adjacent to the protected area in order to permit local resource use and other activities for socio-economic development of local people. Despite the existing legal frameworks encourage to implement co-management activities in protected areas, the actual implementation of the co-management approach is still limited in Myanmar. Moreover, there is no clear provision regarding decision-making and benefit-sharing between park authorities and local people. The lack of clear guideline and management strategy has imposed challenges for park authorities to negotiate with local stakeholders regarding the collaborative management of natural resources (Kimengsi et al., 2019).

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<sup>5</sup>Conservation of Biodiversity and Protected Areas Law (2018)

## CHAPTER 3

# RESEARCH METHODOLOGY

### 3.1 Conceptual Framework

This research conceptualises protected area as a social-ecological system and focuses on the reciprocal interactions between local people and the natural environment. The conceptual model is rooted in social-ecological coevolutionary theory elaborated by Norgaard (1994) and Berkes et al. (1998). The model is further modified based on the framework proposed by Pretzsch et al. (2014) in order to integrate adaptive management principles into protected area management. Following Pretzsch et al. (2014), the conceptual framework is composed of three main components. The first component is the natural system that provides products and services important for human well-being (MA, 2005). The second component is the social system that shapes people's behaviour in constructing their ways of life (Scoones, 1998). The third component is the interface that characterises the co-evolutionary relationship between the two systems within the given policy and legal frameworks (Figure 3.1).

Among the three components, this research emphasises the interface between the two systems in order to understand the relationship between the protected area and local people. Regarding the analytical approach, the interface is conceptualised with four main thematic complexes. The **complex I** deals with local land tenure systems that influence access to and control of ecosystem services provided by the natural environment. As most protected areas in tropics are overlapped with the lands owned by indigenous people, analysing both formal and informal land tenure systems will help to understand local resource-use conflicts and provide options for trade-off between them (Fitzpatrick, 2005). Land tenure system will not be effective unless effective governance systems are in place. Therefore, it is also essential to identify not only different types of rights that are assigned to particular resources (Schlager and Ostrom, 1992) but also different governance activities implemented by different

actor groups (Ostrom, 1990). As communities are diverse and heterogeneous, not all members of the community will accept traditional tenure rules developed by local people. Understanding why some people do not follow the rules is essential to minimise social conflicts (Ramcilovic-Suominen and Hansen, 2012). As local land tenure systems are changing over time (Hundie, 2008), analysing the patterns of changes in tenure rules and their influences on both social and ecological systems will help to minimise adverse impacts in the future.

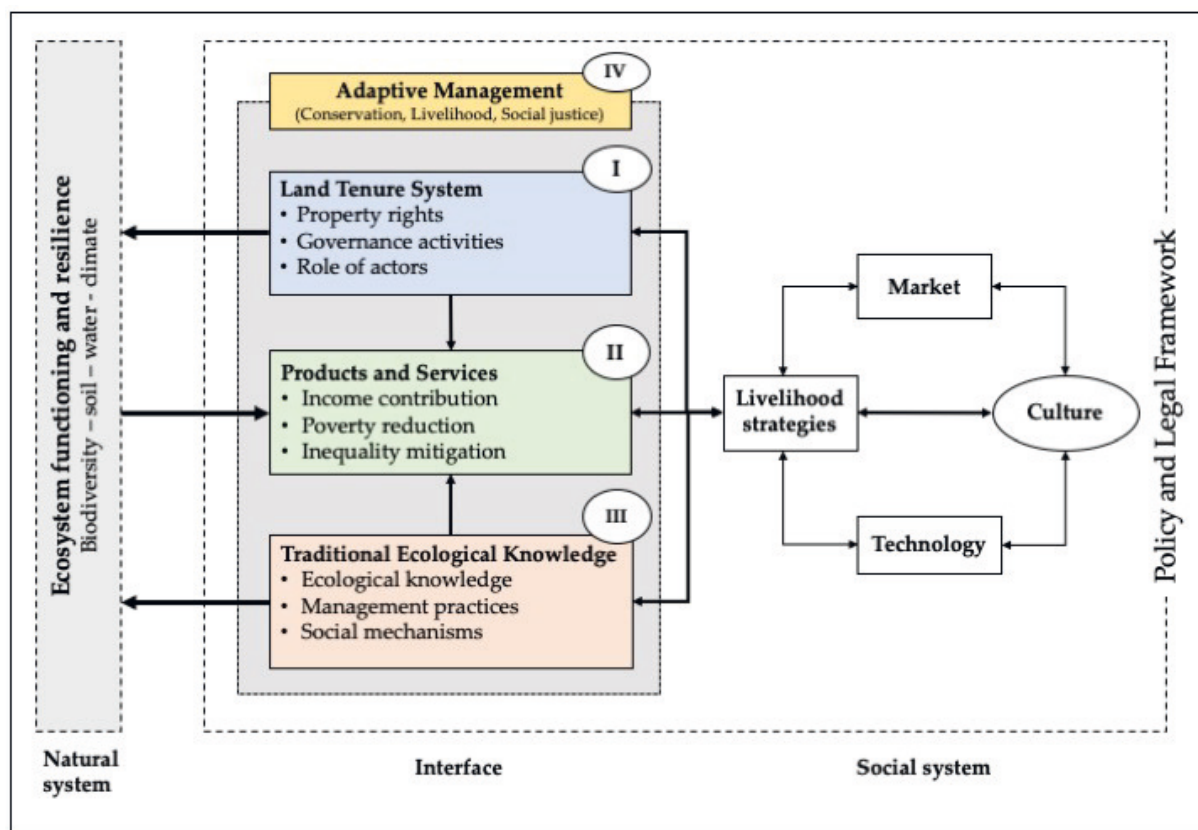


Figure 3.1: Conceptual framework for analysing the relationship between protected area and local people

Source: Adapted from Pretzsch et al., 2014; Berkes et al., 1998.

The **complex II** focuses on the flow of products and services from the natural system to improve the livelihoods and well-being of the society. From an ecological point of view, the capacity to provide ecosystem services may vary depending on the function and scale of a particular ecosystem and its ability to adapt to external disturbances (Groot et al., 2012). From a social point of view, households may use different types of products and services depending on the choice of strategies that households adopt in sustaining their livelihoods (Ellis, 1998). The choice of livelihood strategies is also influenced by individual access mechanism including property right system, knowledge, technology, market, and cultural institutions (Ribot and Peluso, 2003). Changes in livelihood strategies will influence the pattern and distribution



of benefits from the natural system within the community (Dorward et al., 2003). Understanding the relative contribution of forests to local livelihood is essential to highlight the important role of protected area in reducing poverty and inequality among rural households (J. A. Fisher et al., 2014).

The **complex III** focuses on traditional ecological knowledge (TEK) in relation to conservation and sustainable use of natural resources. Following Berkes (2008), this study conceptualises TEK as a knowledge-practice-belief complex that has evolved within the society over a long period of time. Therefore, the analytical approach emphasizes not only the local knowledge and management practices but also the social mechanisms that influence local institutions and resource-use practices. Taboos, norms, and rituals are important social mechanisms that ensure local participation in conservation and reduce management costs (Colding and Folke, 2001). However, TEK may be changed in response to changes in the social system including local world-views and religious belief (Gómez-Baggethun and Reyes-García, 2013). Understanding the pattern of changes in local TEKs will help to minimise TEK losses and to improve local adaptive capacity against external disturbances (Berkes and Ross, 2013).

The **complex IV** focuses on the management system that influences the interaction between the social system and natural environment. Following Plummer and Fitzgibbon (2004), an effective management model can be characterised with three main criteria: (1) conservation effectiveness, (2) livelihood improvement, and (3) social justice. Conservation activities will not be effective unless the management institutions are legitimate and accepted by local stakeholders (Hayes and Ostrom, 2005). Designing management strategies based on existing tenure institutions is essential to improve local participation in conservation and reduce management costs (Persha et al., 2011). To reduce people-park conflicts, the management system should contribute to local livelihoods by ensuring the sustainable provision of ecosystem services (Adams, 2004). To achieve social justice, management interventions should be fair and equitable and should provide opportunities to maintain cultural practices (Plummer and Fitzgibbon, 2004).



## 3.2 Data Collection

### 3.2.1 Selection of case studies and units of analysis

This research applies the case study approach to analyse the social-ecological relationship between the protected area and local people in Natma Taung National Park. The reason to use the case study approach is that social-ecological systems are complex and context-specific so that it requires in-depth analysis rather than the general assessment (Ostrom, 2007). According to Yin (2009), case studies help to understand the comprehensive details of a particular phenomenon and provide context-dependent knowledge for further theory development. In this research, the Natma Taung National Park is chosen as the primary case within which the three village tracts located inside, bordering and outside the park are chosen as embedded cases to perform the cross-case analysis (Figure 3.2).

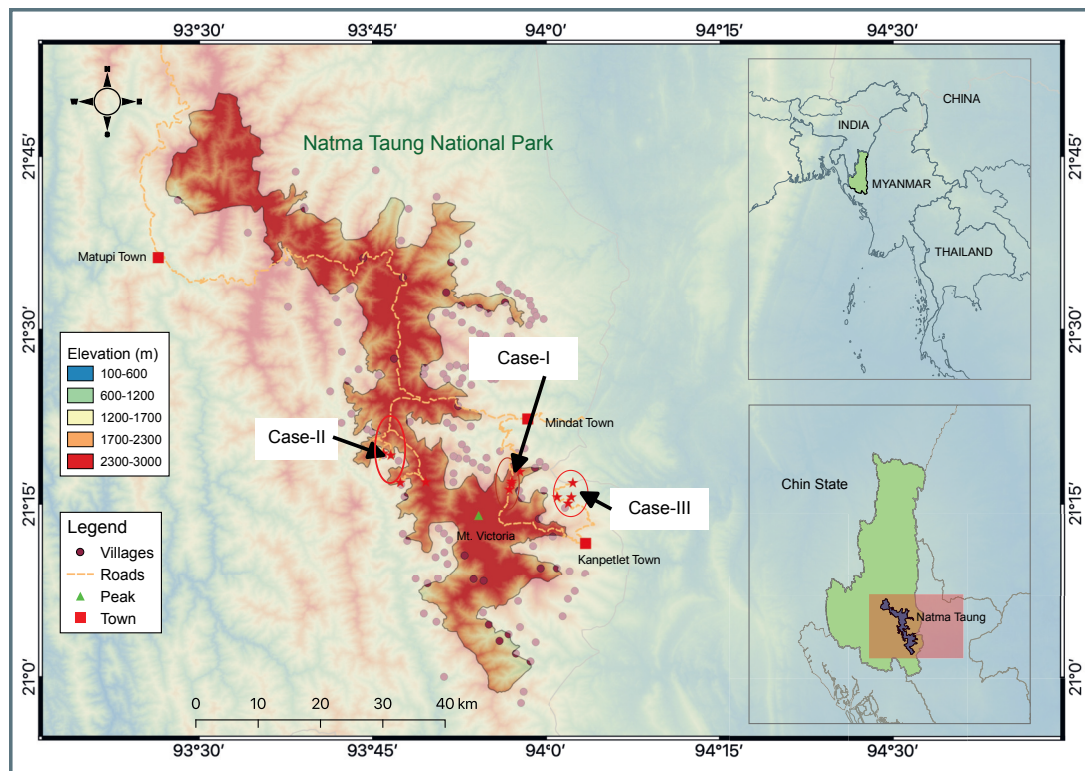


Figure 3.2: Locations of study villages in Natma Taung National Park

Source: Park Management Office, 2017

The reason to choose NTNP is mainly because it is one of the protected areas in Myanmar that encounters a long-standing conflict with local ethnic people. As the NTNP is recognised as an ASEAN Heritage Park (AHP), results from this research can be applied not only in Myanmar but also in other AHPs in South-east Asia. The unit of analysis is the village tract, which includes a cluster of three or more village

settlements. The reason to choose the village tract is that it is the basic administrative unit of formal government structure in Chin state. Moreover, selecting the village tract allows analysing inter-community relationships among villages that share the same administrative unit.

The selection of case study village tracts was conducted based on four main criteria: (1) community having similar forest conditions, (2) community facing a different degree of influences from the national park, (3) community depending on forest resources for their livelihoods, and (4) community showing willingness to participate in the research. The first case is the *Makyar* village tract located inside the core area of the national park with frequent visits by park authorities. The second case is the *Ung* village tract located on the boundary of the national park with less frequent visits by park rangers. The third case is the *Kitaw* village tract located outside the national park without any influence by the park management. A total of 50 households that represent at least 31% of total households in each case were selected for household survey by using the stratified random sampling method (Table 3.1). The reason to use equal sample sizes is to minimise sampling differences for cross-case analyses.

Table 3.1: Number of sample households selected for each case study

Case-I (Inside)			Case-II (Bordering)			Case-III (Outside)		
Villages	HH	Sample	Villages	HH	Sample	Villages	HH	Sample
Makyar A	42	15	Ung A	58	15	Kitaw A	40	15
Makyar B	20	10	Ung B	58	15	Kitaw B	31	11
Makyar C	26	15	Ung C	26	10	Kitaw C	43	15
Makyar D	21	10	Ung D	22	10	Kitaw D	9	9
Total	109	50		162	50		123	50

*Note:* Village names are changed for ethical reasons. HH refers to total number of households.

### 3.2.2 Process of data collection

Data collection was conducted in three phases. The first phase, preliminary exploration, was carried out from May to June 2016. The primary purpose was to explore current situations in the study area in order to assess the feasibility of the research project. The second phase, empirical data collection, was conducted from January to June 2017. The purpose was to collect the empirical data from sample households in each case study village tract. The third phase was the scenario workshop conducted in September 2018 in order to disseminate the research findings and to develop management scenarios with stakeholder participation.

Following the conceptual framework, data collection processes focused on four main thematic areas: (1) local land tenure system, (2) livelihood dependency on forest products, (3) traditional ecological knowledge, and (4) future management scenarios. Variables and indicators were developed for each thematic area in order to guide the data collection processes. The contextual information for the study area was collected mainly from government reports, publications, and grey literature. The overview of research variables, indicators and data sources are presented in Table (3.2).

Table 3.2: Lists of key variables, indicators, and data sources

Key variables	Measurement indicators	Data sources
<b>1. Land tenure system</b>		
• Property rights	Status and dynamic of different rights (access, withdrawal, management, exclusion, alienation)	Participatory land-use mappings
• Governance structure	Formal and informal governance activities (boundary delineation, controlling forest, permission, sanctioning, conflict resolutions)	Key informant interviews and focus group discussions
• Role of actors	Duties and responsibilities of local actors in governance activities	Key informant interviews and focus group discussions
<b>2. Ecosystem services &amp; livelihoods</b>		
• Forest income	Net benefit from the sale and use of forest products	Household surveys
• Poverty and inequality	Total income (cash and subsistence) from all income sources	Household surveys
• Livelihood trends	Patterns of changes in livelihood activities and key drivers of change	Household surveys and focus group discussions
<b>3. Traditional Ecological Knowledge (TEK)</b>		
• Ecological knowledge	Local knowledge regarding natural resource management	Key informant interviews and focus group discussions
• Management practices	Awareness and compliances with local management practices	Household surveys
• Social mechanisms	Local customs, norms, taboos, and belief system	Key informant interviews and focus group discussions

*Continued on next page*

Table 3.2: (continued)

Variables	Measurement indicators	Data sources
<b>4. Adaptive Management</b>	Multi-criteria decision analysis based on conservation effectiveness, improved livelihood, and social justice	Diagnosis from research outcomes; Participatory scenario workshop

### 3.2.3 Methods of data collection

Both qualitative and quantitative methods were employed for data collection. The advantage of using the mixed-method approach is that it allows utilising the strength of both qualitative and quantitative data collection methods. According to Creswell (2009), the mixed-method approach is more suitable when the use of either qualitative or quantitative approach alone is inadequate to address the complex research issues. As the interactions between social and ecological systems are complex, using the mixed-method approach provides more comprehensive data to realise the research objectives. The qualitative methods applied in this research include participatory land-use mappings, focus group discussions, key informant interviews, and field observations. Regarding quantitative methods, the semi-structured household survey was used to support the qualitative analyses. The details of each technique are discussed below:

- **Field observation:** Field observation is an important tool to explore the real-life situations of the study area (Yin, 2009). During field observation, the researcher took field notes regarding the social behaviour of local communities and the actual conditions of the natural environment. It includes the current status of forest resources, land-use types, household conditions and livelihood activities, market accessibility, and local cultural practices. Information from direct observations was also used to revise the questionnaires and to validate the responses.
- **Participatory land-use mapping:** This exercise was applied at 12 villages located within the three case study village tracts. The primary purpose was to explore the bundles of rights associated with each land-use type. A group of villagers including village headman and elders were asked to participate in drawing village land-use maps. First, the villagers were asked to identify the traditional village boundaries with the aid of Google-Earth images. After that, different land-use types within each village territory were identified for each distinct geographical feature. Finally, local land ownership system and different types of

right associated with each land-use type were discussed. The village territories were further confirmed with neighbouring communities to validate the historical land ownerships. Participatory mapping exercises helped to discover how the villagers classify and assign different tenure rights for each land-use type and how they differ from formal cadastral maps.

- **Focus Group Discussion (FGD):** About 16 FGDs were conducted not only with local villagers but also with the rangers from the national park. FGDs helped to get insight into particular issues and produced general consensuses about local culture. At community levels, FGD were used to discuss settlement history, tenure rules, agricultural practices, livelihood challenges, and social conflicts. At the park management level, FGD were conducted to identify historical events, current park management activities, significant challenges, and possible interventions to improve the situation. Each FGD was conducted with three to ten participants depending on the village and the topic of discussions. During the FGD, the researcher raised a particular topic of interest and facilitated discussions among the participants. Each discussion took from one to three hours, and the points of discussion were recorded in the field notes for further analysis.
- **Key informant interview:** A total of 36 key informants were interviewed during field data collection. These informants included village headmen, elders, local hunters, carpenters, representatives from local NGOs, and government staff. The informants were selected by using snowball-sampling in order to get access to competent experts (Neuman, 2014). Depending on the informants, the interviews covered a wide range of topics including government plans and regulations, village history, tenure changes, livelihood activities, market prices, resource management practices, and social mechanisms. Each interview took from thirty to ninety minutes. The informants were asked informally by using open-ended questions. The major advantage of the key informant interview was getting information not only about the topics of interest but also expert opinions based on the respondents' experiences (Yin, 2009).
- **Household surveys:** A total of 150 households (50 from each case) were interviewed during the second field data collection. All interviews were conducted at the respondents' homesteads using face-to-face discussions by the author with the help of local translators. The use of face-to-face interviews allowed the researcher to observe the surroundings, to use non-verbal communications with visual aids, and to reduce the misunderstanding of the questions (Neuman, 2014). The interviews were done with household heads who usually make household decisions. Each household was visited at least three times to establish good

relationships with respondents and to avoid taking long interview periods. This approach was useful not only to get valid information but also to clarify the unclear or missing data in subsequent visits.

Both structured and semi-structured questionnaires were used during household surveys. The questionnaires were separated into three main sessions for each field visit. The first session is related to household characteristics, major livelihood activities, and income sources. Forest income was excluded during the first visit because the information was sensitive and it required to establish trust between the respondents and interviewer. The second session focused on forest income and local use of different ecosystem services. The third session included structured questionnaires that investigated household compliances with tenure rules and TEK-based management practices. The questionnaires for the third session were formulated based on the key informant interviews and focus group discussions during the first two visits.

- **Participatory scenario planning workshop:** A stakeholder consultation workshop was held in NTNP on 25-26 September 2017. The primary purpose was to disseminate research findings and to discuss future options for achieving effective conservation and reducing social conflicts. A total of 25 stakeholders including 11 government officials, 11 community representatives, and 3 civil society organisations participated the workshop (see participant list in Annex B). The participatory scenario planning approach (Rowland et al., 2014) was used to discuss the future scenarios of social-ecological systems for the next ten years and to propose appropriate management strategies to achieve biodiversity conservation, livelihood improvement, and social justice. After the discussion, the participants were asked to give priority rankings on each strategy according to the sustainable development criteria (see detail in section 3.3.4).

## 3.3 Data Analysis

### 3.3.1 Assessment of local land tenure systems

Both qualitative and quantitative analyses were applied to explore the status and trends of local land tenure systems. For qualitative analysis, this research first identified different types of rights associated with each land ownership system as classified by Schlager and Ostrom (1992). Second, it explored local governance structures in accordance with the governance principles proposed by Ostrom (1990). Third, it



determined the roles and responsibilities of each actor regarding land use rights and governance activities (Table 3.3).

Table 3.3: Framework for analysing local land tenure system

Land ownerships	Type of rights	Governance activities	Actors
<ul style="list-style-type: none"> <li>• Private</li> <li>• Common</li> <li>• Government</li> <li>• Open-access</li> </ul>	<ul style="list-style-type: none"> <li>• Access</li> <li>• Withdrawal</li> <li>• Management</li> <li>• Exclusion</li> <li>• Alienation</li> </ul>	<ul style="list-style-type: none"> <li>• Defining boundary</li> <li>• Creating rules</li> <li>• Giving permission</li> <li>• Monitoring</li> <li>• Sanction</li> <li>• Conflict resolution</li> </ul>	<ul style="list-style-type: none"> <li>• Administrator</li> <li>• Village head</li> <li>• Tribal leaders</li> <li>• Landowners</li> <li>• Tenants</li> <li>• Outsiders</li> </ul>

*Source:* Adapted from Schlager and Ostrom (1992) and Ostrom (1990).

For quantitative assessment, the cultural consensus method (Romney et al., 1986) was applied to determine the patterns of agreement with existing tenure rules. This method was commonly applied for quantitative assessment of local compliance with cultural institutions and traditional practices (Reyes-García et al., 2007; Gómez-Baggethun et al., 2010; Bofo et al., 2015). A total of 15 different tenure rules identified during focus group discussions were used to prepare the questionnaire. During household surveys, each rule was explained to the respondent and asked if he or she was aware of it or not. If the rule was recognised, the next question was whether he or she was still following the rule or not. A score of one was given for each positive response. The analysis was done separately for awareness and compliances. If all responses were positive, each household would have a total score of 15 for awareness and 15 for compliances. The total scores were compared across the three case studies in order to determine the differences in local awareness and compliance across the three cases. The compliance scores were also compared across socio-economic categories in order to determine patterns of changes in tenure compliance by local people.

### 3.3.2 Assessment of livelihood strategies and forest income

In order to identify household livelihood strategies, this study first explored different types of livelihood activities that households had engaged within the last twelve months. Income from each activity was estimated by using income accounting methods proposed by Vedeld et al. (2004). Both cash and subsistence income were considered for income estimation. Family labour was omitted because the labour market in the study area was limited so that the opportunity cost of labour was extremely low and may not be realistic (Sjaastad et al., 2005). Due to mutual labour sharing among farmers, it was difficult to calculate individual labour inputs for collective activities. Forest

income in this study refers to the gross monetary values from the use and sale of all forest products minus the sum of estimated production costs without family labour values. Based on this concept, this study estimated the monetary values from the sale and subsistence use of timber, firewood, Non-Timber Forest Product (NTFP), forest food, wildlife, fodder, and medicinal plants. A similar concept was used to estimate income from other sources including agriculture, livestock, wage employment, and other non-farm activities. Income was calculated based on self-reported value because it represents actual household choices and reflects local demand and supply conditions (Cavendish, 2002).

After estimating income, households were clustered to form a group of households with similar livelihood activities. To identify livelihood clusters, the two-step clustering method was applied by using the Principal Component Analysis (PCA) and an agglomerative Hierarchical Cluster Analysis (HCA). The reason to apply the PCA before cluster analysis was to avoid multicollinearity among the income sources (Chilongo, 2014). The PCA was performed by using the share of income from each income category to generate the linear combinations of variables (principal components) according to income variations across households. The resulting principal components with Eigenvalues greater than "one" were taken as inputs for HCA. The Euclidean distance matrices were calculated based on the selected principal components. After that, the agglomerative HCA was performed by using Ward's methods. The livelihood clusters were determined based on the evaluation of cluster dendrograms produced by the HCA. After clustering households, the amount of forest income was compared across livelihood strategies in order to determine which strategy depend more on forest income. The pattern of changes in livelihood strategies within the last ten years was analysed based on household responses.

In order to determine the relative importance of forest income, the three Foster–Greer–Thorbecke (FGT) poverty measures (i.e. poverty headcount ratio, poverty gap ratio, and poverty severity index) were calculated by using equation 3.1 as proposed by Foster et al. (1984). The FGT indices were compared between with and without forest income in order to indicate the effect of forest income on poverty reduction.

$$P_{\alpha} = \frac{1}{n} \sum_{i=1}^q \left[ \frac{z - y_i}{z} \right]^{\alpha} \quad (3.1)$$

where  $P$  refers to poverty measure<sup>1</sup> defined by  $\alpha \geq 0$ ;  $y$  refers to household income in increasing order;  $z$  refers to national poverty line; and  $q$  is the number of poor individuals.

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<sup>1</sup>If  $\alpha=0$ ,  $P$  measures poverty headcount ratio; if  $\alpha=1$ ,  $P$  measures poverty gap ratio; and if  $\alpha=2$ ,  $P$  measure poverty severity.



The Gini decomposition method proposed by Lerman and Yitzhaki (1985) was also used to measure the effect of forest income on total income inequality. Following Lerman and Yitzhaki (1985), the marginal effects of each income source were calculated by using equation 3.2 and 3.3.

$$G_T = \sum_{k=1}^k S_k G_k R_k, \quad (3.2)$$

$$\frac{\partial G_T / \partial k}{G_T} = \frac{S_k G_k R_k}{G_T} - S_k, \quad (3.3)$$

where  $G_T$  represents the Gini coefficient of total household income;  $S_k$  refers to the share of total income by each income source;  $G_k$  measures the Gini coefficient of each income source; and  $R_k$  represents the Gini correlation between each income source and the cumulative distribution of total income (Lerman and Yitzhaki, 1985).

### 3.3.3 Assessment of traditional ecological knowledge

For analysing traditional ecological knowledge (TEK), this research first identified different types of TEK regarding the use, control and management of natural resources. Qualitative content analysis was mainly used to identify TEK that local people apply in their daily lives. The awareness and compliance scores for each TEK were calculated by using cultural consensus method (Romney et al., 1986) as described in section 3.3.1. The scores were compared across the three case studies in order to determine its variations in response to the national park regulations. The identified TEKs were further categorised based on normative and instrumental aspects in order to understand the patterns of changes in local compliances.

Regarding statistical analysis, the non-parametric Kruskal-Wallis tests were used to analyse variations across three case studies. The pair-wise multiple comparisons were conducted by using Dunn's tests with the Bonferroni correction method. The Wilcoxon-Mann-Whitney rank-sum tests were also applied to compare the differences between two socio-economic categories such as education, religion, and residency status. The associations between different income sources were tested using the Pearson correlation method. All analyses were conducted with R statistical software version 3.4.4.

### 3.3.4 Assessment of future management scenarios

Four different management scenarios were proposed based on the levels of local participation in protected area management (Borrini-Feyerabend et al., 2013). The Multiple Criteria Decision Analysis (MCDA) method was applied to select the most appropriate model among different management alternatives (Mendoza and Martins, 2006). Criteria for selection of management scenario were justified based on the three pillars of sustainable development: (1) effectiveness for biodiversity conservation, (2) improving local livelihood, and (3) enhancing social justice (see Table 3.4). The assessment of each criterion was conducted based on empirical results and outcomes from the participatory scenario planning workshop. The general assumption is that conservation approaches will be effective only if the local people comply with rules and regulations (Ostrom, 1990). Local livelihoods will be improved if conservation programs address local needs and interests of ecosystem services (Sunderlin et al., 2005). Social justice will be achieved if the conservation benefits are distributed equitably, fair and equitable decision-making mechanisms are in place, and local cultural practices are maintained in the long run (Berkes, 2004).

Table 3.4: Criteria for evaluation of management scenarios

Management scenarios	Criteria	Assessment indicators
1. Business-as-usual 2. Strict protection 3. Community control	Conservation effectiveness	<ul style="list-style-type: none"> <li>● Potential impacts for conservation</li> <li>● Local legitimacy of regulations</li> <li>● Effectiveness for implementation</li> </ul>
4. Co-management	Livelihood improvement	<ul style="list-style-type: none"> <li>● Meeting local livelihood needs</li> <li>● Contribution to poverty reduction</li> <li>● Potential livelihood improvement</li> </ul>
	Social justice	<ul style="list-style-type: none"> <li>● Income equality</li> <li>● Social equity in decision making</li> <li>● Maintaining cultural practices</li> </ul>

*Source:* Own elaboration.

## 3.4 Data Reliability and Validity

Data reliability refers to dependability or consistency of research methods so that the numerical values of an indicator do not vary under different measurement processes or instruments applied (Neuman, 2006). This research applied both qualitative and quantitative data collection tools to ensure the reliability of the study results. For land tenure analysis, participatory land-use mapping approach was mainly used to ensure

that the village territories and tenure rules reflect local realities by integrating the knowledge and perception of most community members. The oral history analysis method was also used to support the reliability of participatory land-use mapping results. The application of focus group discussion methods also allowed participants to express ideas and opinions in a more interactive way. Focus group discussion enabled participants to query and explain to each other in order to produce common information (Neuman, 2014).

To ensure the consistency of livelihood analysis, the study used survey questionnaires in accordance with the income accounting methods applied in the global study by PROFOR (2009). For income estimation, the recall periods were carefully chosen and adjusted with significant events in order to stimulate the memory of the respondents (Lund et al., 2011). For example, shorter periods were used for small and frequently-used products whereas more extended periods were used for lesser-used products such as timber or wildlife. The recall for each event was made from the present back into the past in order to increase the recall ability of the respondent (Wollenberg, 2000). Traditional ecological knowledge and management practices were explored mainly based on direct observation by the researcher and semi-formal interviews with village elders and other key informants. Although no scientific assessment was made to validate the actual impact of local management practices, the preliminary findings were triangulated with local experts, government authorities, and historical publications such as Carey and Tuck (1896), Stevenson (1943), and Lehman (1963). The participatory scenario planning method was also useful to validate the research findings based on the discussions among the relevant stakeholders.

Regarding data validity, this study focused on building trust between the researcher and respondents before commencing data collection. Key empirical data such as local use of forest products, livelihood activities, income, and asset holdings are sensitive, and therefore households may respond with incorrect information unless they trust the researcher (Lund et al., 2011). As trust is being built over time, the researcher spent significant time in the study communities and clearly explained that the study is purely scientific and all respondents will be kept as anonymous. The role of interpreter is also crucial in building trust within communities. Therefore, the interpreters were explicitly selected based on their relationships with local villagers. For instance, the researcher hired three interpreters who have close relationships with villagers in each case study. In addition to trust, the interview location can also shape the actions and statements of the respondents (Neuman, 2014). Therefore, the interviews were mostly conducted at the respondents' homesteads so that they can be more confident in answering questions and giving their opinions. It also provided opportunities to observe household characteristics in order to triangulate with the responses.

Most data in this study were obtained through respondents' recalls and estimation rather than direct measurements. This types of data are never completely accurate and depend on honesty, cooperation, and the ability to recall past events. However, this research tried to maximise the response validity by using triangulation and proper designing of the recall periods (Lund et al., 2011). For instance, forest income was estimated separately for each product, and the calculation was done based on the quantity of each product that households used per time and the frequency of using it. Local names and units were mostly used in order to help the respondent to estimate the correct amount or quantity of the products (Cavendish, 2002). Furthermore, not all the informant statements for local land tenure and cultural practices will represent the whole community (Romney et al., 1986). Therefore, the responses were validated by integrating well-design questionnaires into household surveys.

### **3.5 Ethical Considerations**

This research followed the principles of conduct in doing case studies in social science (Thomas, 2014). The free and informed consents were taken not only from the respondents but also from the village headmen and community leaders in each case study. Before deciding the case studies, the researcher organised a meeting with community leaders and village headmen and explained about the nature and purpose of the research, expected benefits, possible harm to the community, and measures to minimise them. The case studies were selected only if the participants of the meeting agreed to take part in this research. During data collection, each respondent was given a full option to agree or reject for participating in the research. Although it is important to have written agreements, this research did not take any written agreement because it is culturally uncommon in the study area and the respondents are usually reluctant to sign the formal agreement. In order to reduce negative impacts to the respondents, the anonymity of each respondent was ensured by coding with numbers instead of using the real name. The villages in each case study were named with pseudonyms in order to improve the confidentiality of the respondents. Only the names of the village tracts were used in the thesis in order to facilitate data validations and further researches.

## CHAPTER 4

# SOCIAL-ECOLOGICAL SETTINGS OF THE STUDY AREA

### 4.1 Background of the Natma Taung National Park

#### 4.1.1 History

The Natma Taung National Park (NTNP) (locally known as Kawn Nu M'zum<sup>1</sup>) is located in the southern Chin State of Myanmar. The geographical extent of the national park lies between north latitudes of N 20°58' and 21°50', and east longitudes of E 93°27' and 94°2'. The total area of the park is about 713.46 km<sup>2</sup>. The park area falls into three administrative townships: *Kanpetlet* Township, *Mindat* Township, and *Matupi* Township. There are about 40 villages located in and adjacent to the national park. Most of these villages are situated within Kanpetlet and Mindat townships. Only a few villages located in Matupi township are associated with the national park.

The history of the park was initiated during the Nature Conservation and National Park Project (NCNPP) implemented from 1981 to 1985 (Table 4.1). The project proposed Natma Taung as one of the potential sites for national parks in Myanmar (FAO, 1985). According to J. A. Sayer (1983), the Natma Taung area was justified as a national park with four distinct features. First, the area is geographically distinct because it is the highest mountain not only in the Chin Hills but also in the central and southern part of Myanmar. Second, the area is composed of a wide variety of montane species that could not be found in any other part of the country. Third, Natma Taung area is home to an endemic bird species (*Sitta victoriae*) and other five bird species that are not known elsewhere in Myanmar. Fourth, the scenic beauty of the mountain is attractive

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<sup>1</sup>the Government instructed to change the name of the park from "Natma Taung" to "Kawn Nu M'zum" by official letter no 2(2)18 (1860/2016) dated 2 June 2016.

and highly suitable for recreational activities such as hiking, bird watching, or natural history observations.

Table 4.1: Historical time-line for the establishment of NTNPN

Date	Events
1936	Declared as Bawli Climatic Forest for watershed protection and climate control.
1983	First field survey was conducted by FAO expert team and recommended to establish as a national park.
1993	Follow-up survey was conducted by FD team, and the draft boundary of the park was proposed.
1994	The park management office was opened at Kanpetlet to execute land settlement processes.
1994-1996	Detailed measurement of the proposed boundary was conducted.
1997	Officially declared as a proposed national park.
1997-1998	Land settlement committee was formed, and the land settlement processes were conducted.
1999	Submission of the first land settlement report to the Ministry of Forestry.
2000-2005	Review on the first land settlement report by the Ministry.
2008	Decision on land allocation scheme was made by the Chin SPDC.
2009-2010	Land settlement processes were re-established to determine the areas for land compensation.
2010	Officially gazetted as National Park.

Source: synthesised by the author.

Following the recommendations of J. A. Sayer (1983), a field survey was conducted in 1993 to identify a suitable boundary for the national park. The survey team mentioned that the park boundary recommended by J. A. Sayer (1983) is located within the area of *Bawli* climatic forest<sup>2</sup> designated during the British colonial period in 1936. However, there was no proper boundary demarcated for the climatic forest so that the team selected the park boundary mainly based on the imaginary boundary of the *Bawli* climatic forest. The team also included the remaining intact forests located above the altitude of 1,500 m in the national park (Ngai, 1993).

In 1994, the park management office was opened at Kanpetlet Township in order to execute the land settlement processes. The proposed boundary was measured from 1994 to 1996 in accordance with the boundary demarcation procedures. The official notice of the proposed boundary was issued in 1997. After the notification,

<sup>2</sup>The 'climatic forest' refers to the area designated for both watershed protection and climatic control.

the land settlement committee was formed to investigate the current land uses and land ownership within the proposed area and to compensate the rights and privileges claimed by the customary landowners. Land settlement processes were conducted until 1998. However, there were challenges to compensate for the loss of customary lands by local people. The amount of land claimed by the customary landowners was extremely high<sup>3</sup> and the government had to compensate about 250 million Kyats<sup>4</sup> to local landowners for their lands<sup>5</sup>. Therefore, the land settlement committee decided to re-investigate the claims made by local farmers. The committee also decided not to compensate if the land falls within the boundary of Bawli climatic forest. After the re-investigation, the government still had to compensate about 10.5 million Kyats (1.5 million USD in official exchange rate) to the customary land owners<sup>6</sup>. Nevertheless, the Ministry of Forestry rejected the revised proposal and postponed the notification processes.

In 2007, the State Peace and Development Council (SPDC)<sup>7</sup> issued a notification letter to proceed the land settlement processes. The letter mentioned that the village settlement areas should be excluded from the national park boundary and the land settlement committee should find out solutions to compensate for the agricultural lands. Following SPDC instructions, the land settlement committee submitted a proposal to allocate agricultural lands based on the number of household members residing in each village. The Chin SPDC approved the proposal in 2008<sup>8</sup>. As a result, the park authorities allocated a total of 10,615 acres (4,295 ha) of land to 40 villages located around the national park (Figure 4.1).

According to park regulations, the land recipients have to follow three conditions regarding the allocated lands. First, only the household heads written in the land settlement report have the right to cultivate or enjoy the benefits of allocated lands so that the descendants are not eligible to inherit the land. Second, the land recipients are not allowed to extend, transfer, or sell the land to another person. Third, the recipients are permitted to use firewood, poles, and bamboo for subsistence purposes only. Therefore, selling forest products from allocated land is forbidden for all villagers. After the land allocation processes had completed, the NTNP was officially gazetted in 2010<sup>9</sup>.

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<sup>3</sup>The local price for a shifting cultivation plot was about 2,000 Kyats (3 USD) in 1998. A single farmer (e.g. Daw Hone Kee from *Wa Kaut* village) claimed to compensate for 79 plots.

<sup>4</sup>The official exchange rate for one US dollar was about 7 Myanmar kyats in the year 2000.

<sup>5</sup>Letter no. Natma/trip-5/98-99 dated on 2-12-1998.

<sup>6</sup>Letter no. UYin-ThaBaWa/Natma/3170/2003 dated 28-11-2003

<sup>7</sup>The official name of Military Government during 1997 to 2010.

<sup>8</sup>The proposal was approved at the Chin SPDC meeting no. 20/2008 held on 11-9-2008.

<sup>9</sup>Government notification no. 164/2010 dated 2-12-2010.



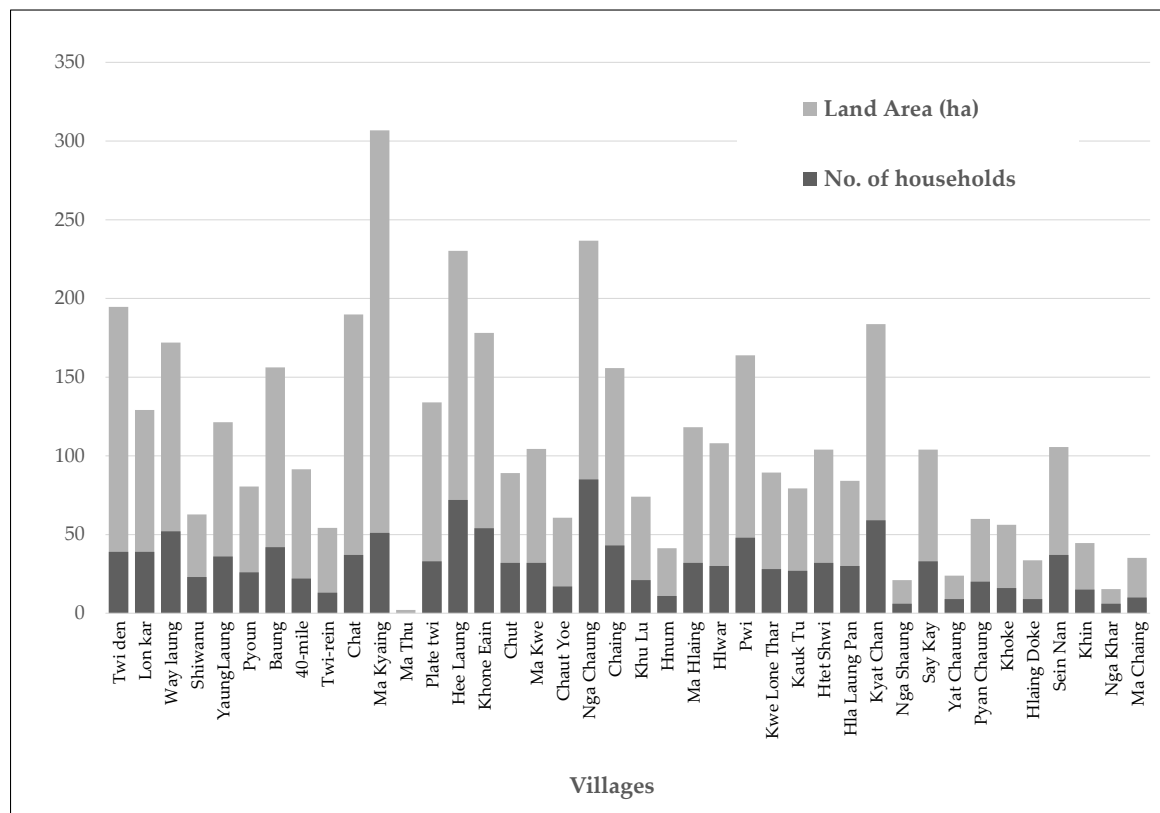


Figure 4.1: Area of lands allocated to each village by the national park

Source: Land settlement report (2008).

#### 4.1.2 Key ecosystems and related services

NTNP is located in the Chin Hills that connect between the southern extension of Himalaya and Arakan Mountain Ranges. The topography of the park ranges from 740 m to 3,050 m above sea level. Due to the dramatic increase in altitude within a relatively narrow area, different plant-communities occur along with the different altitudinal ranges (Fujikawa et al., 2008). The tropical dry deciduous forests dominate most areas below 1,000 m above sea level. After the deciduous forests, the mixed evergreen broadleaved forests occur between 1,000 m to 2,000 m. Most of the shifting cultivation plots and human settlements are distributed within this elevation ranges. After the broadleaved forests, the pine forests (*Pinus kesiya*) occur 1,500 m up to 2,500 m along the exposed ridges. These forests serve as a major source of timber as there are limited pine forests outside the national park.

The temperate semi-evergreen forests occur between 2,200 m and 2,900 m. Temperate species such as laurels (*Cinnamomum* spp.) and stone oaks (*Lithocarpus* spp.) dominate the moist valleys between 2,300 m and 2,500 m. These forests serve as major sources of marketable forest products such as orchids, yams, cinnamon barks, or the beeswax.



After the laurels and stone oaks forests, the evergreen oaks (*Quercus semecarpifolia*) and the rhododendrons dominate the mountain ridges. The colourful meadows can be found along the slope from 2,900 m up to the peak (Fujikawa et al., 2008). Due to the occurrence of different vegetation zones within a narrow landscape, a high diversity of plant species can be found within the national park. According to the park management office, a total of 1,129 plant species had been recorded within the national park. Among these, three flower species—*Rhododendron burmanicum*, *Potentilla montisvictoriae* and *Roscoea australis*—are endemic to NTNP (Fujikawa et al., 2008).

Table 4.2: Key ecosystems and related services in NTNP

Elevation(m)	Ecosystem types	Key ecosystem services
Below 1,000	Dry deciduous forests	Bamboo and fuelwood for household uses
1,000-2,000	Mixed evergreen forests	Soil formation for shifting cultivation, Human settlements
1,500-2,200	Pine forests	Timber and resins for household uses
2,200-2,900	Temperate semi-evergreen forests	NTFPs; Habitats for wildlife; Watershed protection
2,900-3,000	Alpine meadows	Ecotourism, Scientific research

Source: synthesised by the author.

Apart from the floral diversity, another important feature of the national park is the occurrence of several bird species. According to Thingstad and Gjershaug (2014), about 337 bird species were recorded both inside and around the park. Among these species, White-browed Nuthatch (*Sitta victoriae*), which is endemic to Natma Taung area, serves as the flagship species of the national park (Naing, 2003). About 35 mammal species are inhabiting in NTNP<sup>10</sup>. The most important mammal species include Sunda Pangolin (critically endangered), Western Hoolock Gibbon (endangered), Dhole (endangered), Asiatic black bear (vulnerable), Sambar (vulnerable), and Chinese Goral (vulnerable).

Although the national park provides a diverse array of ecosystem services, many of them are observed to be declining within the last few decades. According to C. Wang and Myint (2016), the annual deforestation rate for Chin state between 2001 and 2010 was about 0.28% per year. This rate is relatively higher than the deforestation rate between 1990 and 2000, which was about 0.1% per year (Leimgruber et al., 2005). A study by Bhagwat et al. (2017) indicates that even though about 92% of the land in Chin State is still covered with forests, the actual intact forests (over 80% canopy cover) constitute only about 37% of the Chin State. The rate of conversion from intact forests

<sup>10</sup>According to the camera trap surveys conducted by Smithsonian Institute in 2014

to degraded forests is rapidly increased with an average rate of 0.65% per year between 2002 and 2014 (Bhagwat et al., 2017).

The effect of deforestation on ecosystem services is relatively unstudied in NTNP. A study on local perception by Saumya et al. (2014) shows that about 90% of the respondents agreed on the reduction of forest resources. More than 70% of the respondents also agreed on the reduction in water levels of the nearby rivers within the last few years (Saumya et al., 2014). Interviews with Township Municipality Officers also mentioned that the amount of water available for local uses has declined within the last five years. Particularly, the water levels of two sources in Kanpetlet and one source in Mindat have significantly decreased in recent years. At the same time, local demand for drinking water has increased mainly due to the increasing number of visitors and hotels in response to ecotourism promotion inside the national park. Therefore, conservation of watershed forests has become a priority in NTNP to meet future demand for drinking water in both townships.

Previous studies in NTNP mainly focused on species taxonomy and there was no systematic study regarding the status and trend of wildlife population inside the park. However, local observations have shown that the number of wildlife in NTNP has declined within the last few years (Saumya et al., 2014). Focus group discussions with park rangers also confirmed that wildlife populations have declined due to excessive hunting and infrastructure development inside the park. Most flagship species such as White-browed Nuthatch and other large mammals have disappeared along with the roadsides due to hunting and increasing access of visitors with motorbikes. A key informant mentioned that the decline in wildlife population affects not only the provisioning services for household consumption but also the cultural services associated with traditional hunting practices.

#### **4.1.3 Current state of management**

The park management activities in NTNP are mainly implemented in accordance with the annual operation plan<sup>11</sup>. The main activities include patrolling, boundary demarcation, species monitoring and research, public awareness, and ecotourism promotion. Patrolling is usually conducted by three patrol teams. Each team is comprised of three to four members led by a senior park ranger. According to the operational plan, each team has to patrol at least twice a month in each patrolling zone. However, a key informant mentioned that the rangers usually conduct patrolling only in areas that are easily accessible with motorbikes. There is no regular patrolling in the

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<sup>11</sup>Although a five-year management plan was prepared in 2017, the park manager still follow the operational plan due to budget regulations

northern part of the park area due to difficult accessibility. Therefore, most of the park areas can be considered as 'open-access' due to the lack of law enforcement activity against illegal uses.

The most common illegal activities in NTNP are shifting cultivation, logging, hunting, illegal encroachment, and collection of non-timber forest products (NTFP). According to the park management office, there are 78 illegal cases encountered by park rangers between 2009 and 2017 (Figure 4.2). About 65% of all these cases are related to shifting cultivation and illegal logging inside the park. A key informant mentioned that shifting cultivation inside the park is commonly encountered mainly because of the unclear land tenure system between the government and local landowners during land settlement processes. Illegal logging has increased in recent years due to the increasing demand for timber to construct wooden houses. There is no legal sawmill in Chin state so that most construction activities have to rely on illegal timber extracted from the national park and adjacent forests.

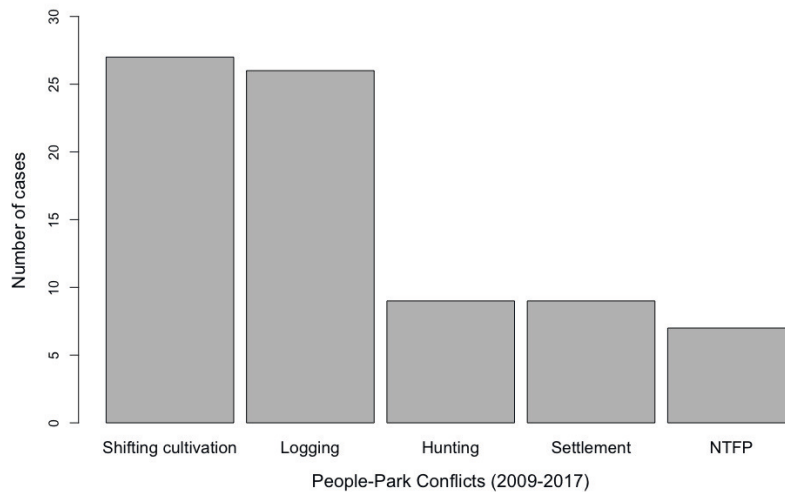


Figure 4.2: Number of illegal cases encountered by park rangers (2009-2017)

Source: NTNP Park Management Office, 2017.

Boundary demarcation is another important management activity in NTNP. As of 2017, only about 25% of the park boundary has been demarcated and the rest areas do not have proper boundary demarcation on the ground. The absence of proper boundary has offered potential land-use conflicts. Most villagers do not know the park boundary and frequently encroach into the park area. Since after the establishment of the park, ten villages have already encroached into the core area without permission. Among these, three villages have already received official approval from the government and the rests are still regarded as illegal settlements inside the national park.

According to the park warden, there are two main challenges to conduct boundary demarcation. The first challenge is due to the limited budget allocated for boundary demarcation. Since the park is located in mountainous terrain, it costs at least 100 USD per km to install boundary pillars as per standard operating procedures. Therefore, it needs a budget of about 40,000 USD to demarcate the remaining 400 km of the park boundary. Since the annual budget allocation for boundary demarcation is about 1,000 USD only, it may take several years to complete boundary demarcation around the park. The second challenge for boundary demarcation is due to the resistance of local villagers against the park. The villagers do not accept the park boundary because most of their customary lands are located inside the park. They do not allow park rangers to install boundary pillars near the villages. In some cases, the villagers even threatened the park rangers for installing boundary pillars on their customary lands<sup>12</sup>. Therefore, the rangers are concerned for their own safety since the villagers usually have firearms<sup>13</sup> but the rangers are not permitted to carry guns in order to avoid conflicts.

Park management activities are being implemented with limited financial and human resources. Although the initial staff allocation is 35, only 25 are currently assigned to implement park management activities. Among the 25 staff members, only 16 are park rangers and the rest are office administrative staff. On average, each park ranger has to protect about 44.6 km<sup>2</sup> of the park. The staff-to-area ratio is about 22.42 staff per 1,000 km<sup>2</sup>, which is lower than the global average of 26.9 staff per 1,000 km<sup>2</sup> in developing countries (James et al., 1999). The annual park management budget is about 94 USD per km<sup>2</sup> for the year 2017-2018<sup>14</sup>. The amount is lower than the required budget (240 USD per km<sup>2</sup>) to implement all management activities indicated in the park management plan (Forest Department, 2017). The operational cost (excluding staff salary) is about 27 USD per km<sup>2</sup> only. This amount is relatively lower than the operational expenses of other Southeast Asia countries which range from 39-329 USD per km<sup>2</sup> (Emerton et al., 2015). To achieve effective implementation of management activities, NTNP needs more budget and staff allocation as proposed in the park management plan.

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<sup>12</sup>In 2016, the villagers threatened the park rangers that they will be killed if they continued to install boundary pillars near the village.

<sup>13</sup>Home-made guns are part of the Chin custom and legally permitted to carry in Chin State.

<sup>14</sup>The total operating budget for 2017-2018 was about 67,220 USD including the staff salaries.

## 4.2 Socio-Cultural Settings of the Study Area

### 4.2.1 Background of the Chin society

Most people living in and around NTNP belong to the Chin ethnic group, which is one of the eight major ethnic groups in Myanmar<sup>15</sup>. Generally, the Chins refer to one of the Tibeto-Burman descents who migrated from southern China (Vumson, 1986). The Chins originally lived in the upper Chindwin valleys and later migrated to the mountains in order to avoid conflicts with other ethnic groups (Sakhong, 2003). After migration to the mountains, the Chins were distributed along the three hilly regions, namely Chin Hills, Arkan Hills, and Chittagong Hills. When the British occupied the Chin Hills in 18<sup>th</sup> century, the Chins were geographically divided into three different countries: Myanmar, India, and the Bangladesh (Sakhong, 2003). The Chins are known as *Mizo* or *Kuki* in India, *Lushai* in Bangladesh, and *Chin* in Myanmar.

The Chins in Myanmar can be differentiated into three main groups: northern Chin, central Chin, and southern Chin (Lehman, 1963). Due to isolation in hilly regions, the Chins are separated into several tribal groups. There are 53 Chin ethnic tribes living in the Chin State of Myanmar. They all speak *Chin* language in many different dialects which are not mutually understandable among different tribes (Bradley, 1997). As the NTNP is located in the southern Chin region, the term 'Chin' in this thesis mainly refers to the Chin people who live in the southern Chin region.

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<sup>15</sup>There are 135 ethnic tribes officially recognized in Myanmar, which are grouped into 8 major ethnic groups such as Kachin, Kayah, Kayin, Chin, Mon, Bamar, Rakhine, and Shan.

### 4.2.2 Political changes

The political history of Chin people can be differentiated into six different periods: (1) pre-colonial period, (2) colonial period, (3) independence period, (4) socialist period, (5) military control, and (6) democratic period. A summary of major political events and their influences on the Chin people is presented in Table 4.3.

Table 4.3: Major political changes in Chin State

Date	Events	Political influences on Chin State
1885	British occupation to upper Myanmar	The Chins were divided into three countries. Tribal chiefs still maintain administrative powers.
1896	The Chin Hills Regulation was enacted.	The tribal chiefs received both traditional and legal administrative powers.
1947	The first constitution was adopted by Panglon Agreement.	Chin Hills Tract integrated into Myanmar as Chin Special Division.
1948	Myanmar got her independence. Chin Special Division Act 1948 was enacted.	Both tribal chiefs and village heads were recognised under formal administration. Traditional rules still applicable at village levels.
1962	Military coup was performed due to civil unrest.	The Minister for Chin Affairs was substituted by the military officers. No significant changes at village level.
1974	The socialist constitution was adopted. The Socialist Party took over the government.	The Chin Special Division was renamed as the Chin State. Tribal groups were organised into village tracts.
1988	The second military coup was performed. The SLORC took power and adopted the military administration.	Village tract administrators were directly assigned by local authorities. Customary rules were no longer legitimate.
2008	The 2008 constitution was adopted.	State/Regional governments were established. Village tract administrators were selected by village representatives.
2010	Democratic elections based on 2008 constitution.	Tribal customs no longer existed in government structure.

*Source:* synthesised by the author.

**Pre-colonial period (before 1852)**

Before the British annexation, the Chin were merely tribal groups who inhabited in the mountains. According to Carey and Tuck (1896), the Chins mainly lived as separate tribal groups—each group had a different name and was administered by different tribal Chief. Each tribe consists of several villages ranging from three to five villages for smaller tribes up to more than 100 villages for larger tribes (Carey and Tuck, 1896). Depending on the type of villages, the political systems differed from each other. Stevenson (1937) distinguished the political systems of Chin tribal groups into two different types: autocratic groups and democratic groups. For autocratic groups, the Chief was the founder of the tribe and considered as the lord of all villages within the tribe. For democratic groups, there was no tribal Chief among the villages. Instead, a council of elders who represented the clans had to administer the whole village group (Stevenson, 1937).

The pre-colonial land tenure system can be classified into three different types: (1) village settlement areas, (2) cultivated lands, and (3) forested lands. Regarding the *village settlement areas*, all clan members had the right to establish houses on any available spaces within the village territory (Lehman, 1963). For non-clan members, access to settlement areas was granted only if they made some payments to the chief or village headmen as protection fees (Stevenson, 1943). The payment may range from a chicken and a pot of local wine (namely *Zu*) or a full-grown Mithan (*Bos frontalis*). Once the payment had been made, the farmers received similar rights as the clan members (Stevenson, 1943).

For the *cultivated lands*, all households residing within the village territory had the right to access and use any unoccupied land within the village territory for cultivation. According to Stevenson (1943), there were two main types of land tenure systems for cultivated lands. The first system was based on collective ownership systems under the guidance of the chief or village headmen. Under this system, cultivable lands were distributed to each household every year before the cultivating season. The Chief or village headman was responsible to ensure that all households received a plot of land for cultivation (Stevenson, 1943). However, the plots were granted to each farmer for one cultivation season only so that the farmers could not inherit or transfer the plots to their next generations (Stevenson, 1943).

The second system was the individual ownership system, where land ownership over cultivated lands could be obtained based on the first clearance principle<sup>16</sup>. In this

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<sup>16</sup>The same system was commonly practised in the lower part of Myanmar known as “dama-u-gya”, which means that the ownership claimed by wielding the machete on the unoccupied land (Furnivall, 1957, p. 50).



system, household who cleared the forests for the first time received the perpetual right for cultivation (Stevenson, 1943). The cultivator received both use and transfer rights to his patrilineal descents or another person within the community. However, he had no right to sell the land to outsiders, and he still had to pay protection fees to the village headman. If the land was not used for cultivation, another villager can cultivate on the land with approval from village headman. The cultivation rights may be cancelled when the land was needed for general public welfare such as roads or other public buildings (Stevenson, 1943).

Regarding *forest lands*, all villagers or clan members had the right to access and collect the forest products. According to Stevenson (1943), all villagers had the right to cut building materials, fuelwood, forest foods, fishing, and hunting in any uncultivated forest lands within the village territory. However, some forest products required permission before harvesting. For example, hunting could be done without prior permission, but the hunter had to pay a hind leg of the animal he killed to the Chief. Harvesting right for the thatch grasses from the forests was also vested in households who had cleared the weeds or tended the area for better growth of the thatch. Cutting pine trees for house constructions required prior approval from village headmen (Stevenson, 1943).

### ***Colonial period (1852-1948)***

After British occupation, the Chin Hill was divided into three administrative districts: the Lushai Hills District in India; the Chittagong Hills Tracts in Bangladesh; and the Chin Hills District in Myanmar. The Chin Hill Regulations was enacted in 1896. It was the first formal law introduced to the Chin people. The regulation authorised a superintendent or deputy commissioner to administer the Chin Hill Tract. Under the superintendent, assistant superintendents were assigned with general administrative powers to control each village group. At the village level, the tribal chief or head of the clans were appointed as formal 'headmen' to control the respective villages. For communities without a tribal chief, the village headmen were directly appointed by assistant superintendents to administer the villages (Lehman, 1963).

Regarding village settlements, the Chin Hills Regulations restricted the formation of new settlements without permission from the government. The Section 19 of the Chin Hills Regulation stated that '*no new village should be formed without the consent of the Superintendent, who may, for reasons to be recorded in writing, prohibit the formation thereof.*' Furnivall (1957) mentioned that there was no proper village system during the pre-colonial days, and it was introduced by the British, based on their experiences in



India, in order to make the country easier to rule. Moreover, the British administration transformed the nomadic behaviour of the hill tribes by introducing a punishment system, either cash or the crops, to the villagers who migrated out of his village (Stevenson, 1943).

Another significant change in local land tenure was the delineation of the village boundaries throughout the Chin Hills. According to Stevenson (1937), the demarcation of village boundaries not only influenced the village land tenure system but also created social conflicts among the tribal villages. Particularly, villages which had better relationships with the authorities received a large area of village territories regardless of tribal boundaries recognised before the British occupation. Villages which received smaller areas of land had to borrow cultivated lands from other villages. Consequently, land markets had evolved in most populated areas of the Chin Hills (Stevenson, 1937).

Although the British introduced formal regulations, they did not restrict the rights of villagers to practise shifting cultivation, and forest resource uses within the village boundary. Stevenson (1937) mentioned that access to and the use of agricultural lands were still maintained under the customary rules, although individual ownership was gradually evolved in response to the territorial restrictions. Moreover, section 32 of the Chin Hills Regulations stated that '*No prosecution under the Upper Burma Forest Regulation (1887), or any rule thereunder, be instituted against any Chin except with the sanction in writing of the Superintendent.*' Therefore, the villagers were able to continue their rights to hunt wildlife or collect the forest products in accordance with local customary practices.

### ***Independence period (1948-1962)***

Myanmar received her independence in 1948. After the independence, the constitution provided special conditions for the frontier areas including the Chin Hills. The Chin Hills Tract was renamed into the Chin Special Division. The Chin Special Division Act (1948) was enacted to administer the Chin people. It included the modifications of several laws in line with the tribal customs and traditions of the Chin people (Hmone, 1962). The Act was later amended in 1959 to have a uniform system in judicial organisations (Maung, 1959). Under the Chin Special Division Act, the administrative power was given to the Minister for Chin Affairs elected by the Chin Affairs Council. The village Chief still maintained his administrative power in accordance with the village traditions<sup>17</sup>.

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<sup>17</sup>Article 11(1) of the Chin Special Division Act (1948).

Under the Chin Special Division Act, the villages were regulated similarly to the British administration. Access to cultivated lands was permitted in accordance with local traditions. Apart from cultivated lands, the forest lands were protected in accordance with the Forest Act (1902). However, special provisions were made for the Chin Special Division in order to adapt with customary regulations. For example, the clause (c) of the forest law in Chin Special Division Act stated that *'No tree shall be reserved tree except Teak.'* The clause (d) also stated that *'There shall be no restrictions on the collection or removal of other forest products including the parts and products of animals except those prescribed by local custom.'* The Chin Special Division Act also included provisions to give awards to the hunters who could kill large predators such as tiger, leopard, or bear to appreciate their culture (Hmone, 1962). Therefore, although there were a few administrative reforms after the independence, customary rules were still legitimate in Chin State during that period.

### **Socialist period (1962-1988)**

In 1962, the military took a coup and replaced the government with the "Revolutionary Council" formed by the military officers. The Minister for Chin Affairs was replaced by the military officer appointed by the Council. Later in 1974, the military government enacted a new constitution<sup>18</sup> based on socialist political ideology. According to the article 11 of the constitution, there was only one ruling party in the government that controlled all the administrative authorities. The Revolutionary Council founded the Burma Socialist Programme Party (BSPP) as its own political party where most of its members were from the military (Leckie and Simperingham, 2009).

Under this constitution, the Chin Special Division was no longer a 'Special Division'. It was renamed as 'Chin State' in order to have equal status with the other States and Divisions. The villages were grouped into village tracts regardless of their tribal affiliations. The customary rules were no longer legitimate in Chin State (Vumson, 1986). The laws and rules were applied in the same way as in the central government. The constitution also stipulated that the state is the ultimate owner of natural resources and shall nationalise the means of production within the land.

The Chin Special Division Act (1948) was no longer applicable under the socialist constitution. Other national laws, that were previously exempted in Chin State, had become applicable towards the Chin people. The most important laws that influenced the customary rights of the Chin people were the Land Nationalisation Act (1953) and the Forest Act (1902). According to the Land Nationalisation Act (1953), the State had

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<sup>18</sup>The Constitution of the Socialist Republic of the Union of Burma (1974)

the right to confiscate any agricultural land within the country. The purpose of the Act was to abolish the *landlordism* and to ensure equal distributions of land ownership among the farmers (Leckie and Simperingham, 2009). The Act included provisions to exempt against the confiscation of agricultural lands owned by the agriculturalist family. However, there was no provision for collective land ownership so that the communal lands under collective ownership had become open-access in accordance with the new legislation.

### ***Military control (1988-2010)***

In 1988, the military took a coup again due to public uprisings. The socialist government was abolished, and a new government, namely the State Law and Order Restoration Council (SLORC)<sup>19</sup>, was formed with military officers. The administrative power was vested to the military generals directly appointed by the chairman of the council. The village tract administrators were no longer elected by the villagers. Instead, they were directly appointed by township authorities.

During the military government, a series of laws were promulgated to restrict local use of forest resources. Among these, the Forest Law (1992) and the Protection of Wildlife and Protected Areas Law (POWPA) (1994) had a significant influence on the local rights to forest resources. The Forest Law (1992) authorised Forest Department to establish reserved forests and protected public forests on the “Land at the disposal of the Government”. It means that any land that had not acquired legally under existing laws could be converted into reserved forests. Since the Chins did not have any legal title over the communal lands, most of the uncultivated forest lands in Chin State were transformed into reserved forests. Furthermore, the Forest Law restricts the collection of any forest product for commercial purpose without permission from the Forest Department.

### ***Democratic period (2010-Present)***

In 2008, a new constitution was enacted to substitute the Socialist Constitution (1974). According to this constitution, the administrative power is shared between the States and the Union Government. At the local level, the village tract councils were formed by elected representatives from each village. The councils were also responsible to select the village tract administrators in accordance with the Ward or Village Tract Administration Law (2012). Since all existing laws become applicable under this

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<sup>19</sup>it was later renamed as State Peace and Development Council (SPDC).

constitution, there is no difference in legal regulations between Chin State and other regions of the country.

In 2012, the Government also enacted two new laws related to land administration, namely the Farmland Law (2012) and the Vacant, Fallow and Virgin Land Management (VFVLM) Law (2012). According to the Farmland Law (2012), all farmers need to apply the "Land Use Certificate (LUC)" for their agricultural lands in order to get the rights to use, inherit, and sell the lands. However, the farmers need to submit evidence to the Township Farmland Administration Body to prove the ownership of the land. For instance, the section 6 of the Farmland Law states that "*[...] a person who has right for farming shall be [...] head of the household [...] who is legally holding and working the land in accordance with the land laws existed at the time when he acquired the land*". This provision is not applicable in Chin State since most of the shifting cultivation areas are under the collective ownership of all villagers or members of a particular lineage group. Moreover, the application process needs to be passed through many institutional levels which made the farmers less incentive to apply for the formal documents. As a result, most swidden farmers in Chin State do not apply or are not eligible to apply the LUC under formal regulations (Andersen, 2015).

The VFVLM Law (2012) also threatened the rights of swidden farmers in Chin State. The law increases the risks of land grabbing for business concessions. For instance, the article 3 of the VFVLM Law states that the land that is not cultivated over five years can be defined as vacant or fallow lands and can be granted as concessions to business investors for the commercial uses. Since most swidden farmers in Chin State could not apply LUC, they do not have any formal right over shifting cultivation areas collectively owned by all village members. Consequently, the conflicts between the government and traditional landowners have increased due to the formal regulations imposed by the Farmland Law and the VFVLM Law.

### 4.2.3 Socio-economic changes

In response to political changes, Chin State had undergone several changes in socio-economic conditions. The changes became more dramatic within the last two decades. Major socio-economic changes in Chin State can be differentiated into three different types—demographic changes, economic changes, and cultural changes.

#### *Demographic changes*

Chin State has the lowest population density in Myanmar compared to other administrative divisions<sup>20</sup>. Although the population has increased within the last decades, the rate of increase is not dramatic compared to other States and Regions. According to the national census in 2014, about 478,801 people live in Chin State representing about 0.9% of the country's population (Department of Population, 2015). The population density is about 13 persons per km<sup>2</sup>, where about 79% of them are living in rural areas. The amount of population is slightly increased compared to the census results conducted in 1983, where the total population was about 368,949 and the population density was 10 persons per km<sup>2</sup> (Department of Population, 2015).

The average household size in 2014 was about 5.1 persons per household. This amount did not show significant changes compared to the colonial times, which was reported to be about five persons per household in 1896 (Carey and Tuck, 1896). Due to limited economic opportunities, Chin State has the highest internal migration rate compared to the other States and Regions (Department of Population, 2015). Most of the people migrated to Yangon and neighbouring regions such as Sagaing or Magway. International migration is relatively lower in Chin State than the other States and Regions. Within the Chin State, the Mindat district, where the NTNP is situated, has the least emigration during the last decade. As of 2014, about 15,536 people have migrated to foreign countries and most of the migrants are between 20 and 30 years old (Department of Population, 2015).

International migration is also common among the case study village tracts. About 11 people in Case-I, 44 in Case-II and 5 in Case-III were reported to have migrated abroad within the last ten years. The most common destination is Malaysia mainly because of higher job opportunities for the young people. Despite the increasing rate of migration, the total population of case study village tracts has increased by 34 per cent between 2008 and 2017 (Figure 4.3). The amount is lower than the average national population growth rate which has increased by 46 per cent between 1983 and 2014

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<sup>20</sup>Myanmar has a total of 14 administrative divisions (seven States and seven Regions).

(Department of Population, 2015). The total population is expected to increase in the future due to the improving infrastructure and increasing market opportunities for certain cash crops.

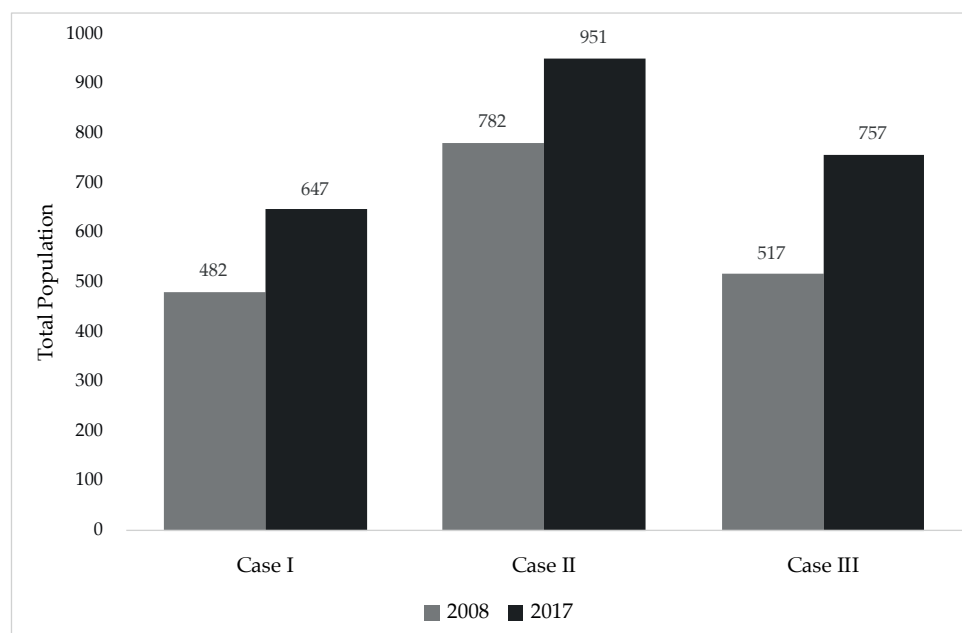


Figure 4.3: Changes in total population of case study village tracts (2008-2017)

Source: Land settlement report (2008) and field survey (2017).

### **Economic changes**

The people in Chin State mainly rely on agriculture, livestock, forest products, and a few off-farm activities. Before British occupation, there was no cash currency or trade within Chin State (Carey and Tuck, 1896). Although British administration introduced Indian currency to pay for salaries and labour charges, the opportunity to spend the money was limited due to the absence of markets within Chin State (Stevenson, 1943). Cash economy and modern trading practices were improved after the independence. Notably, cash earning opportunities had increased only among the civil servants, such as teachers, soldiers, and wage labour (Lehman, 1963). Due to the political conflicts, the economic opportunities were limited in Chin State for several decades (MIID, 2014). Therefore, despite the increasing development initiatives, the majority of the population in Chin State still rely on shifting cultivation, livestock farming, and collection of forest products (P. S. Aung et al., 2015; Kmoch et al., 2018).

After the democratic reforms, the government introduced several development schemes in Chin State (MIID, 2014). Village roads, schools, and hospitals were constructed throughout the Chin State (World Bank, 2014). Several development projects

were also implemented with the supports of local and international organisations. These development projects have influenced local economic conditions. Due to improved accessibility, markets for certain cash crops have increased in recent years. One of the most promising cash crops is the elephant-foot-yam (*Amorphophallus* spp.) (Vicol et al., 2018). Although yam market had been introduced since 1997, the systematic cultivation of yam started just around 2006 (Fujikawa et al., 2013). Some farmers have even cultivated yam at commercial scale (Chan and Takeda, 2016). Consequently, market prices for yam have significantly increased in Chin State which has motivated farmers to engage more in yam cultivation.

### **Cultural changes**

Religion was one the most important cultural changes in Chin State. In pre-colonial times, the Chins were mostly animists who believed in spirits and superstitions. Carey and Tuck (1896) mentioned that rituals and feasts were the main characteristics of the Chins' religion. During the colonial period, the British officers invited American Baptist Missions to the Chin Hills in order to introduce Christian religion (Sakhong, 2003). At first, only about 3% of the population in Chin State were converted to Christian religion (Stevenson, 1943). The conversion rate was increased after the missionaries had introduced the written language and taught at missionary schools (Sakhong, 2003). Lehman (1963) indicated that the introduction of modern medicines also motivated the Chins to convert to Christianity. As of 2014, about 85.4% of the total population in Chin State are Christians; only 13% are Buddhists, and the rests are Islam and a few Animists (Department of Population, 2016).

Apart from religion, the education level of local people has also increased within the last decade. In the past, only a few people attended the school mainly because of inaccessibility and language barrier (Lehman, 1963). After the democratic reform, the number of schools has increased in Chin State. Consequently, the number of students has increased with an average of 3,020 students per annum between 2011 and 2017 (Figure 4.4). As of 2014, more than 90% of the people within 10-24 years old have formal education, whereas only less than 70% of the people between 50-70 years old have formal education (Department of Population, 2015). This indicates the younger generations in Chin State have more formal education than the older generation.

The village settlement structure has changed compared to the last ten years. Traditionally, the Chin villages were mostly established along the steep mountain slopes. Lehman (1963) indicated three main criteria that the Chins traditionally used for selecting new areas for village establishment. The first criterion was that the village should



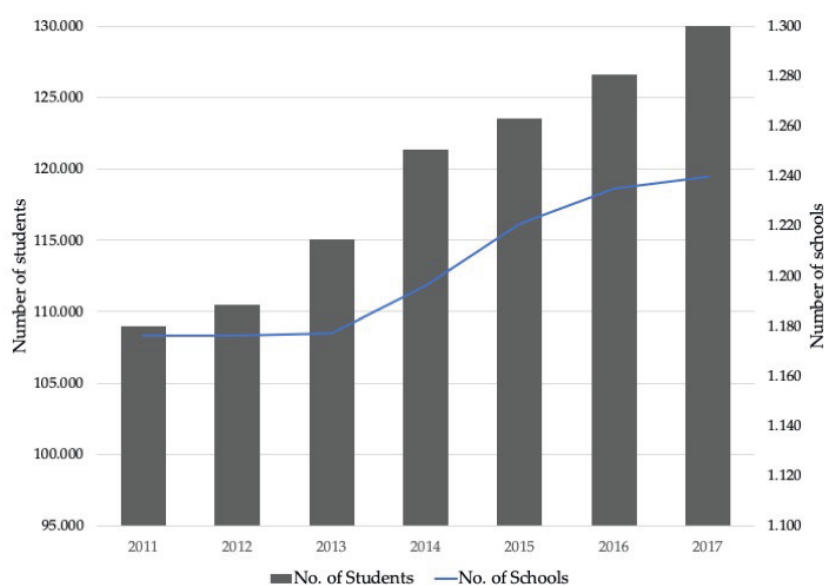


Figure 4.4: Changes in the number of schools and students in Chin State (2011-2017)

Source: Myanmar Statistical Yearbook, 2017.

be in a defensible position against the enemies. The second one was that the site should be as close as possible to natural water sources and agricultural fields, and the last one was to have a proper shelter against the wind and other natural hazards (Lehman, 1963). Although most villages are still following some of these criteria, some villages have started to choose the area with better access to roads and other public services. It is mainly because access to market and public services has become important along with the increasing market economy and infrastructure development. The introduction of Chinese motorbikes also motivates them to move village settlements closer to the roads. As a result, most villages have started to encroach into the national park due to better road conditions and accessibility to the township markets.

## **CHAPTER 5**

### **DIAGNOSES OF CASE STUDY VILLAGE TRACTS**

#### **5.1 Case Study-I: Makyar Village Tract**

##### **5.1.1 Land tenure system**

About 75% of the land owned by Makyar village tract is inside the national park. Among the four villages, only Makyar B village has the legal permission to stay inside the park. The other three villages are regarded as 'illegal settlements' inside the park. According to park regulations, the villagers have no formal right to access, use, or transfer the land and other forest resources. In reality, the villagers have been managing their lands in accordance with local customary practices. Participatory land-use mapping exercises indicate four different land-use types in Makyar village tract: (1) village settlement area, (2) agricultural land, (3) forest land, and (4) government allocated land (see detailed land-use map in Appendix A).

##### ***Village settlement area***

The village settlement areas are located along the eastern side of mountain ridges approximately between 1,800 m and 2,200 m above sea level. The houses are built in the positions to protect against the south-west wind during the monsoon season. There is no housing plan in all villages. Any villager who wishes to build a house can choose any available site. There is no boundary or fence between houses so that the free spaces are regarded as village communal lands. Generally, the settlement area is the collective ownership of all villagers residing in the village. Even if the village is established on the land formerly owned by someone, the land has to be donated to the community as collective ownership.

Under the customary system, all village members can access and use the land inside the settlement area. The land can also be transferred or inherited to other village members. However, it cannot be sold to outsiders since the absolute ownership is collectively held by all villagers. For the land borrowers<sup>1</sup>, they have access, use, and management rights over the land, but they do not have the right to exclude, transfer, or sell the land to outsiders. The land borrower has to pay a land-use fee to the landowner which usually includes several pots of local wine (*Zu*) and a few livestock depending on crop productivity. Table (5.1) summarises the local rules for village settlement areas in Makyar village tract.

Table 5.1: Local rules for village settlement areas in Makyar village tract

Types of rights	Formal rules	Local rules (villagers)		Borrowers	Outsiders
		Village area	Housing site		
Access	Yes	Yes	Yes	Yes	Yes
Use	No	Yes	Yes	Yes	No
Manage	No	Collective	Individual	Yes	No
Exclude	No	Collective	Individual	No	No
Transfer	No	Collective	Individual	No	No
Sale	No	No	No	No	No

Source: Focus group discussions, 2017.

### **Agricultural land**

Shifting cultivation is the main type of agriculture in Makyar village tract. Shifting cultivation areas are located at lower altitudes below the village settlement areas. The cultivation plots are organised into different rotational fields—each field consists of several plots depending on the number of households cultivated on the field<sup>2</sup>. The farmers cultivate on each field for two to three years depending on soil condition. After the soil has exhausted, the farmers move to another field, which has better tree cover to provide sufficient soil for the next cultivation cycle. The fallow period of each field ranges from five to ten years or more depending on the number of cultivators and land availability within the village territory.

There are two levels of tenure that are related to agricultural lands in Makyar village tract. The first level is related to the ownership of the shifting cultivation fields. Generally, all shifting cultivation fields are collectively owned by villagers, and no one

<sup>1</sup>Traditionally, landless farmers can borrow the land from others either from the same village or from different village.

<sup>2</sup>In southern Chin dialect, the field is known as *Khawbung* and the individual plot is known as *Khawming*.

owns the fields individually. Therefore, the tenure rights related to cultivation fields are controlled by all village members. The second level is related to ownership of individual plots within each field. The plots may be owned by a single household or by a group of households within the same lineage. They have both access and use rights to their plots. They also have the right to transfer their lands to future generations or any other household within the same community. However, they do not have the right to sell their lands to outsiders. For instance, in 2014, the former headman of Makyar A village tried to sell his lands to outsiders. The villagers protested against him and reported to the park authority to take action in accordance with the park regulations<sup>3</sup>.

Selling or transfer of agricultural land is permitted within the community only. According to the local custom, only the patrilineal sons have the right to inherit the land. For outsiders, they can only borrow the land from landowners for a short period of time. They also have to follow the village customs and regulations in relation to shifting cultivation. Land borrowers are not allowed to transfer the borrowed lands to other farmers. They are also not permitted to cultivate perennial crops such as yam or other horticultural trees to avoid conflicts in the future. Table (5.2) presents the summary of local rules for agricultural land in Makyar village tract.

Table 5.2: Local rules for agricultural lands in Makyar village tract

Types of rights	Formal rules	Local rules (Villagers)		Borrowers	Outsiders
		Fields	Plots		
Access	Yes	Yes	Yes	Yes	Yes
Use	No	Yes	Yes	Yes	No
Manage	No	Collective	Individual	Yes	No
Exclude	No	Collective	Individual	No	No
Transfer	No	Collective	Individual	No	No
Sale (within village)	No	No	Yes	No	No
Sale (outside village)	No	No	No	No	No

*Source:* Focus group discussions, 2017.

### **Forest land**

Forest lands in Makyar village tract refer to the forest areas located outside the cultivated lands. Since all forest lands in Makyar village tract are located inside the national park, the villagers have no formal right to cut trees, collect NTFP, or hunt wildlife within the forest lands. In reality, the villagers use different types of rights

<sup>3</sup>Report no. LaNga-3/ 421/2015 by park warden, February 1, 2015

regarding the forest lands in accordance with traditional regulations. The participatory land-use mappings indicate two different types of forest lands in Makyar village tract, namely watershed forests and the open-access forests.

*Watershed forests:* All villagers rely on natural water springs for their daily uses. To collect water, the villagers constructed small reservoirs (approximately about three to five square meters) around the water sources. From each water source, the water is delivered to each household by using gravity flow system. Therefore, forests located around the water sources are preserved as watershed forests. Destructive activities such as cutting trees or clearing the land for cultivation are strictly prohibited inside the watershed forests. Only non-destructive activities such as hunting or collection of NTFP are permitted without any restriction (Table 5.3).

Table 5.3: Local rules for forest lands in Makyar village tract

Activities	Formal rules	Watershed forests		Open access forest	
		Villagers	Outsiders	Villagers	Outsiders
Access	Yes	Yes	Yes	Yes	Yes
Cutting timber	No	No	No	Yes	No
NTFP	No	Yes	Yes	Yes	Yes
Hunting	No	Yes	Yes	Yes	Yes
Manage	No	Collective	No	Collective	No
Exclude	No	Collective	No	Collective	No
Transfer	No	Collective	No	Collective	No
Sale	No	No	No	No	No

*Source:* Focus group discussions, 2017.

For outsiders, hunting and NTFP collection are permitted in watershed forests. However, cutting trees is prohibited both for village members and outsiders. For instance, in 2016, some villagers from Makyar C village cut a few trees inside the watershed forest of a neighbouring village. The neighbouring villagers reported to the park authorities to punish the Makyar C villagers. The park authorities did not take any action since the forest is located outside the national park. Consequently, the villagers continued to argue each other creating social conflicts between two villages. Therefore, although there is no specific penalty against cutting trees, breaking local rules can lead to social conflicts among the neighbouring villages.

*Open-access forests:* Forests outside the watershed areas are regarded as open-access forests. All villagers have the rights to cut timber, collect NTFP, or hunt wildlife within the open-access forests. Moreover, the open-access forests are regarded as the common

property of all villagers so that everyone has the right to manage, exclude, or give to future generations. However, the villagers do not have the right to sell the land to outsiders without consents from other village members. Regarding outsiders, they are allowed to collect NTFP or hunt within the open-access forests. Only cutting trees is prohibited against outsiders inside the open-access forests.

### **Allocated land**

During the park establishment processes, a total of 270 ha of lands were allocated for villagers who live in Makyar village tract. Among the four villages, Makyar B, Makyar D, and Makyar C had received allocated lands as their village settlement areas are located inside the national park. However, Makyar A villagers, who are traditional landowners, did not receive any allocated land despite they have lost their agricultural lands inside the park<sup>4</sup>. According to park regulations, villagers have the rights to access, withdraw, manage, and exclude others from allocated lands. However, the use right is given exclusively for household consumption and selling forest products for commercial purpose is prohibited. The villagers also do not have the right to transfer the allocated land to another including their own generations<sup>5</sup> (Table 5.4).

Table 5.4: Changes in local rules after land allocation program

Type of rights	Formal rules	Local rules (owners)		Local rules (recipients)	
		Before	After	Before	After
Access	Yes	Yes	Yes	Yes	Yes
Use	Own-use	Own-use	No	Own-use	Own-use
Manage	Individual	Collective	No	Collective	Collective
Exclude	Yes	Yes	No	No	Yes
Transfer	No	Yes	No	No	Yes
Sale	No	No	No	No	No

*Source:* Focus group discussions, 2017.

The land allocation program was designed to distribute agricultural plots to individual households depending on the number of family members. However, the land allocation team only demarcated one to two large shifting cultivation fields without demarcating individual plots for each household. The villagers do not even realise that they have individual ownership for the allocated lands. As a result, all allocated lands are regarded as collective ownership of all villagers living in the village.

<sup>4</sup>Makyar A was excluded from land allocation as its former settlement area was outside the park.

<sup>5</sup>Section 5 of the park notification letter indicates that the allocated lands shall only be used by the person mentioned in the land settlement reports, and shall not be transferred to future generations.

Land allocation programs have created several social conflicts between traditional owners and land recipients. For example, both Makyar B and Makyar D villagers live and cultivate on borrowed lands owned by Makyar A villagers. Therefore, although they hold both the use and management rights over the borrowed land, the exclusion and transfer rights were still controlled by traditional landowners. However, after the land allocation processes, they have received not only access, use, and management rights—that they already have under traditional rules—but also the exclusion right under formal regulations. The recipients also enjoy inheritance right, despite it is prohibited under formal regulations, due to lack of monitoring after land allocation processes. Consequently, traditional landowners no longer have the rights to use, manage, exclude, or transfer the lands that have been allocated to the land borrowers.

### **Governance structure**

There are two levels of land governance structure in Makyar village tract. The first one is the *village tract land administration committee* formally organised at the village tract level. The second one is the *village council* organised at each village level to make land-use decisions.

*Village tract land administration committee:* The village tract land administration committee is a formal governance structure authorised by the township administrative department. The committee is formed with village representatives and is chaired by the village tract administrator. Each village can nominate one representative per ten households so that the larger villages have more representatives in the committee than the smaller ones. According to government regulations, the formal committee has the right to define agricultural boundaries, to permit cultivation, to monitor whether the villagers follow formal obligations or not, to give sanctions against violations, and to resolve conflicts (Table 5.5). In reality, the committee could not practice any of these rights mainly because most government regulations are not compatible with local conditions. For instance, formal rules require farmers to apply for the individual land ownership system. However, the traditional shifting cultivation practices do not allow for absolute land ownership by individual households. The local custom of collective land inheritance system also makes difficult formal authority to validate individual ownership among farmers.

The village tract committee is not authorised to develop new rules because they have to follow formal government regulations. Since the majority of lands are located inside the park, the committee has no jurisdiction to manage the lands within the village tract.



Table 5.5: Land governance structures in Makyar village tract

Activities	Village tract committee		Village council	
	Formal rules	Local rules	Formal rules	Local rules
Defining boundary	Yes	No	No	Yes
Developing rules	No	No	No	Yes
Giving permission	Yes	No	No	Yes
Monitoring	Yes	No	No	Yes
Sanctioning	Yes	No	No	Yes
Resolving conflicts	Yes	No	No	Yes

*Source:* Focus group discussions, 2017.

The committee also fails to resolve land-related conflicts between neighbouring villages. For example, there were several land-related conflicts regarding land ownership between traditional owners and land borrowers. However, the committee was not able to solve these issues mainly because neither traditional owners nor borrowers formally own the land under park regulations. Moreover, the committee is authorised to solve social conflicts in accordance with formal regulations. In reality, the committee could not resolve land conflicts since the formal regulations are not accepted by the villagers.

*Traditional village council:* In contrast to the formal committee, the village councils serve as an important governance body in Makyar village tract. Each village has its own village council informally organised by village elders. The main purpose of the council is to make communal decisions. Instead of formal village headmen, the traditional village leaders usually lead the village council meetings. The traditional village leaders are usually the heads of the clan so that they could influence most villagers in decision-making processes. A key informant mentioned that most land-use decisions in Makyar village tract are made at the village council meetings (KI-20, 2017). It includes the decision to move the village into a new settlement area, to select a new cultivated field, or to permit large-scale tree cuttings from village-use forests. Although the council does not have any legal authority, most villagers tend to follow more on the decisions made by the village council rather than formal village tract committee (see Table 5.5).

The village council also has the authority to develop new informal rules regarding land and resource uses. For example, local rules for watershed protection have been established based on the discussions at village council meetings (KI-20, 2017). The village council also plays an important role in resolving conflicts among the villagers. A key informant mentioned that the villager usually held village council meetings

to resolve land-related conflicts within the village such as disputes related to plot boundary or land ownership among neighbouring farmers (KI-20, 2017). If the conflict occurs between different villages, it has to be resolved either through negotiation by the village council or by consulting with township authorities.

### 5.1.2 Livelihood strategies and forest income

Livelihood activities in Makyar village tract can generally be categorised into five main types: (1) forest, (2) agriculture, (3) livestock, (4) wage labour, and (5) non-farm employment. Among these, forest is the most common livelihood activity reported by all sample households. Agriculture and livestock breeding are the second common activities reported by 92% of total households respectively. About 48% of households reported engaging in wage labour in other farms or government development projects. Non-farm employment is the least common activity reported by 38% of total households. The detailed descriptions of income from each livelihood activity are presented in Appendix A.

#### ***Income distribution by livelihood strategies***

The hierarchical cluster analysis (HCA) in combination with the principal component analysis (PCA) produces three distinct combinations of livelihood clusters in Makyar village tract (see details in Appendix A). Among the three clusters, the *Forest–Wage* strategy provides the highest income with an average of 2,026 USD per year<sup>6</sup>. The second most income-generating strategy is *Agriculture–Wage* strategy which provides an average income of 1,392 USD per year. The *Agriculture–Non-farm* strategy provide the lowest amount of income with an average of 1,162 USD per year. However, the non-parametric Kruskal-Wallis test shows that total income is not significantly different across the three livelihood clusters ( $p>0.05$ ). It implies that the majority of households have a similar amount of income regardless of their livelihood choices.

Regarding cash income, *Forest–Wage* strategy receives the highest amount of income compared to the other two strategies (Figure 5.1a). The distribution is significantly different across three livelihood clusters ( $\chi^2=11.60$ ,  $p<0.05$ ). Correlation analysis shows that there is a significant positive association ( $r=0.44$ ,  $p<0.01$ ) between cash forest income and total cash income, although the correlation coefficient is weak. It indicates that those who engage more in cash forest activities receive more total cash income than the other households. Regarding subsistence income, *Agriculture–Wage*

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<sup>6</sup>The exchange rate for one US Dollar is 1,234 Myanmar Kyats in 2016.

strategy receives higher amount of income than *Agriculture–Non-farm* strategy ( $p < 0.01$ ). However, there is no significant difference for *Forest–Wage* strategy compared to other two livelihood strategies ( $p > 0.05$ ) (Figure 5.1b).

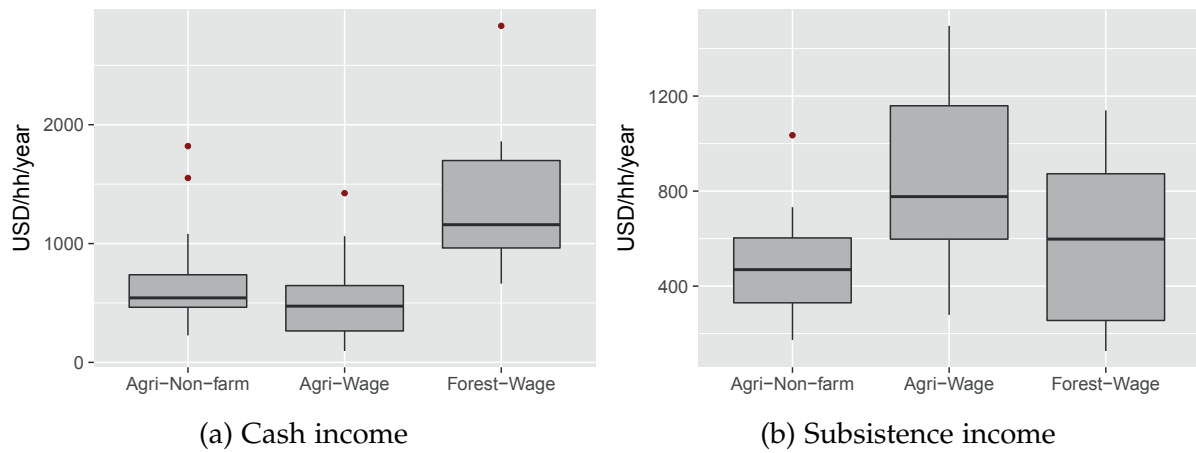


Figure 5.1: Total income by livelihood clusters in Makyar village tract

The distribution of forest income is significantly different across three livelihood clusters ( $\chi^2=11.53$ ,  $p < 0.01$ ). Multiple comparisons indicate that the *Agriculture–Non-farm* strategy receives a lower amount of total forest income than the other two strategies. It means that households that engage mainly in agriculture and non-farm activities use fewer forest products than other households that engage mainly in agriculture and wage employment activities. Regarding cash forest income, the distribution is significantly different across the three livelihood strategies ( $\chi^2=11.25$ ,  $p < 0.01$ ). Multiple comparisons indicate that the *Forest–Wage* strategy receives a higher amount of cash forest income than the other two strategies (Figure 5.2a). Although this strategy receives more cash forest income, only 10% of households have adopted this strategy. It is mainly because cash forest activities, particularly the extraction of wood, require specific skills such as the use of chainsaws or house construction techniques. Therefore, not all households can engage in this strategy. Moreover, extraction of timber for commercial purpose is considered illegal so that there is a high risk for the households to engage in cash forest activities than other livelihood activities.

The amount of subsistence forest income is also significantly different among the three livelihood clusters ( $\chi^2=10.85$ ,  $p < 0.01$ ). However, multiple comparisons indicate that only *Agriculture–Non-farm* and *Agriculture–Wage* strategies are significantly different to each other (Figure 5.2b), whereas there is no significant difference between *Forest–Wage* strategy and the other two strategies. It indicates that engagement in cash forest activity does not influence the subsistence use of forest products.

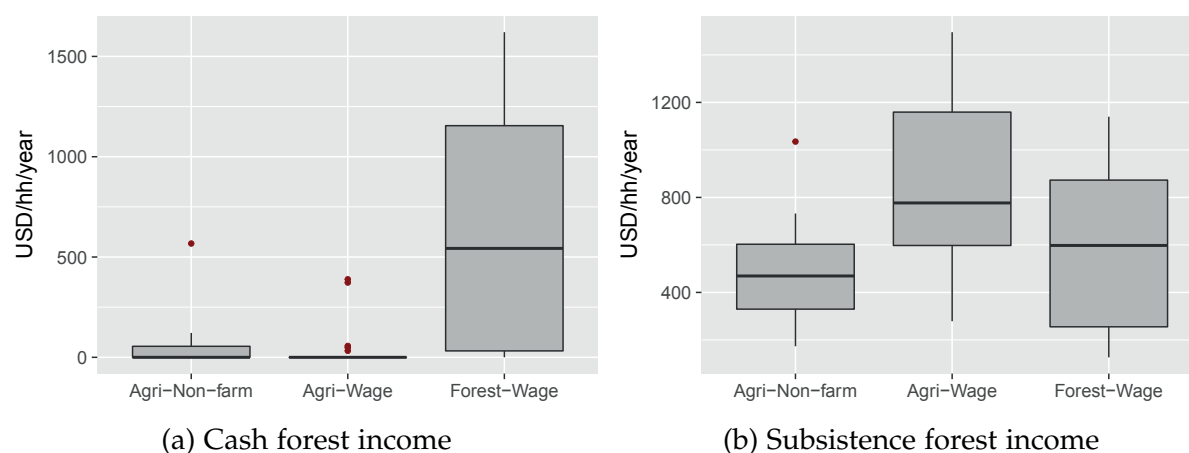


Figure 5.2: Forest income by livelihood clusters in Makyar village tract

### **Contribution of forest income into poverty and inequality**

Forest income contributes about 49% of total household income in Makyar village tract. The contribution is mainly from subsistence use of forest resources rather than cash income from selling forest products. The proportion of cash forest income is relatively lower than other income sources representing about 8% of total household income. It indicates that local households rely on forest mainly to sustain the livelihood needs rather than to generate cash income. The poverty headcount ratio for Makyar village tract is 0.42. It means that about 42% of households in Makyar village tract are living below the national poverty line<sup>7</sup>. The FGT poverty decomposition analysis shows that poverty headcount ratio is reduced from 0.88 to 0.42 due to forest income (Table 5.6). It means that limiting local use of forest products may increase about 52% of income poverty in Makyar village tract. The poverty gap ratio has also reduced from 0.42 to 0.10 due to forest income. It indicates that forest income has a significant impact on poor households by reducing about 76% of their poverty gaps. In addition, forest income also reduces poverty severity from 0.25 to 0.03 indicating that forest income equalises about 88% of income differences among the poor households.

Table 5.6: FGT poverty measures and Gini index in Makyar village tract

Income sources	Headcount	Poverty gap	Poverty severity	Gini
With forest income	0.42	0.10	0.03	0.32
Without forest income	0.88	0.42	0.25	0.38
Differences	-0.46	-0.32	-0.22	-0.06
Relative change	-52%	-76%	-88%	-17%
10% increase in forest income	0.38	0.09	0.03	0.32

<sup>7</sup>The national poverty line for Myanmar is about 376,151 Kyats (304.8 USD) per adult equivalent unit per year (UNDP, 2011).

Forest income also reduces income inequality among households. The Gini coefficient index is reduced from 0.38 to 0.32 due to forest income. It means that about 17% of income inequality in Makyar village tract is reduced due to forest income. The Gini decomposition by income sources also shows that forest income has the lowest Gini coefficient ( $G_k = 0.416$ ) compared to other income sources (Table 5.7). It means that forest income shows more equal distribution among households than other income sources. However, it does not mean that local inequality will be reduced more if access to forest income is increased.

Table 5.7: Gini decomposition by income sources in Makyar village tract

Income source	$S_k$	$G_k$	$R_k$	$G_T$	$S_G$	$MEF_G$
Forest	0.489	0.416	0.807	0.164	0.508	0.020
Agriculture	0.194	0.444	0.305	0.026	0.081	-0.112
Livestock	0.094	0.473	0.266	0.012	0.037	-0.057
Wage	0.143	0.847	0.610	0.074	0.229	0.086
Non-farm	0.081	0.892	0.647	0.046	0.144	0.064
Total	1.000	0.322	1.000	0.322		

Note:  $S_k$ = Income share;  $G_k$ = Gini coefficient of each income source;  $R_k$ =Gini correlation with total income;  $G_T$ =Gini coefficient of total income;  $S_G$ =Share of total Gini;  $MEF_G$ =Marginal effect on total Gini.

Results from marginal effect analysis show that only agriculture and livestock income have equalizing effects (i.e. decreasing inequality effect) on total income inequality<sup>8</sup>. It means that if the current level of forest income is increased by 10% and other income sources remain the same, the total income inequality will be increased by 0.2% in Makyar village tract. Conversely, if agriculture and livestock income are increased by 10% and other income remains equal, the total income inequality will be decreased by 1.12% and 0.57% respectively. It implies that although current levels of forest income reduce income inequality, promotion of forest income will likely to increase total inequality in Makyar village tract.

<sup>8</sup>The Gini decomposition method indicates that if Gini correlation with total income ( $R_k$ ) is lower than Gini coefficient of each income component ( $G_k$ ), the increase (or decrease) in the share of each income source ( $S_k$ ) will increase (or decrease) the Gini coefficient of total income ( $G_T$ ) (Fonta and Ayuk, 2013).

### 5.1.3 Traditional ecological knowledge and practices

Traditional ecological knowledge in Makyar village tract can be differentiated into two different groups: (1) traditional agricultural practices and (2) traditional forest management practices.

#### ***Traditional agricultural practices***

Shifting cultivation is the most common agricultural practice in Makyar village tract. The main characteristic of this practice is that cultivated fields are left for an extended period in order to regenerate forest cover for the next cultivation cycle. The farmers usually adopt four main activities in order to achieve sustainable shifting cultivation practices: (1) rotational field selection, (2) land clearing, (3) controlled burning and (4) ritual performances. The summary of TEK-based agricultural practices and their relevance to conservation in Makyar village tract is presented in Table (5.8).

Table 5.8: Summary of agricultural practices in Makyar village tract

Sr.	Description	Relevance to conservation
1	No cultivation outside the selected field.	Enhance forest protection and systematic land-use.
2	Field selection by village council meeting.	Enhance conservation and reduce conflicts by collective decisions.
3	Plot sharing among farmers.	Reduce encroachment into forests.
4	Labour sharing for land clearing.	Support selective tree cutting.
5	Tree stumps are left standing without cutting.	Enhance soil recovery of fallow lands by promoting coppicing.
6	No clearing of fields without communal rituals.	Systematic timing of land clearing.
7	Preparing fire-breaks before burning.	Reduce destruction of ecosystem.
8	Ritual selection of a person to start fire.	Enable systematic controlled burning.
9	Burning is done during waxing moon only.	Adjust timing of controlled burning.
10	Adoption of systematic burning technique.	Enable efficient control of fire.
11	Compensation payments if fire spread outside the field.	Motivate controlled burning.
12	Taboo not to eat crop before the harvest rituals.	Enhance connection with land and crops.

*Source:* Focus group discussions, 2017.

*Rotational field selection:* There are two main activities that ensure sustainable fallow management. The first activity is the selection of suitable agricultural fields for the next cultivation season. The field selection meetings (locally known as *taungya* meetings) are usually held in October after the crops have been harvested. During the meeting, the farmers decide whether they will continue to cultivate again on the same field or to select a new cultivation field. The decision is made based on the soil condition of current fields as well as the availability of suitable fields for the next crop season.

The second activity is the distribution of agricultural plots to each farmer. The plots are allocated to individual farmers either by using a lottery system or by negotiation among farmers. Plots with better soil condition have to be allocated alternately. The plot size for each farmer is determined based on labour availability and previous performance. It is important because all farmers need to finish clearing the respective plots before the rain begins in order to achieve proper burning (KI-21, 2017).

*Land clearing:* The plots are cleared during November and December in order to allow enough time to dry the wood biomass before burning. One important practice is that the farmers usually do not cut the trees located either at ridge-tops or near the streams (see photo 7 in Appendix D). The primary purpose is to protect the crop against the wind and to reduce soil erosion due to heavy rains. A key informant mentioned that this traditional practice had been adopted by their ancestors so that it is considered taboo in some villages (KI-20, 2017). It means that some farmers follow this practice even though they do not understand its ecological benefits.

*Controlled burning:* The fields are usually burnt in late March or early April before the monsoon rain begins. The controlled burning practices aim to clear the land with minimum labour input, to release nutrients stored in plant biomass for crop cultivation, and to suppress weed species. Traditionally, there are three main activities that the farmers practise to ensure controlled burning. The first activity is the preparation of fire brakes around the field. This activity is collectively done by all farmers, where at least one person from each plot has to participate. The fire-brakes are usually constructed by clearing the land, with a width of at least one to three meters along the field boundary (see photo 9 in Appendix D). It is usually done within one or two days before burning. A key informant mentioned that if they prepare fire-brakes too early, the dry leaves or branches will cover it after a few days and may increase the risk of fire during burning (KI-9, 2017).

The second activity for controlled burning is the selection of burning date. Traditionally, the fields are usually burnt during the waxing-moon period instead of the waning



moon. The farmers believe that it will be difficult to control the fire if the burning is done during the waning moon. A key informant explained that the wind is more unstable during the waning moon than the waxing moon so that it will be difficult to control the fire (KI-21, 2017). The time for controlled burning is also determined based on the arrival of the first monsoon rain. If the burning is done too early, the crops may not grow very well because the ashes may be lost due to the monsoon wind. If the monsoon rain comes before burning, the field will not be adequately burnt, and they have to re-burn the field again. Therefore, selection of an appropriate burning date is essential not only to minimise the risk of fire and but also to ensure optimal growth of the crops.

The third activity is the implementation of a specific controlled burning method. The farmers mentioned that it is essential to start a fire from higher areas toward the valleys so that the natural barriers will minimise the spread of fire to neighbouring fields (see photo 10 in Appendix D). Once the fire has become stable, all farmers can increase the fire intensity around the field. Moreover, the farmers usually select a person to start the fire in order to ensure the timing of burning. A key informant mentioned that in former time, a village shaman was usually appointed to start the fire during the controlled burning processes. If the village did not have any shaman, they had to select an appropriate person who did not cause any fire accident in the past (KI-21, 2017).

*Traditional rituals:* Traditional rituals play important roles in controlling the timing of particular agricultural practices as well as in enhancing social interactions among the villagers. Traditionally, farmers perform a series of rituals throughout a single agricultural season (see Table 5.9). Among these, the most important one is the ‘field opening ritual’, which is usually performed before opening a new field. The purpose of this ritual is to have better crop yields and to avoid accidents during land clearing processes. Generally, the farmers are not allowed to clear their plots without performing this ritual. If someone starts to clear his plot before the rite, he has to pay fine or compensate for any accident encountered during the land clearing processes. The farmers usually perform this ritual by offering chicken, pig, eggs, and *Zu* to the field spirits. The cost for the livestock and *Zu* have to be shared among all participating farmers. In most cases, wealthy farmers usually pay for livestock, and the rests have to contribute *Zu* and other materials.

Other important events are ‘harvest ritual’ and ‘feast of merits’. When the crops are ready for harvesting, each farmer should harvest a small portion of crops from his plot in order to offer to the field spirits. He also has to donate a small share of crops to

Table 5.9: Summary of agricultural rituals in Makyar village tract

Sr.	Name	Timing	Means of performance	Main purposes
1	<i>Khaw Chae</i>	Before land clearing	Collective offering with livestock and Zu	To have better crop yields and to avoid accidents.
2	<i>Khaw Ma She</i>	Before burning	Collective offering with chicken blood and Zu	To avoid fire accidents outside the field.
3	<i>Mashe Bon</i>	Before planting	Individual offering by spraying chicken blood over the seeds	To achieve good germination of seeds
4	<i>Khaw Dok</i>	Flowering period	Individual offering by collecting some leaves, spray with blood, and keep in the kitchen	To have better yields.
5	<i>Lo Kwe</i>	First harvest	Individual offering with firstly harvested crops to the shaman or village elders	To appreciate the guidance of elders and local spirits.
6	<i>Lo Hlu</i>	After harvest	Individual or collective offerings with Mithan as a feast of merit	To avoid sickness, accidents, or being possessed by evil spirits.

Source: Focus group discussions, 2017.

traditional village headman in order to show his gratitude. A key informant mentioned that family members are not allowed to consume their crops without performing the harvest ritual (KI-21, 2017). Some farmers also perform feasts of merit after all crops have been harvested. The main purposes are to appreciate the village spirits for giving prosperity, and to avoid sickness, accidents, or being possessed by evil spirits.

### ***Traditional forest management practices***

Traditionally, the villagers protect forests near to the water sources in order to achieve the sustainable provision of drinking water. This practice has evolved based on the local understanding of the relationship between forest protection and water availability. It was mentioned that the amount of water had declined mainly due to shifting cultivation and tree cuttings near the water sources. The local awareness on watershed protection has increased after the introduction of water transportation system<sup>9</sup>.

<sup>9</sup>This includes preparation of small reservoirs near the water sources and distribution of water to the village through plastic pipes by using gravity flow system.

In addition to watershed protection, there are several local taboos that are relevant for forest protection (Table 5.10). The villagers also protect the forests due to their spiritual beliefs. It was mentioned that the forests, where villagers use to perform ritual offerings, are considered as the home of local spirits. It is believed that whoever cut the trees within those areas will be punished by evil spirits. The punishment may include having accidents during tree cuttings or getting severe sickness among family members (KI-21, 2017). In addition to ritual places, banyan trees (*ficus* spp.) are also considered as the home of evil spirits so that the farmers do not cut this species even if the tree is located on the agricultural fields.

Table 5.10: Summary of resource-use taboos in Makyar village tract

Sr.	Description	Relevance to conservation
1	No cutting of trees or land clearing near water sources.	Enhance water regulation service.
2	No cutting of trees near ritual places.	Support conservation of tree species.
3	No cutting of ficus trees.	Support conservation of tree species.
4	No killing of primate species such as gibbons.	Support conservation of primate species.

Source: Focus group discussions, 2017.

Killing primate species are considered as taboo in Makyar village tract. The villagers believe that killing primate species, particularly the hoolock gibbons, would bring bad luck not only to the one who kills the animal but also to all members of his close relatives. It includes having sickness among clan members, destruction of crops by animals, or encountering fire accidents during the burning processes. A key informant mentioned that in former time, the villagers were not allowed to bring dead gibbons into the village. If someone did, he had to pay for compensation if unusual accidents occurred in the village (KI-21, 2017). This explanation implies that breaking local taboos may have social consequences even though one may not believe in evil spirits.

## 5.2 Case Study-II: Ung Village Tract

### 5.2.1 Land tenure system

About 50 per cent of the total land area in Ung village tract is located inside the national park. Therefore, the villagers do not have any right, except for the access right, to these areas in accordance with formal regulations. The other 50 per cent of land located outside the park is legally recognised as vacant lands so that the villagers have both access and use right over these lands. However, most villagers do not recognise formal regulations so that they usually manage the lands in accordance with local customary regulations. Participatory land-use mapping exercises indicate four different land-use types in Ung village tract, namely (1) village settlement area, (2) agricultural land, (3) forest land, and (4) allocated land (See detailed land-use map in Appendix A).

#### ***Village settlement area***

Village settlement areas are located at higher places along the mountain ridges. Houses are built along the roads that connect the villages to a nearby town. There is no fence between the houses so that the remaining spaces are available for every villager. The settlement areas are regarded as collective ownership of all villagers residing in the village. Therefore, both use and management rights are collectively held by all villagers. Each household has the rights to access, use, or transfer the housing site among the villagers. However, it does not have the right to sell the land to outsiders. It is because the settlement area by itself is regarded as a collective property of all villagers so that every decision has to be made collectively by all community members. Table (5.11) summarises the local rules for village settlement areas in Ung village tract.

Table 5.11: Local rules for village settlement areas in Ung village tract

Types of rights	Formal rules	Local rules (villager)		Outsider
		Village area	Housing site	
Access	Yes	Yes	Yes	Yes
Use	Yes	Yes	Yes	No
Manage	Yes	Collective	Individual	No
Exclude	No	Collective	Individual	No
Transfer	No	Collective	Individual	No
Sale	No	No	Yes	No

*Source:* Focus group discussions, 2007.

### **Agricultural land**

There are two different types of agricultural land in Ung village tract: (1) shifting cultivation areas, and (2) permanent farms. Traditionally, local rules for shifting cultivation differ between the cultivation fields and individual plots. The fields are usually owned by a group of farmers or lineage families, and all farmers collectively make the decision to open a new field. Regarding individual plots, the owners have the right to access, use, manage or transfer the land to another farmer within the same village. However, they are not allowed to use their plots unless the field is collectively chosen for cultivation. The farmers are not allowed to sell individual plots to outsiders. Nevertheless, selling the whole field is permitted if it is agreed by all farmers.

Apart from shifting cultivation, farmers apply different tenure rules for permanent farms. Traditionally, permanent farms refer to the areas where the farmers planted perennial crops continuously for several years. The most common perennial crop in Ung village tract is elephant-foot-yam, which is one of the most common cash crops in Chin State. Yam is usually planted in areas closed to the village in order to reduce the risk of being stolen by outsiders. In principle, yam plots are considered as private property so that landowners have the right to sell yam plots to everyone including outsiders from other villages. Consequently, permanent plots have become more important for farmers than the shifting cultivation plots. Land borrowers are not allowed to plant yam on the borrowed lands because it will become a permanent farm in the future. Therefore, farmers who want to plant yam require either to buy the land from other farmers or to encroach into the forests collectively owned by all villagers. Table (5.12) summarises tenure rules for agricultural lands in Ung village tract.

Table 5.12: Local rules for agricultural lands in Ung village tract

Type of rights	Formal rules		Local rules (Villager)		Non-villager
	Inside park	Outside park	Swidden	Permanent	
Access	Yes	Yes	Yes	Yes	Yes
Use	No	Yes	Yes	Yes	No
Manage	No	Yes	Collective	Individual	No
Exclude	No	No	Collective	Yes	No
Transfer	No	No	Collective	Yes	No
Sale	No	No	No	Yes	No

*Source:* Focus group discussions, 2017.

### Forest land

More than 75% of forests in Ung village tract are situated inside the national park. Therefore, the villagers have no right to use or manage these forests under formal regulations. In reality, the villagers are managing the forests within each village territory in accordance with the customary regulations. Depending on purposes and level of protection, forest lands in Ung village tract can be categorised into three different types: (1) watershed forest, (2) village-use forest, and (3) open-access forest.

*Watershed forest:* Forests around the village water sources are considered as watershed forests in Ung village tract. Destructive activities, such as cutting trees, clearing the land for cultivation, and livestock grazing, are not allowed inside the watershed forests. Hunting and NTFP collection are permitted to all village members. Collecting forest product by outsiders is strictly prohibited inside the watershed forests (Table 5.13).

Table 5.13: Local rules for forest lands in Ung village tract

Activities	Watershed forests		Village use forests		Open access forests	
	Villager	Outsider	Villager	Outsider	Villager	Outsider
Access	Yes	Yes	Yes	Yes	Yes	Yes
Cutting timber	No	No	Own use	No	Yes	No
NTFP	Yes	No	Yes	No	Yes	No
Hunting	Yes	No	Yes	No	Yes	No
Manage	Collective	No	Collective	No	Collective	No
Exclude	Collective	No	Collective	No	Collective	No
Transfer	Collective	No	Collective	No	Collective	No
Sale	No	No	No	No	No	No

*Source:* Focus group discussions, 2017.

Among the four villages, Ung A and Ung C villages have established a fine system against cutting trees inside the watershed forests. In Ung A village, whoever commit tree cutting within the watershed forest have to pay a fine of 5,000 kyats (about 4 USD) and the timber will be confiscated as village property. In Ung C village, the amount of fine for cutting a tree is 15,000 kyats (about 11 USD), and the trees will be confiscated as village property. A key informant mentioned that a villager was recently punished to pay a fine of 20,000 kyats (about 16 USD) for cutting trees inside the watershed forest (KI-14, 2017).

*Village-use forest:* Village-use forests are clearly defined in Ung A and Ung C villages. Within these forests, the villagers can cut the trees both for personal and public uses. In

Ung B and Ung D, village-use forests are not clearly delineated. Instead, forests located near the villages are regarded as village-use forests. Within these forests, all villagers have the right to cut timber for consumption only. Selling timber for commercial purpose is prohibited inside the village-use forests. A key informant mentioned that,

The demand for timber has increased recently because many people have started to build wooden houses. Therefore, we decided to regulate cutting trees within two furlongs (about 0.4 km) from the village. Within this area, villagers are not allowed to cut timber without permission from village headman (KI-14, 2017).

Apart from timber, the villagers are allowed to collect NTFP not only for home consumption but also for commercial purposes. Outsiders are not permitted to cut timber or collect NTFP without prior consents from village members. If an outsider cut the trees without permission, he has to pay a fine as decided by the villagers. For example, in 2015, the Ung C villagers cut the trees inside the Ung B territory to renovate the village church. The Ung B villagers complained about it and asked to pay 50,000 kyats (about 37 USD) as a compensation. A key informant mentioned that according to the local custom, the villagers could claim the compensation even if they found out after a long period (KI-14, 2017).

*Open-access forest:* Within the open-access forests, all villagers have the right to cut timber or collect NTFP without any restriction. Cutting timber for commercial purpose is also permitted to all village members. However, shifting cultivation is prohibited in order to avoid fire accidents to the remaining forests. Outsiders are not allowed to cut timber or clear the land without permission. For example, in 2016, Ung C villagers collected construction materials, such as gravel and stones, inside the open-access forest owned by Ung D villagers. The Ung D villagers found out and asked Ung C villagers to pay money as a fine (KI-14, 2017). A similar case had occurred in 2014, where some outsiders had to pay a hunting muzzle<sup>10</sup> as they did shifting cultivation inside the open-access forests (KI-17, 2017). Therefore, although the open-access forests are not restricted for the villagers, they are not freely available to outsiders under customary regulations.

### ***Allocated land***

About 270 hectares of lands were allocated to Ung village tract. According to the land settlement report, agricultural lands were allocated to each household depending on

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<sup>10</sup>Traditionally, the Chin people use any valuable thing such as a knife, gun, livestock, or earrings as a local currency.



the number of household members. However, the villagers do not know the area of land allocated for each household. They do not have any official certificate so that they do not know about their rights and regulations regarding the allocated lands. For example, a villager mentioned that,

My father participated in the preliminary surveys conducted by the land settlement team. They demarcated some areas and told us that those areas will be allocated to us as compensation for our land inside the national park. Later, no one contacted us again and we did not receive any official document regarding land allocation (KI-11, 2017).

As the villagers do not recognise the allocated lands, there is no particular change in customary tenure due to the allocated lands. The customary landowners are still regarded as the owners of allocated lands. They still hold all land-use rights in accordance with the traditional tenure regulations. Table (5.14) presents both formal and local rules for allocated lands in Ung village tract.

Table 5.14: Local rules for allocated lands in Ung village tract

Types of rights	Formal rules	Local Rules		
		Recipient	Owner (individual)	Owner (collective)
Access	Yes	Yes	Yes	Yes
Withdraw	Own use	No	Yes	Yes
Manage	Individual	No	Individual	Collective
Exclude	Yes	No	Yes	Collective
Transfer	No	No	Yes	Collective
Sale	No	No	Yes	No

Source: Focus group discussions, 2017.

**Governance structure**

Both formal and informal governance structures were observed in Ung village tract. The formal governance structure is the Village Tract Land Administration Committee organised at the village tract level in accordance with the Farmland Law (2012). The village tract committee has the formal rights to regulate the lands within the village tract. Therefore, it has the *de jure* rights to define who is eligible to cultivate on village farmlands or not, to monitor land-use activities within village tract, and to exercise sanctions against farmers who do not follow existing regulations. In reality, the committee does not have any right either to define plot boundary or to decide who is eligible to cultivate within the village tract. The monitoring activities are not

regularly implemented by the committee, and it does not have any formal right to give sanction against local offences (Table 5.15).

Table 5.15: Local governance structures in Ung village tract

Activities	Village tract committee		Village council	
	Formal rules	Local rules	Formal rules	Local rules
Defining boundary	Yes	No	No	Yes
Developing rules	No	No	No	Yes
Giving permission	Yes	No	No	Yes
Monitoring	Yes	No	No	Yes
Sanctioning	Yes	No	No	Yes
Resolving conflicts	Yes	Yes	No	Yes

Source: Focus group discussions, 2017.

In addition to village tract committee, each village has an informal land management council traditionally organised by village elders. The council has permanent members nominated by the villagers. The main responsibility of the council is to choose the shifting cultivation fields and to distribute plots among individual households. The council is also responsible for negotiating with landowners to share their plots with landless farmers. In addition, the council has the right to develop sanctions against illegal use of forest products<sup>11</sup>.

### 5.2.2 Livelihood strategies and forest income

The most common livelihood activities in Ung village tract are agriculture and forest reported by all sample households. Another common livelihood activity is livestock reported by 94% of total households. About 38% of households engage in non-farm employment activities. The least common activity is wage labour reported by 30% of total households. The detailed description of income from each livelihood activity is presented in Appendix A.

#### ***Income distribution by livelihood strategies***

The hierarchical cluster analysis indicates three distinct combinations of livelihood clusters in Ung village tract, namely *Agriculture–Wage*, *Non-Farm–Livestock*, and *Livestock–Agriculture* (see details in Appendix A). Among the three livelihood clusters, the

<sup>11</sup>For example, Ung A village has formulated a new rule that whoever clear the forests outside collectively selected field must pay a fine of 5,000 kyats (about 4 USD) and shall not continue to cultivate on that cleared land (KI-12, 2017).

*Livestock-Agriculture* strategy receives the highest amount of income compared to other strategies. The distribution of total income is significantly different across livelihood clusters ( $\chi^2=12.88$ ,  $p<0.01$ ). Multiple comparisons indicate that total income is significantly higher in *Livestock-Agriculture* strategy than *Agriculture-Wage* strategy (Figure 5.3a). There is no significant difference between *Non-Farm-Livestock* strategy compared to the other two strategies. The results imply that households that engage in livestock receive more income than those that do not engage in livestock breeding. This is mainly because livestock, particularly mithan, is an important source of cash income in Ung village tract.

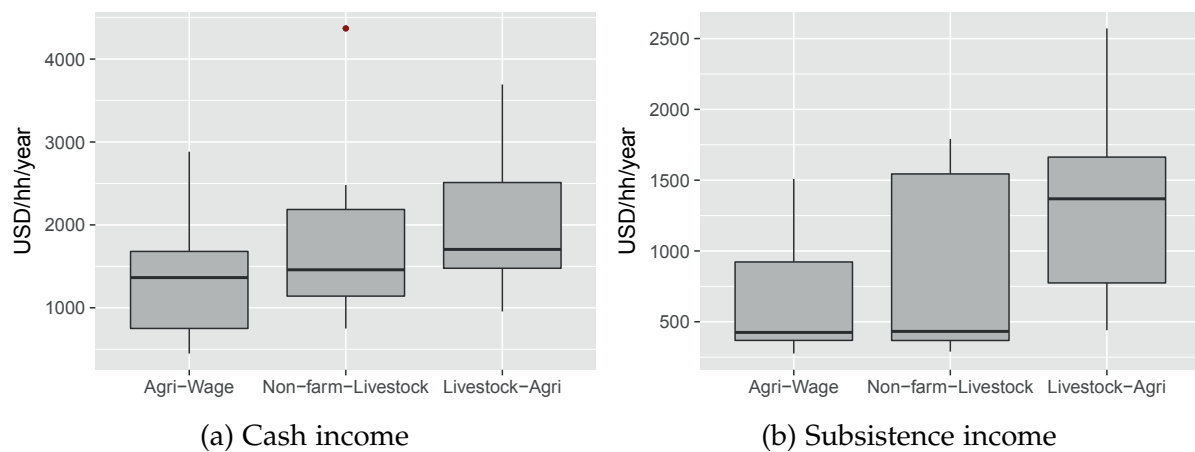


Figure 5.3: Total income by livelihood clusters in Ung village tract

Similar income distribution is observed for total cash income where *Livestock-Agriculture* strategy receives higher cash income than *Agriculture-Wage* strategy ( $\chi^2=6.36$ ,  $p<0.05$ ). It is mainly because cash income from livestock dominates a high share of total cash income. Regarding subsistence income, *Livestock-Agriculture* strategy receive higher income than *Agriculture-Wage* strategy ( $p<0.001$ ) and *Non-farm-Livestock* strategy ( $p<0.05$ ) (Figure 5.3b). The results imply that households with *Livestock-Agriculture* strategy engage more subsistence livelihood activities than the other two strategies.

Forest income is significantly different across the three livelihood clusters ( $\chi^2=14.89$ ,  $p<0.001$ ). Multiple comparisons show that the distribution is particularly significant for *Livestock-Agriculture* strategy compared to *Agriculture-Wage* strategy ( $p<0.001$ ) and *Non-farm-Livestock* strategy ( $p<0.05$ ). This means that households that engage mainly in livestock and agricultural activities receive more forest income than the other livelihood activities. Regarding cash forest income, *Livestock-Agriculture* strategy receives higher amount of income than the other two strategies (Figure 5.4a).

The subsistence forest income is significantly higher in *Livestock-Agriculture* strategy than *Agriculture-Wage* strategy ( $p<0.001$ ) (Figure 5.4b). However, there is no significant difference between *Non-Farm-Livelihood* strategy compared to the other two strategies

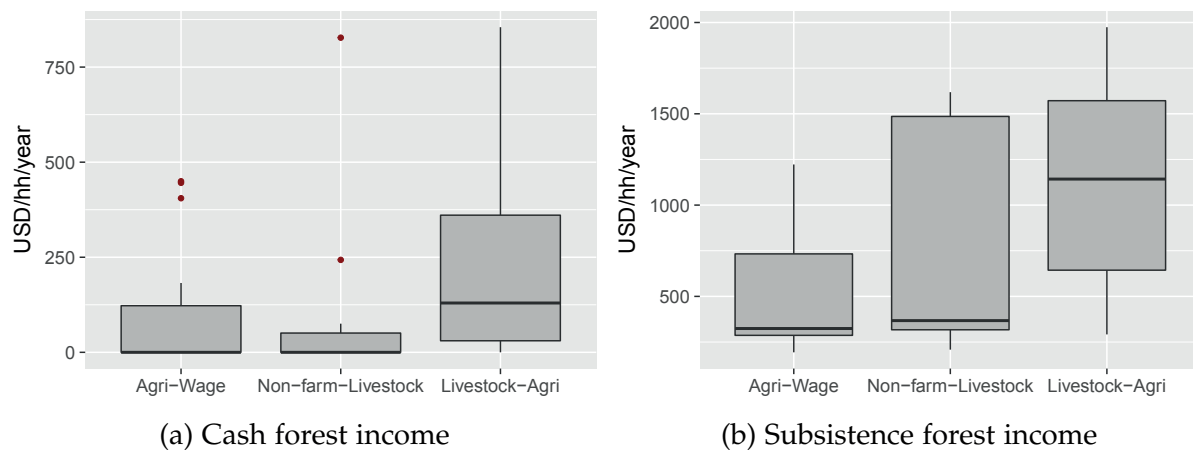


Figure 5.4: Forest income by livelihood clusters in Ung village tract

( $p > 0.05$ ). It is mainly because subsistence forest income in Ung village tract is mostly contributed by the use of wood for house construction. However, house constructions require cash investments for hiring labour and professional carpenters. In this case, households with more livestock have more cash income opportunities so that they can use more construction wood than the other households. Nevertheless, correlation analyses indicate that there is no significant association between forest income and other income sources ( $p > 0.05$ ).

### **Contribution of forest income into poverty and inequality**

Forest income contributes about 35% of total income in Ung village tract. The contribution is lower when subsistence forest income is excluded from income accounting. For cash income, forest contributes the lowest share of income (5%) compared to other income sources. It implies that although households in Ung village tract highly rely on forests, the role of forest income is to sustain local livelihood rather than to help households in stepping out of poverty. The FGT poverty analysis shows that forest income reduces all three poverty indices among households. Specifically, poverty headcount ratio is reduced from 0.30 to 0.06 due to forest income (Table 5.16). It indicates that about 80% of poor households in Ung village tract are lifted above the poverty line due to forest income. The poverty gap is reduced from 0.09 to 0.01 indicating that forest income has filled about 92% of poverty gap in Ung village tract. The poverty severity is reduced from 0.04 to 0.001 indicating that income inequality among the poor households is reduced by 98% due to forest income.

Although forest income is relatively important for poverty reduction, its impact on mitigating income inequality is minimal in Ung village tract. The Gini coefficient is slightly reduced from 0.24 to 0.23 if the forest income is taken into account (see Table

Table 5.16: FGT poverty measures and Gini index in Ung village tract

Income sources	Headcount	Poverty gap	Poverty severity	Gini index
With forest income	0.06	0.01	0.00	0.23
Without forest income	0.30	0.09	0.04	0.24
Differences	-0.24	-0.08	-0.04	-0.01
Relative change	-80%	-92%	-98%	-4%
10% increase in forest income	0.04	0.01	0.00	0.23

5.16). Regarding inequality within each income source, forest income has the second-lowest Gini coefficient ( $G_k=0.376$ ) after agricultural income ( $G_k=0.308$ ). However, forest income has the highest Gini correlation ( $R_k=0.75$ ) and share of total income inequality ( $S_G=0.444$ ) among all income sources (Table 5.17). It means that changes in forest income will have a higher impact on total income inequality than other income sources.

Table 5.17: Gini decomposition by income sources in Ung village tract

Income source	$S_k$	$G_k$	$R_k$	$G_T$	$S_G$	$MEF_G$
Forest	0.362	0.376	0.750	0.102	0.440	0.078
Agriculture	0.226	0.308	0.233	0.016	0.070	-0.156
Livestock	0.252	0.479	0.563	0.068	0.292	0.040
Wage	0.061	0.875	0.466	0.025	0.107	0.046
Non-farm	0.099	0.762	0.278	0.021	0.090	-0.009
Total income	1.000	0.232	1.000	0.232	1.000	

Note:  $S_k$ = Income share;  $G_k$ = Gini coefficient of each income source;  $R_k$ =Gini correlation with total income;  $G_T$ =Gini coefficient of total income;  $S_G$ =Share of total Gini;  $MEF_G$ =Marginal effect on total Gini.

The marginal effect analysis shows that forest income has a positive marginal effect ( $MEF_G=0.078$ ) on total income inequality. It indicates that if forest income is increased by 10% and other income remains the same, total income inequality will be increased by 0.78% due to forest income. Therefore, although forest income reduces income inequality at the current level, promoting forest income will have a negative impact on income equality in Ung village tract. This is mainly because extractions of high value forest products such as construction wood require cash investment for chain saws and transportation so that rich households will have more benefits than poor households. This explanation is supported by correlation analysis which shows a significant positive association ( $r=64$ ,  $p<0.001$ ) between total income and forest income.

### 5.2.3 Traditional ecological knowledge and practices

Traditional practices in Ung village tract can be differentiated into three different groups: (1) traditional agricultural practices, (2) pasture management, and (3) hunting practices.

#### ***Traditional agricultural practices***

Shifting cultivation is the main type of agriculture in Ung village tract. Traditionally, farmers adopt several practices based on their ecological knowledge, namely rotational field selection, land clearing, controlled burning, and ritual performances.

*Rotational fallow management:* The plots are usually organised into rotational fields depending on geography situations. Each village has at least ten rotational fields within its territory. Each field is given with a unique name depending on its location. The fallow period ranges from five to ten years depending on soil condition. For example, a key informant in Ung A reported that the field which is opened in 2017 was previously cultivated in 2009 and 1995 respectively (KI-19, 2017). It indicates that there is no fixed rotation period even for the same field. Traditionally, the fields are selected depending on soil conditions and the types of crop that the farmers aim to cultivate. The decision is usually made at the *taungya* meetings. After selecting the next cultivation field, the village council distributes individual plots to interested farmers and decides the dates to perform the field opening rituals. The key informant mentioned that the rotational fallow management ensured the sustainability of shifting cultivation fields within the village territory and helped to avoid the destruction of the remaining fallow forests for future cultivations (KI-19, 2017).

*Land clearing:* Majority of farmers in Ung village tract adopt a specific land clearing method in order to improve soil condition. Traditionally, the farmers do not cut all trees during the land-clearing processes. Instead, they usually left higher stumps in order to enhance soil recovery and to reduce erosion (see photo 8 in Appendix D). A key informant mentioned that,

[...] only smaller plants and shrubs are completely felled during land clearing. For large trees, only the branches are pruned at a certain height to avoid shadows over the crops. For medium-size trees, only the tops are cut instead of cutting from the base. (KI-19, 2017)

Traditional land clearing method has several advantages regarding soil condition and secondary successions. Leaving larger trees in standing forms reduce soil erosion because they create a reservoir of soil nutrients by collecting debris at the base during the heavy rains. It can also increase the regeneration processes during the fallow periods as they start to produce coppice after burning. The standing stumps also provide natural supports for some crops such as climbing peas and beans.

The sharing of labour among farmers was also observed in Ung village tract. Since pruning and pollarding require intensive labour activities, the farmers usually request additional labour from neighbouring farmers. In Ung A and D, the farmers use collective labour during land clearing by organising working groups among neighbouring farmers. A key informant mentioned that labour sharing reduces the risk of accidents during the land clearing process and save the cost of hired labour (KI-19, 2017). Therefore, labour sharing is one of the main reasons to cultivate in the collectively chosen fields.

*Controlled burning:* Traditional controlled-burning practices are still common in Ung village tract. All farmers have to contribute collective labour in preparing fire-breaks and during the burning processes. For those who are not able to join in preparing fire-breaks, they have to pay a fine of about 5,000 kyats (about 4 USD). However, Ung village tract is located on steep mountains so that most agricultural fields have natural barriers, such as streams or valleys, against the spread of fire. The construction of fire-breaks for each plot is not necessary since the whole field is cleared and cultivated at the same time. Therefore, this practice motivates farmers to cultivate collectively in a chosen field so that they can share the responsibility for the construction of fire-breaks.

All farmers have to pay fine if the fire accidentally spreads out into neighbouring village territory. Therefore, the farmers usually set the date of burning in collaboration with neighbouring villages. There is no spiritual criterion in selecting dates to start the fire. A key informant mentioned that they usually start burning in the last week of March or early April to avoid the monsoon rains (KI-9, 2017). It indicates that the farmers select the optimum date for controlled burning based on their ecological knowledge and past experiences.

*Traditional rituals:* Two main collective rituals are usually performed during a single agricultural season. The first one is field opening ritual usually performed before opening a new field. The second one is *taungya* burning ritual usually performed before the controlled burning processes. Since most households are Christians, the



ritual offerings are usually led by village priests. The process of ritual is similar to traditional practices, where one or two chicken are killed in the field in order to get better yields and reduce accidents. A village priest mentioned that since it is a local tradition to perform rituals before agricultural activities, the village church has to help the farmers to continue with their traditions. However, the rituals are guided by the church, and the farmers have to pray to God instead of the field spirits (KI-31, 2017). The cost of ritual has to be shared among the farmers. The rituals are also transformed by praying to God instead of the field spirits. Instead of offering the first harvest to the village shaman, the farmers usually offer about 10% of their first harvests to the village church (KI-11, 2017).

### ***Traditional pasture management***

Mithans are usually reared by free-roaming in the forest without any additional feeding. Traditionally, the farmers adopt a rotational grazing system in combination with the management of agricultural fallows. In this system, an old agricultural field is used as a common grazing site by all livestock holders. After one to two years, the animals are moved to another fallow field leaving the old one to recover before the next cultivation. A key informant mentioned that the newly-harvested fallows are usually rich in smaller shrubs and grasses so that they can provide plenty of fodder for livestock grazing. The presence of livestock also increases soil fertility by adding organic matters from their dungs. Therefore, it is believed that combining fallow management with grazing increases crop productivity in the next cultivation cycle. However, this practice also increases weed species so that additional labour is required for weeding in the next cultivation cycle (KI-14, 2017).

The decision to select a new grazing field is usually made collectively at the village level. Fences are constructed around the field to protect the crops. Those who do not participate in fence construction are not allowed to release their livestock in the grazing field. If the animals destroy the crops in neighbouring villagers, all livestock owners have to share the compensations. The payment is calculated either based on the extent of crops destroyed or the duration that the animals have spent in the cultivated field. For example, in 2013 mithan owners in Ung C had to pay about 60,000 kyats (about 50 USD) as their mithan had damaged the crops of Ung B villagers. A key informant mentioned that the payment had to share among all mithan owners even though only a few mithan had released from their grazing field (KI-14, 2017). This particular case indicates the motivation of farmers to practise collective grazing in order to share the risk of compensation among livestock owners.

### **Traditional hunting practices**

Although there is no specific taboo regarding wildlife species, several customary practices were reported in relation to hunting expeditions. The first custom is the celebration of hunting festivals after all the crops have been harvested. At least five to ten men participate in each hunting expedition. Before the expedition, they have to perform hunting ritual outside the village by offering chicken or pigs to local spirits. The ritual also aims to increase the number of animals and to avoid accidents during the expedition. It usually lasts two or three days depending on the numbers of wildlife. After the expedition, all animals have to be shared among the households, whereas the heads belong to the one who killed the animal<sup>12</sup>.

Table 5.18: Summary of traditional hunting practices in Ung village tract

Sr.	Description	Relevance to conservation
1	Hunting expedition only after performing communal rituals.	Reduce illegal hunting within village territory.
2	No hunting by outsiders within village territory without permission.	Promote wildlife conservation.
3	No taking of wildlife killed by other people.	Support species conservation.
4	Giving wildlife hind leg to village headman, and a small portion of meat to other villagers.	Promote resource monitoring and social cohesion.
5	Giving bird meat to the newlywed family by the parents.	Improve social cohesion, but contribute to species decline.
6	No taking of honey from beehive without permission from owners.	Promote sustainable resource use.

*Source:* Focus group discussions, 2017.

Although hunting festivals are less common in recent days, hunters are still considered necessary for monitoring resources within village territory. For example, a key informant mentioned that the hunters usually report to village headman if there are new encroachments from neighbouring villages. Hunting expeditions were traditionally used for conflict resolutions whereas the team which captured more wildlife was decided as the winner (KI-14, 2017).

Hunting is generally allowed within the village territory only. Hunting in another village territory requires prior permission from the residents. If illegal hunting is found out, the hunters will get punishments from the villagers. For example, Ung D

<sup>12</sup>Killing wildlife is an honour in Chin customs, and the hunters usually hang the animal heads in front of the houses to show their achievements

villagers mentioned that they usually confiscate both weapons and animals if someone does illegal hunting in his or her village territory. If someone has captured a big game species, he has to give a hind leg of the animal to the village headman. It means that the village headman usually knows the numbers and type of wildlife captured within his village territory. In addition, the hunters have to distribute a small portion of meat to each household. It also indicates that the benefit of hunting is shared among the community so that villagers support village hunters and protect against hunting by outsiders.

Another important tradition in Ung village tract is that the villagers usually give bird meat among relatives in order to enhance social bonds between the two families. Traditionally, when a father visits his daughter's house, he should bring some meat for his in-laws in order to express his goodwill. The most common custom is that the father brings bird meat that he had captured by himself. In return, the other parents have to give back chicken or pig according to the number of wild birds that he brought. A key informant mentioned that the number of birds per gift might range from 50 to 100 individuals depending on the size of birds (KI-14, 2017). In some cases, they even do not count the number of birds. Instead, they put them in bamboo baskets showing his efforts for good relations between the two families. This particular custom indicates that maintaining traditional practices often contribute to the loss of wildlife other than killing wildlife for regular consumption.

Collection of honey from natural beehives is also regulated by local customs. All beehives within the village territory have individual owners who have the exclusive right to collect honey from respective beehives. Traditionally, if someone found a beehive at the rock cavity, he has to declare his ownership to other villagers. Each beehive is given a name according to locally distinct features so that other villagers also know the owner of the hive. After declaring his ownership, only the owner has the right to collect honey from his own beehive. It is also taboo for other villagers to collect honey without permission from the owner. If the owner does not want to collect by himself, he may permit someone who wishes to collect honey from his beehives. In such cases, the owner receives about half of the collected honey, and the collector will take the other half. If an illegal collection is found out by the owner, the collector has to pay back the same amount of honey or other products to the owner. A key informant mentioned that the ownership system motivates the farmers to collect honey sustainability with minimum disturbances (KI-14, 2017).

### 5.3 Case Study-III: Kitaw Village Tract

#### 5.3.1 Land tenure system

The village territories in Kitaw village tract belong to the category of vacant land or land at the disposal of Government. Therefore, the villagers have both access and use rights, but they do not have formal rights to manage, exclude, or transfer the land. In practice, the villagers still recognise customary tenures, which can be differentiated into three different types: (1) settlement areas, (2) agricultural lands, and (3) forest lands (see detailed land-use map in Appendix A).

#### ***Village settlement area***

Village settlement areas are regarded as the common property of all villagers. Every villager has the right to build a house in any open space within the settlement area. After the house has been built, the owner has the right to manage or transfer his land among villagers or to his future generations. Selling or transfer of the lands to outsiders is not allowed under customary regulations. Table 5.19 presents a comparison between formal and local rules for village settlement areas in Kitaw village tract.

Table 5.19: Local rules for village settlement areas in Kitaw village tract

Types of rights	Formal rules	Local rules (villagers)		Outsiders
		Village area	Housing site	
Access	Yes	Yes	Yes	Yes
Use	Yes	Yes	Yes	No
Manage	Yes	Collective	Individual	No
Exclude	No	Collective	Individual	No
Transfer	No	Collective	Individual	No
Sale (within village)	No	No	Yes	No
Sale (outsiders)	No	No	No	No

*Source:* Focus group discussions, 2017.

#### ***Agricultural land***

Both shifting cultivation and permanent farms are observed in Kitaw village tract. Therefore, the farmers adopt two different sets of rules for each land-use type. Regarding shifting cultivation, the right to open a new field is regulated under the collective decisions of all farmers. The cultivation plots within each field are owned

either by individual households or lineage families. Individual ownership is usually established when a farmer clears the open-access land for the first time. After the land has been cleared, the farmer becomes the plot owner and consequently holds the right to cultivate, exclude, or transfer the land to other villagers. Selling agricultural lands to an outsider is not prohibited in Kitaw village tract. Regarding the land owned by lineage families, the rights to manage, exclude, or transfer to another villager are held by all lineage members. However, the individual members do not have the right to sell the land without approval from other lineage members.

Permanent farming has become common in Kitaw village tract, particularly for yam cultivation. The main difference for permanent tenure is that farmers have the right to clear and cultivate yam based on his own decision. Unlike the shifting cultivation, the farmers have to pay money as rent if he or she borrows the land for yam cultivation. The amount of rent for one hectare plot is about 200,000 kyats (ca. 150 USD) per rotation. Permanent farm owners have the right to sell the land to outsiders without any permission. Table (5.20) summarises tenure rules related to cultivated lands in Kitaw village tract.

Table 5.20: Local rules for agricultural lands in Kitaw village tract

Types of rights	Formal rules	Local rules (swidden)		Local rules (permanent)	Outsider
		Lineage land	Private		
Access	Yes	Yes	Yes	Yes	Yes
Use	Yes	Yes	Yes	Yes	No
Manage (field)	Yes	Collective	Collective	n.a	No
Manage (plot)	Yes	Collective	Yes	Yes	No
Exclude	No	Collective	Yes	Yes	No
Transfer	No	Collective	Yes	Yes	No
Sale	No	No	Yes	Yes	No

Source: Focus group discussions, 2007.

### **Forest land**

About 17% of the total land area in Kitaw village tract is covered with forests. Participatory land-use mapping exercises indicate three categories of forest lands in Kitaw village tract: (1) watershed forests; (2) village-use forests; and (3) open-access forests.

*Watershed forest:* All villages in Kitaw village tract have demarcated watershed forests around the water sources. Destructive activities such as land clearing, tree felling, or mithan grazing are strictly prohibited inside the watershed forests. Non-disturbance

activities such as hunting or collection of NTFP are permitted both for villagers and outsiders. Although tree cutting is prohibited inside the watershed forests, there is no explicit sanction against village members. For example, a villager from Kitaw C cut a few trees from the watershed forest to construct a community centre. The other villagers complained about it so that the village headman had to stop him and asked to look for timber in other places.

*Village-use forest:* All villages in Kitaw village tract have demarcated village-use forests. Within these forests, villagers are allowed to cut timber, collect NTFP, or hunt wildlife without permission. Burning or clearing the land for cultivation is prohibited within these forests. Selling of timber for commercial purpose is prohibited for all villagers. Outsiders are permitted only for hunting and NTFP collection.

Among the four villages, Kitaw A is the most active village to legalise the village-use forests. Since 2012, the villagers have initiated to get legal land titles for their village-use forests. The main motive of the villagers is to protect the forests against occupation by government or private investors. The village headman mentioned that,

We were afraid that the Government would occupy our forests and give concession to a private company for development projects. Therefore, we developed a management plan and submitted to Forest Department in order to get legal recognition as Community Forest (CF). All villagers contributed about 5,000 kyats per household (about 4 USD) for preparing and making photocopies of the document. Nevertheless, we have not received any response from the Government (KI-25, 2017).

This particular case indicates that the demand for formal recognition has increased in Kitaw village tract mainly due to the increasing contacts with local NGOs and government organisations. Moreover, they had witnessed when the government occupied unregistered lands from their neighbouring villages.

*Open-access forest:* Among the four villages, only Kitaw B and Kitaw C have open-access forests within each village territory. The forests are located far away from the villages so that the villagers do not regularly visit these forests during cultivation seasons. The villagers mentioned that it is impossible to control illegal activities within these forests because they are located far away from their villages. Therefore, these forests are considered as open-access by outsiders. There is no regulation against villagers to cut trees in open-access forests including for commercial purposes. However, shifting cultivation by an outsider is prohibited as the forests are still inside

the village territory and it can be easily detected if someone clears the land for shifting cultivation.

Outsiders, who would like to cultivate within these forests, are required to request permission from the village headman and pay a land-use fee as determined by the villagers. For example, Kitaw D villagers have borrowed some areas of open-access forests from Kitaw B village. In return, they have to pay a land-use fee of 30,000 kyats (about 25 USD) per cultivation season to Kitaw B villagers (KI-28, 2017). This particular case highlights that the principle of land ownership by clearing open-access forest is applicable to village members only, and the outsiders will not get any ownership status unless they live in the village. Table (5.21) presents a summary of rules regarding forest lands in Kitaw village tract.

Table 5.21: Local rules for forest lands in Kitaw village tract

Activities	Watershed forest		Village-use forest		Open-access forest	
	Villager	Outsider	Villager	Outsider	Villager	Outsider
Access	Yes	Yes	Yes	Yes	Yes	Yes
Cutting timber	No	No	Own-use	No	Yes	Yes
NTFP	Yes	Yes	Yes	Yes	Yes	Yes
Hunting	Yes	Yes	Yes	Yes	Yes	Yes
Manage	Collective	No	Collective	No	Yes	No
Exclude	Collective	No	Collective	No	Collective	No
Transfer	Collective	No	Collective	No	Collective	No
Sale	No	No	No	No	No	No

*Source:* Focus group discussions, 2017.

### **Governance structure**

Both formal and informal governance structures were observed in Kitaw village tract. The formal governance structure is the Village Tract Land Administration Committee organised at the village tract level. Although the village tract committee has the legal authority to administer land-related issues, the villagers tend to use the formal committee to resolve land-use conflicts between neighbouring villages. For example, in 2015, a few trees from Kitaw A forest were cut by neighbouring villagers. The villagers reported to the township authorities via the formal village tract committee. The case was investigated by township farmland management body and gave warnings to neighbouring villagers to stop cutting trees outside their village territory (KI-26, 2017). A similar case was observed in Kitaw C, where neighbouring villagers cut the trees in their watershed forest. Kitaw C villagers reported to the village tract committee, which gave warnings against offenders not to commit it again (KI-27, 2017). In both cases,



formal governance authorities were able to resolve conflicts between villages although they could not solve the conflicts among villagers residing in the same village (Table 5.22).

Table 5.22: Local governance structures in Kitaw village tract

Activities	Village tract committee		Village committee	
	Formal rules	Local rules	Formal rules	Local rules
Defining boundary	Yes	No	No	Yes
Developing rules	No	No	No	Yes
Giving permission	Yes	No	No	Yes
Monitoring	Yes	No	No	Yes
Sanctioning	Yes	No	No	Yes
Resolving conflicts	Yes	Yes	No	Yes

*Source:* Focus group discussions, 2017.

In addition to the formal committee, the traditional village council serves as an informal institution in making land-use decisions. The village headman usually leads the council whereas every villager has the right to participate and discuss their opinions at the village council meetings. Selection of land for shifting cultivation is usually made at the village council meeting. During the meeting, the villagers also negotiate with landowners to share their plots with landless farmers. Other land-use decisions, such as the designation of watershed protection or village use forests, are also made at the village council meetings. Village council meetings are also important to resolve land-use conflicts among the villagers. The council also has the right to formulate new regulations and sanctions to protect land and forest resources within the village territory. For instance, local rules related to Kitaw CF were discussed and approved at the village council meetings.

### 5.3.2 Livelihood strategies and forest income

Five major livelihood activities are observed in Kitaw village tract. Among these, forest is the most common activity reported by all sample households. The second most common activity is agriculture reported by 98% of total households. Livestock is the third most common activity reported by 94% of total households. Wage labour and non-farm employment are the least common activities reported by 46% and 38% of total households respectively. The detailed description of income from each activity is presented in Appendix A.

### **Income distribution across livelihood strategies**

The hierarchical cluster analysis (HCA) indicates three distinct combinations of livelihood clusters, namely *Non-farm–Agriculture–Livestock*, *Non-farm–Agriculture–Wage*, and *Wage–Agriculture–Forest* (see details in Appendix A). Although households use different livelihood strategies, the average total income is not significantly different across the three livelihood clusters ( $\chi^2=10.70$ ,  $p>0.05$ ). It is mainly because households in all three clusters receive a similar amount of subsistence income, mainly from agriculture and livestock. The distribution of total cash income is significantly different across the three clusters ( $\chi^2=5.53$ ,  $p<0.05$ ). Multiple comparisons also show that the average cash income is significantly lower in *Wage–Agriculture–Forest* cluster than the other two clusters (Figure 5.5a). It is mainly because non-farm income contributes a high share of total income (24%) in Kitaw village tract. Correlation analysis shows a significant positive association between non-farm income and total cash income ( $r=0.61$ ,  $p<0.001$ ). This implies that households that engage in non-farm activities receive more cash income than those who do not engage in non-farm activities.

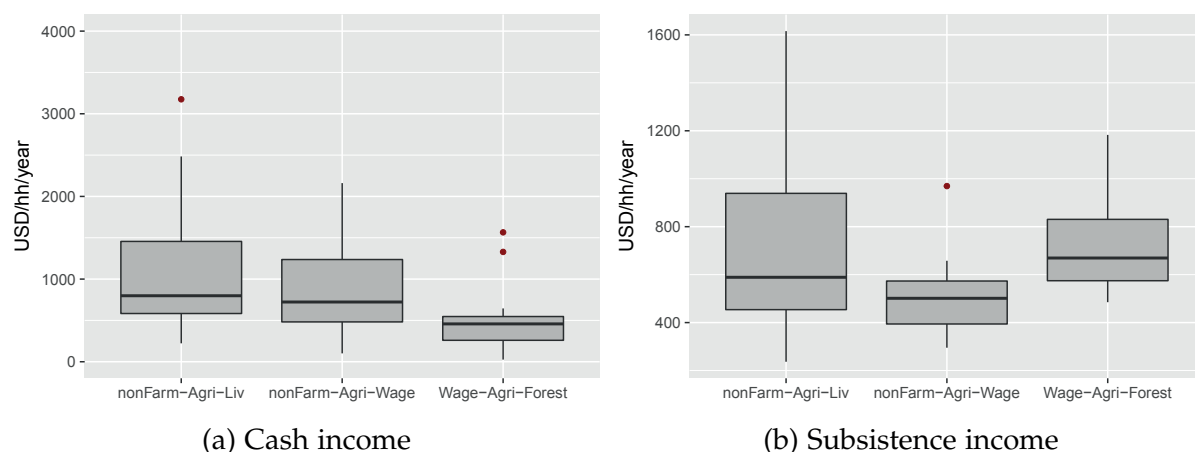


Figure 5.5: Total income by livelihood clusters in Kitaw village tract

The distribution of total forest income is significantly different across the three livelihood clusters ( $\chi^2=15.70$ ,  $p<0.001$ ). Multiple comparisons indicate that forest income is significantly higher in *Wage–Agriculture–Forest* strategy than the other two strategies. However, correlation analysis shows that there is no significant association between forest income and other income sources ( $p>0.05$ ). Regarding cash forest income, the distribution is significantly different across three livelihood clusters ( $\chi^2=8.51$ ,  $p<0.05$ ). Multiple comparisons indicate that households that engage in *Wage–Agriculture–Forest* strategy receive higher cash forest income than the other two strategies (Figure 5.6a). Correlation analysis shows a significant positive association between cash forest income and subsistence agricultural income, although the correlation coefficient is very weak ( $r=0.29$ ,  $p<0.05$ ). It implies that households that engage more in subsistence agriculture

are more likely to participate in cash forest activities than those who engage less in such activity.

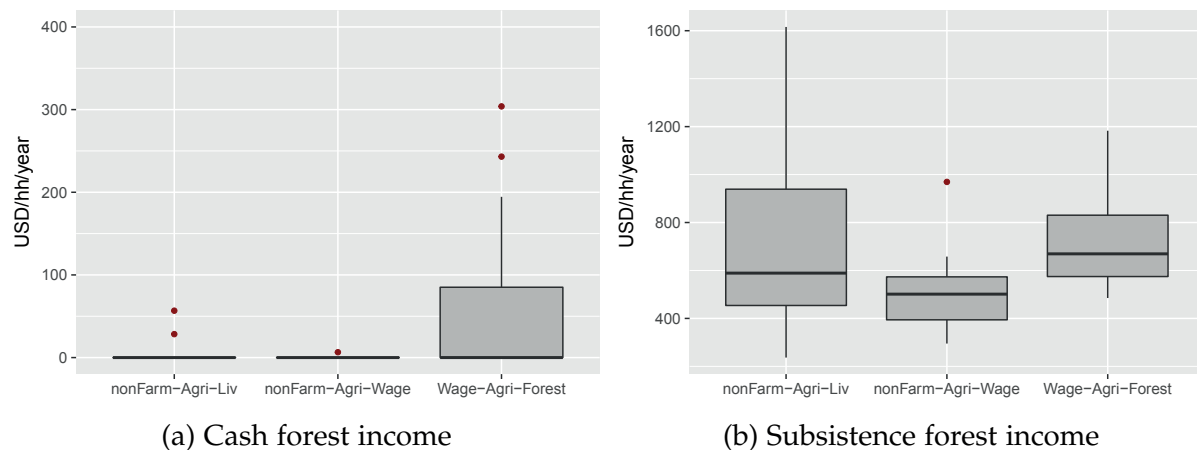


Figure 5.6: Forest income by livelihood clusters in Kitaw village tract

Regarding subsistence forest income, the distribution is significantly different across the three clusters ( $\chi^2=11.02$ ,  $p<0.01$ ). Multiple comparisons show that *Non-farm-Agri-Wage* strategy receive lower subsistence forest income than the other two strategies (Figure 5.6b). Correlation analysis shows that there is no significant association between subsistence forest income and other income sources ( $p>0.05$ ). The results imply that the use of forest resources for subsistence purpose is not determined by the amount of income that households receive from other sources. In other words, subsistence forest income is equally important for all households in Kitaw village tract regardless of their livelihood choices.

### **Contribution of forest income into poverty and inequality**

Forest income contributes about 29% of total household income in Kitaw village tract. The contribution is mainly in the form of subsistence income accounting for 92% of total forest income. It indicates that the majority of households in Kitaw village tract rely on forest mainly to sustain their livelihood rather than generating cash income. The FGT poverty results also show that poverty headcount ratio is reduced from 0.70 to 0.30 due to forest income (Table 5.23). Forest income also reduces poverty gap from 0.31 to 0.10 and poverty severity from 0.17 to 0.04 respectively. This indicates that forest income is relatively important in mitigating poverty in Kitaw village tract. Moreover, comparison of the three poverty indices shows that the relative impact of forest income is higher in poverty severity (82%) than poverty gap (67%) and poverty headcount indices (46%). The results indicate that forest income plays a more important role in

mitigating the depth and distribution of poverty than reducing the number of poor households in Kitaw village tract.

Table 5.23: FGT poverty measures and Gini index in Kitaw village tract

Income source	Headcount	Poverty gap	Severity	Gini index
With forest income	0.38	0.10	0.04	0.31
Without forest income	0.70	0.31	0.17	0.42
Differences	-0.32	-0.21	-0.14	-0.11
Relative change	-46%	-67%	-82%	-26%
10% increase in forest income	0.38	0.80	0.03	0.30

In addition to poverty, forest income has a significant impact on reducing income inequality among households. The Gini coefficient has reduced from 0.42 to 0.31 if the forest income is integrated into household income (see Table 5.23). The effect of forest income on reducing income inequality is higher than other income sources. The Gini decomposition analysis shows that forest income has the lowest Gini coefficient ( $G_k=0.285$ ) compared to other income sources (Table 5.24). It implies that the distribution of forest income is more equal than other income sources. Moreover, forest income has a negative marginal effect ( $MEF_G=-0.198$ ) on total income inequality. It implies that the 10% increase in forest income will reduce total income inequality by 1.98%. Therefore, promoting access to forest income will likely to reduce income inequality in Kitaw village tract.

Table 5.24: Gini decomposition by income sources in Kitaw village tract

Income sources	$S_k$	$G_k$	$R_k$	$G_T$	$S_G$	$MEF_G$
Forest	0.292	0.285	0.359	0.030	0.094	-0.198
Agriculture	0.302	0.405	0.587	0.072	0.226	-0.075
Livestock	0.138	0.577	0.592	0.047	0.149	0.011
Wage	0.066	0.826	0.272	0.015	0.047	-0.019
Non-farm	0.202	0.877	0.865	0.153	0.484	0.282
Total income	1.000	0.317	1.000	0.317		

Note:  $S_k$ = Income share;  $G_k$ = Gini coefficient of each income source;  $R_k$ =Gini correlation with total income;  $G_T$ =Gini coefficient of total income;  $S_G$ =Share of total Gini;  $MEF_G$ =Marginal effect on total Gini.

### 5.3.3 Traditional ecological knowledge and practices

Traditional practices in Kitaw village tract can be differentiated into three different groups: (1) traditional agricultural practices, (2) traditional forest management practices, and (3) traditional bamboo management practices.

#### ***Traditional agricultural practices***

There are four main traditional practices regarding shifting cultivation in Kitaw village tract, namely (1) rotational field selection, (2) land clearing, (3) controlled burning, and (4) ritual practices.

*Rotational field selection:* Selection of rotational field by *Taungya* meeting is still common in Kitaw village tract. The average fallow period for each field is about seven to ten years. Each village has at least seven fields to allow for sustainable rotation, except for Kitaw D which has only two rotational fields within its village territory<sup>13</sup>. Although there are no specific indicator species, the farmers usually decide the suitability of each field based on the regeneration status. A key informant mentioned that they usually decide a suitable field by evaluating whether the vegetation cover will allow proper burning or not (KI-25, 2017). The allocation of plots is usually done by negotiation among the farmers.

*Land clearing:* During land clearing, the large trees are left standing by pollarding the branches. The primary purpose is to increase the rate of soil recovery after cultivation. The remaining stumps are also used as natural supports for bean species which are planted together with maize. This selection of maize-bean intercropping system also motivates farmers to leave a certain number of standing trees during land clearing. A key informant mentioned that it is also necessary to pollard the branches as they provide nesting sites for birds that destroy the crops (KI-28, 2017). Labour sharing is still common to implement selective land clearing practices. Also, the farmers avoid clearing the trees located at top ridges or near to the streams in order to reduce landslides and excessive erosions.

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<sup>13</sup>Since Kitaw D has only two fields, they have to borrow some area of land from Kitaw B to complete the required rotations.

*Controlled burning:* Except for Kitaw B, all villages in this village tract usually prepare fire-breaks along the field borders. In Kitaw B, most agricultural fields are located far away from the houses so that the farmers usually do not prepare fire-breaks before burning. Moreover, they usually face forest fire coming from other areas so that preparing a fire-break is not effective to protect the spread of fire in their fallow lands. In the other three villages, fire-breaks are still important since most of their fields are located close to their houses. All farmers have to pay for compensation if the fire spread into another village territory. For example, Kitaw A farmers had once paid four Mithans to Kitaw C as the fire from their field had spread out into Kitaw C territory. Since the accident had happened during collective activity, the cost of Mithan had to share among all participating farmers. The date of burning is collectively decided in order to ensure that every farmer can participate in controlled burning. If a farmer could not participate, he should hire someone or pay fine for his absence.

*Traditional rituals:* Although the majority of farmers have converted to Christianity, traditional rituals are still performed in Kitaw village tract. There are four types of rituals performed in Kitaw village tract, which are the field-opening ritual, *taungya* burning ritual, harvest ritual, and the feast of merit. The first two types are usually performed collectively while the latter two are performed individually. Although the rituals are performed collectively, the Christians usually offer and pray to God instead of local spirits. For harvest rituals, the Christians offer some of their harvests to village churches while the others offer to Buddhist monasteries and local spirits.

Feasts of merit are still common in Kitaw village tract. The feast is usually performed by offering mithan meat and *Zu* to all villagers. The villagers usually establish wooden posts in front of their houses after performing the feasts (see photo 18 in Appendix D). The number of posts corresponds to the number of mithan that have killed during the feasts. Although feasts of merit have become less frequent, some villagers still perform the feasts to improve their health conditions. For example, a villager from Kitaw B recently performed a feast of merit with two Mithans to improve the health condition of his wife, who have been suffering severe sickness for a long time. This particular explanation indicates that feasts of merit are still crucial for some farmers to improve their spiritual well-being.

### ***Traditional forest protection practices***

Apart from the designation of watershed forests and village-use forests (see detail in section 5.3.1), the villagers also protect forests based on their spiritual beliefs. Traditionally, the areas where villagers usually perform ritual offerings to local spirits are considered as sacred forests. Except for Kitaw D, all other three villages have sacred forests within each village territory. Traditionally, the villagers do not cut the trees within sacred forests in order to avoid negative consequences from evil spirits. Banyan trees (*ficus spp.*) are also considered as sacred trees since it is believed that this species provides home for local spirits. A key informant mentioned that the role of sacred forests has declined since most villagers have converted to the Christian religion. It was also mentioned that sacred forests should be cut so that the evil spirit could no longer live within the village territory (KI-32, 2017). Since the villagers started to cut trees within sacred forests, the village council had to inform them to respect the remaining believers. These particular cases indicate that although the sacred forests are common in Kitaw village tract, the role of these forests for conservation has declined due to the changes in local religious beliefs.

### ***Traditional bamboo management practices***

Bamboo plays an important role in local daily life. Bamboo is used for many purposes including house construction, fencing, woven baskets, and other household items. Traditionally, most farmers planted bamboo in their farms, particularly along the plot borders so that they can easily recognise plot boundary in the future. The most commonly species are *Melocanna baccifera*, *Bambusa polymorpha*, and *Dendrocalamus hamiltonii*. The farmers mentioned that most of the bamboo culms located within village territory have individual owners so that no one is permitted to cut without permission.

Bamboo is usually harvested based on selective felling system. A key informant mentioned that the mature culms which are at least two years old are usually harvested. Moreover, harvesting of bamboo is usually done in November or December after the rainy season. The farmers also apply particular methods in cutting bamboo culms. For example, a key informant explained that,

We regularly clear around bamboo culms in order to protect against formations of termites colonies that can slow down the growth. Bamboo should not be harvested during rainy seasons (July to September) since they produce new shoots and roots during that period. The best season for harvesting bamboo is between November and January when the roots become mature enough to support culms in the long



run. Moreover, we should leave at least three to five stems in order to support the development of new bamboo culms (KI-24, 2017).

This explanation indicates that local farmers have proper knowledge on sustainable harvesting and maintenance of bamboo species. Another informant also mentioned that bamboo culms must be cut closer to the base in order to give enough spaces for remaining culms; however, a small amount of stumps must be left on the ground so that a new shoot can grow quickly in the next shooting season (KI-25, 2017). The villagers also apply the bamboo-sharing system in order to maintain selective cutting practices. Traditionally, if a farmer does not have enough mature culms, he can request them from other farmers. In return, he has to share a similar amount of bamboo culms if the other farmers request him to share some of his bamboos. This mutual sharing practice also enhances social cohesion among farmers and supports long-term collective activities.

The villagers also recognise impacts of bamboo flowering in the region<sup>14</sup>. For example, a key informant mentioned that they had observed bamboo flowering in 2008. Consequently, there were several outbreaks of rats, which had destroyed all their crops. The outbreak was associated with bamboo flowering which provides food for the rats. It indicates that the villagers are aware of the ecological consequences of bamboo flowering.

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<sup>14</sup>In Chin language, the bamboo flowering is called as *Mautam* meaning the death of bamboo.

## CHAPTER 6

# COMPARATIVE ANALYSIS OF THREE CASE STUDIES

### 6.1 Land Tenure and Property Right Systems

#### 6.1.1 Summary of tenure rules in three case studies

The three case studies indicate that local households tend to follow informal (*de facto*) tenure system rather than formal (*de jure*) government regulations. All case study villages have their own traditional territories that are clearly defined and accepted by neighbouring villagers. Within each village territory, different tenure rules are formulated for different land-use types, such as village settlement area, agriculture land, and forest land. Regarding village settlement areas, all three cases have similar tenure rules, where every household has the right to build a house at any available space within the village territory. Frequent movements of settlement areas are observed in all three cases. However, the movement occurred only within the village territory since moving outside the territory will lead to social conflict with neighbouring villagers.

Regarding agricultural land, tenure rules for shifting cultivation areas are similar across three cases. In all three cases, tenure rules for shifting cultivation can be differentiated into two main levels. The first level is related to rotational fields, where the farmers require collective decisions to open a new field for cultivation. The second level is related to individual plots where farmers can cultivate crops after the field is chosen collectively. Within each field, the individual plots are owned either by private, clan, or all community members (see Figure 6.1). Private ownership systems are usually established by clearing the open-access forests for the first time. After the land is cleared and cultivated, it becomes the property of the cultivator and can be inherited for his generations. Women are traditionally not allowed to inherit the land since they can cultivate on the lands owned by their husbands after they have married. Land ownership by first clearance is applicable only for village members so that outsiders

will not be landowners even if they clear it for the first time. For clan ownership, all clan members have equal rights to use or manage the land. Individual farmers are not allowed to cultivate without collective agreements. The land is inherited collectively without individual allocation so that the right to sell the clan lands by an individual member is prohibited. For communal ownership, all villagers have the right to access and use the cultivation plots regardless of their tribal affiliations. The allocation of plots to each farmer is collectively done at village council meetings.

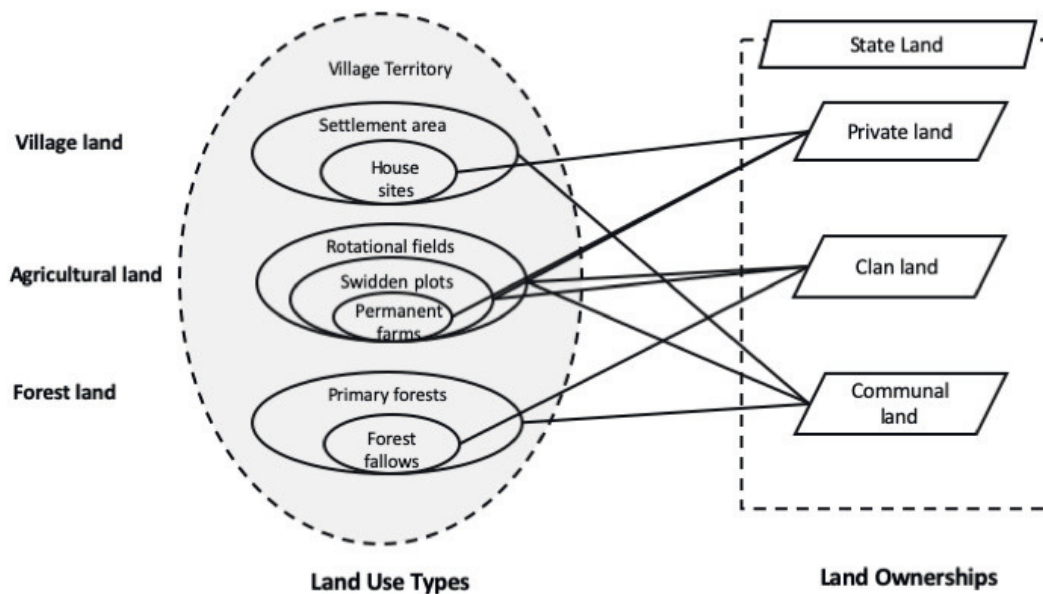


Figure 6.1: Relationship between local land ownership and land-use practices

Source: Own elaboration.

Apart from shifting cultivation, only Case-II and Case-III have permanent farms for yam cultivation. In both cases, permanent farms are considered as private lands so that the farmers have the right to transfer or sell the land to outsiders without any restriction. Land borrowers are not permitted to establish permanent farms on the borrowed land. Therefore, the farmers who would like to establish permanent farms have to buy land from other villagers. In Case-I, the villagers only practice shifting cultivation so that there is no clearly defined tenure rule for permanent farming.

Regarding forest lands, all three case studies have demarcated watershed forests in order to preserve the village water sources. Tenure rules for watershed forests are similar between Case-I and Case-III, where the outsiders are allowed for hunting and collection of non-timber forest products (NTFPs). In Case-II, both hunting and NTFP collection are prohibited inside the watershed forest (Table 6.1). Apart from watershed

forests, both Case-II and Case-III have designated village-use forests. In Case-I, the villagers have not designated village-use forest mainly because existing forest areas are already occupied by the national park. In Case-II and Case-III, village-use forests are located outside the national park so that the villagers are still motivated to protect their forests. Local rules for village-use forests are similar for village members in all three cases. Although the villagers are not allowed to cut timber for commercial purposes, other forest use activities are permitted without any regulation. Local rules against outsiders are different between Case-II and Case-III. For instance, hunting and NTFP collection are prohibited in Case-II although they are permitted in Case-III.

Table 6.1: Comparison of local forest rules against outsiders in three case studies

Activities	Watershed forest			Village-use forest			Open-access forest		
	C-I	C-II	C-III	C-I	C-II	C-III	C-I	C-II	C-III
Access	Yes	Yes	Yes	n.a	Yes	Yes	Yes	Yes	Yes
Cutting timber	No	No	No	n.a	No	No	No	No	<b>Yes</b>
NTFP collection	Yes	<b>No</b>	Yes	n.a	<b>No</b>	<b>Yes</b>	Yes	<b>No</b>	Yes
Hunting	Yes	<b>No</b>	Yes	n.a	<b>No</b>	<b>Yes</b>	Yes	<b>No</b>	Yes
Manage	No	No	No	n.a	No	No	No	No	No
Exclude	No	No	No	n.a	No	No	No	No	No
Inheritance	No	No	No	n.a	No	No	No	No	No
Sale	No	No	No	n.a	No	No	No	No	No

*Note:* C-I refers to Case-I; C-II refers to Case-II; C-III refers to Case-III.

Local rules for open-access forests are different across the three cases. For instance, cutting timber by an outsider is permitted in Case-III although it is prohibited in Case-I and Case-II. The main reason is that most open-access forests in Case-III are far from the village so that the villagers have less control over these forests. Moreover, Case-III is located outside the national park so that it is more accessible by outsiders to cut timber without permission. In Case-I and Case-II, the villagers are able to control tree cutting inside the open-access forests since only a few outsiders have engaged in tree cutting due to national park regulations. Hunting and NTFP collection are permitted in both Case-I and Case-III. In Case-II, outsiders are not permitted for hunting and NTFP collection inside the open-access forests. It is mainly because forests in Case-II have more marketable forest products compared to Case-I and Case-III so that the villagers are more motivated to protect their forests against outsiders.

All three cases have both formal and informal governance structures to administer local land-use practices. Although the role and responsibility of formal governance structure are similar across the three cases, local acceptance of formal rules is higher in Case-II than Case-I and Case-III. Particularly, the villagers in Case-II tend to rely more on formal village tract administrator to resolve land-use conflicts. In Case-I, the village

tract administrator does not have the authority to resolve land-use conflicts because all agricultural lands are located inside the park. In Case-III, the villagers rely more on traditional leaders to resolve land-use conflicts since they have more knowledge and experiences about customary lands than the village tract administrator (Table 6.2).

Table 6.2: The role of actors in governance activities in three case studies

Activities	Case-I				Case-II				Case-III			
	TL	VS	VH	VT	TL	VS	VH	VT	TL	VS	VH	VT
Defining boundary	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Creating rules	<b>Yes</b>	<b>Yes</b>	Yes	No	<b>No</b>	<b>No</b>	Yes	No	<b>No</b>	<b>No</b>	Yes	No
Giving permission	No	No	Yes	No	No	No	Yes	No	No	No	Yes	No
Monitoring	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Sanctioning	No	Yes	Yes	No	No	No	Yes	No	No	No	Yes	No
Conflict resolution	Yes	Yes	Yes	<b>No</b>	Yes	<b>No</b>	Yes	<b>Yes</b>	Yes	Yes	Yes	<b>No</b>

*Note:* TL= Tribal leaders; VS = Village shaman; VH= Village headman; VT= Village tract administrator

The roles of tribal leaders are more important in Case-I than Case-II and Case-III. Although the village headman often takes responsibilities for communicating with township authorities and official paperwork, the village council meetings are usually organised by tribal leaders in all three cases. The tribal leaders are also important in resolving boundary disputes among the farmers. As the shifting cultivation areas can only be cultivated again after 7 to 15 years, the experience and knowledge of village elders are important to identify plot boundaries for each farmer. In Case-II and Case-III, the role and responsibilities of tribal leaders are less important because the majority of farmers have engaged in yam cultivation so that they do not need to follow the collective decisions made by village council meetings. In addition, most tribal leaders usually believe in local spirits, which the young generations consider as an outdated religion. This particular trend has further excluded tribal leaders and village shamans in making land-use decisions.

### 6.1.2 Awareness and compliance of tenure rules

Focus group discussions revealed a total of 15 customary tenure rules that are still being applied across the three cases. Depending on the type of ownership, tenure rules can be categorised into three different groups, namely communal land, clan land, or private land. Table 6.3 describes average awareness and compliance scores of each tenure rule across the three case studies.

Table 6.3: Awareness and compliance of tenure rules in three case studies

Description of tenure rules	Case-I		Case-II		Case-III	
	A	C	A	C	A	C
<i>Communal land</i>						
Village territories have clearly defined boundaries	98	96	100	98	96	92
All villagers have the right to use communal land	100	80	100	98	100	100
Cutting trees for commercial purpose is prohibited	64	60	78	74	86	82
Clearing the land near water spring is prohibited	92	92	100	100	100	92
Shifting cultivation is not allowed without collective decision	86	84	78	56	82	68
<i>Clan land</i>						
Management right hold by all clan members	98	98	100	100	92	88
No cutting trees on fallow forests without permission from clan members	82	78	42	34	64	56
Selling clan land by individual member is prohibited	98	98	98	98	96	92
Clan lands are inherited without individual allocation	98	86	88	38	92	74
Women do not have the right of land inheritance	90	54	100	56	100	88
<i>Private land</i>						
Land ownership for individual plots is established by first clearance principle	86	54	100	78	94	76
Management right for individual plot is controlled by owner	96	94	100	100	98	98
Customary owners still control land inside the park	72	52	90	82	86	82
Right to cut trees on private fallows is held by owner	96	90	98	96	98	98
Selling of private land to outsiders is prohibited	90	76	42	24	98	90

Note: A=Awareness (% of total households); C=Compliance (% of total households); Sample size for each case is 50.

More than 85% of total households in all cases are aware of the local tenure rules indicated in Table (6.3). Only about 75% mentioned that they are still in compliance with local tenure rules. The non-parametric Mann-Whitney-U tests show that local compliance scores are significantly lower than the awareness scores in all three cases ( $p < 0.001$ ). It means that although the majority of households still recognise the local tenure rules, some households no longer accept them in their day-to-day practices. It also indicates that the legitimacy of customary rules has declined among households in all case study village tracts.

The comparative analysis shows that awareness scores are significantly different across the three cases ( $\chi^2 = 5.73$ ,  $p < 0.05$ ). Multiple comparisons indicate that the awareness scores are significantly higher in Case-III (92%) than Case-II (88%). There is no statistically significant difference in Case-I (90%) compared to the other two cases (Figure 6.2a). It means that both inside and outside the national park have similar knowledge on traditional tenure regulations. The distributions of compliance scores are significantly different across the three cases ( $\chi^2 = 14.40$ ,  $p < 0.001$ ). Specifically, the compliance scores are significantly higher in Case-III (85%) than Case-II (75%). There is no significant difference in Case-I (79%) compared to the other two cases (Figure 6.2b). It indicates that although households located inside the park have different formal regulations compared to the other two cases, they all have similar compliances with locally crafted rules.

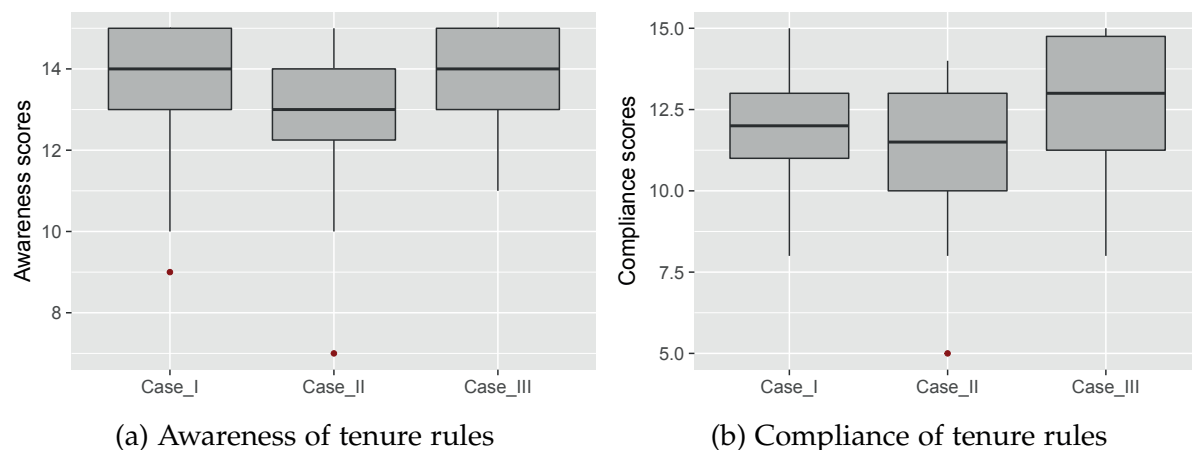


Figure 6.2: Awareness and compliance scores of tenure rules across three case studies

The distribution of tenure rules differs depending on the land ownership types. Regarding communal ownership, the awareness scores are not significantly different across three cases ( $p > 0.05$ ). It means that households in three case studies have a similar rate of awareness on communal tenure rules. Regarding clan and private ownership, the awareness scores are significantly different across three cases (Table 6.4). Specifically, the awareness scores for clan lands are significantly higher in Case-



I (93%) than Case-II (88%), although there is no significant difference in Case-III (86%) compared to the other two cases. The results show that households living outside the park are similarly aware of the clan tenure rules compared to households inside and bordering the park. In terms of private ownership, the awareness scores are significantly higher in Case-III (96%) than Case-I (88%) and Case-II (82%). This indicates that households living outside the park are more aware of the private tenure rules than those living inside and bordering the park.

Table 6.4: Distribution of awareness and compliance scores for tenure rules across three case studies

Land Ownership	% of respondents (n=50)			$\chi^2$
	Case-I	Case-II	Case-III	
<i>Communal Tenure</i>				
awareness	88	91	93	2.91
compliance	82	85	87	0.07
<i>Clan Tenure</i>				
awareness	93 <sup>a</sup>	86 <sup>b</sup>	89 <sup>ab</sup>	14.28*
compliance	83 <sup>a</sup>	65 <sup>b</sup>	80 <sup>a</sup>	26.99***
<i>Private Tenure</i>				
awareness	88 <sup>a</sup>	86 <sup>a</sup>	95 <sup>b</sup>	14.60***
compliance	73 <sup>a</sup>	76 <sup>a</sup>	89 <sup>b</sup>	20.96***

Note: Values marked with the same superscript letters are not significantly different (Dunn's test,  $p > 0.05$ );  $\chi^2$  = Kruskal-Wallis Chi-squared; \*= $p < 0.05$ ; \*\*= $p < 0.01$ ; \*\*\*= $p < 0.001$

Similar to awareness scores, local compliance scores for communal lands are not significantly different across the three cases ( $p > 0.05$ ). It means that households in all three cases are still maintaining communal tenure rules regardless of the national park regulations. For clan lands, local compliance scores are significantly lower in Case-II (65%) than Case-I (83%) and Case-III (80%) ( $\chi^2 = 26.99$ ,  $p < 0.001$ ). It indicates that clan tenure rules are less legitimate among bordering households than those living inside and outside the park. For private lands, local compliance scores are significantly higher in Case-III (89%) than Case-I (73%) and Case-II (76%) ( $\chi^2 = 20.96$ ,  $p < 0.001$ ). The results show that households outside the park are more likely to follow informal rules for private lands than those inside and bordering the park.

### 6.1.3 Pattern of changes in local land tenure system

The three case studies indicate that local land tenure systems have changed compared to traditional practices. Despite the communal lands are still common in all three cases, local land ownership system tends to change from collective to individual ownership. Along with the introduction of cash crops, both communal and clan lands are being transformed into private lands owned by individual farmers. Household surveys show that about 16% of households in Case-I, 80% in Case-II, and 82% in Case-III have private land that they inherited individually from their ancestors (Table 6.5). About 8% in Case-I, 14% in Case-II, and 38% in Case-III have private agricultural lands that they own via first clearance. The private ownership is lower in Case-I because the majority of farmers are land borrowers so that they have no right to become landowners even if they clear an unoccupied area for the first time. The increasing numbers of private lands have also created local land markets in all cases. Household surveys show that the percentage of farmers who have bought land from other villagers is higher in Case-II (30%) than Case-I (6%) and Case-III (2%). The number is higher in Case-II because yam cultivation is more intensive in this village tract and the land borrowers need to buy land from others to establish permanent farms.

Table 6.5: Households' access to agricultural lands across three case studies

Types of agricultural lands	% of households (n=50)		
	Case I	Case II	Case III
Private ownership from inheritance	16	80	82
Private ownership by first clearance	8	14	38
Clan or lineage ownership	74	98	84
Land bought from others	6	30	2
Land borrowed from others	90	46	46

*Source:* Field survey, 2017.

The transformation of communal lands to private ownership is mainly motivated by three main factors. Firstly, there is an increasing demand for permanent farms in response to changes in livelihood strategies of local households. The increasing market price for yam has motivated farmers to engage in permanent farming rather than traditional shifting cultivation practices. As of 2017, about 40% of households in Case-I, 94% in Case-II, and 84% in Case-III have cultivated yam to generate cash income. Since yam cultivation does not require slash-and-burn practices, it is no longer necessary to cultivate crops collectively in a commonly chosen field. Since yam cultivation requires to wait for three to five years before harvesting, the cultivated plots are gradually considered as the private property of the farmers who have invested in yam cultivation.

Yam cultivation plots are permitted to be sold not only to local villagers but also to outsiders. As a result, land markets have evolved within the communities, particularly among the villages which have limited land for yam cultivation.

Secondly, private land tenure has increased due to changes in village settlement structure. Traditionally, the villages were established on steep valleys in order to have better defence position against their enemies. The houses were also built with bamboo so that they can be easily relocated once there were conflicts among tribal groups. In recent years, tribal conflicts have reduced due to improving infrastructures and communication. Consequently, the villagers have started to establish permanent settlements by constructing wooden houses. The introduction of modern transportation technologies such as motorbike has also encouraged to stabilize the village settlements near to the roads. As a result, the villagers are motivated to settle in one place and to invest in permanent farms for commercial purposes.

Thirdly, land allocation programs by the national park also support private tenure rather than collective ownership. According to this program, formal land titles for agricultural lands were given to individual households in order to promote agroforestry practices. Although there is no individual farmer who has formally accepted the allocated lands, there is a tendency to increase private tenure if the farmers start to claim individual plots allocated to each household. Land allocation programs have also disrupted social cohesion between customary landowners and land recipients mainly because they provide opportunities for landless farmers to become landowners under formal regulations. Consequently, traditional landowners are being excluded from their lands resulting in several social conflicts among the villagers.

Local compliances with tenure rules differ depending on the age and religion of the respondents (Table 6.6). Specifically, younger respondents are less likely to comply with tenure rules compared to medium-age and older respondents ( $\chi^2=10.13$ ,  $p<0.01$ ). This is because younger respondents have more opportunities to engage in off-farm livelihood activities so that they become less involved in traditional agricultural practices. In terms of religious groups, those who have converted to Christian have lower compliance scores than those who still believe in Buddhism and traditional ritual practices ( $U=1440$ ,  $p<0.05$ ). This is because some of the traditional regulations are highly associated with traditional religious beliefs so that those who have converted to modern religious belief such as Christianity are no longer comply with such regulations.

The role of village elders has also changed compared to traditional practices. In former times, tribal leaders played an important role in local governance activities within each community. They had unwritten authority and legitimacy to govern the land and natural resources in accordance with local customary practices. Traditionally,

Table 6.6: Distribution of compliance scores for tenure rules across socio-demographic categories

Variables		Mean compliance scores			
		Case-I	Case-II	Case-III	Total
Age	Young (<35 years)	12.00	10.88 <sup>a</sup>	12.30 <sup>a</sup>	11.26 <sup>a</sup>
	Medium(35-50 years)	11.90	12.63 <sup>b</sup>	14.00 <sup>b</sup>	12.24 <sup>ab</sup>
	Old (>50 years)	12.58	12.86 <sup>ab</sup>	14.94 <sup>b</sup>	12.56 <sup>b</sup>
	$\chi^2$	1.92	6.23 <sup>*</sup>	6.25 <sup>*</sup>	10.13 <sup>**</sup>
Education	Primary	12.15	12.56	13.92	12.26
	Secondary	12.00	10.93	13.07	11.57
	<i>U</i>	279	345 <sup>*</sup>	315	2743
Religion	Christian	12.19	n.a	13.06	11.78
	Traditional	11.95	n.a	14.78	12.68
	<i>U</i>	321	n.a	118 <sup>*</sup>	1440 <sup>*</sup>
Residency	Resident	12.23	14.00	13.91	12.29
	Migrant	11.67	12.06	13.62	12.02
	<i>U</i>	195	41	236	1673

Note: Values marked with the same superscript letters are not significantly different (Dunn's test,  $p > 0.05$ );  $\chi^2$  = Kruskal-Wallis Chi-squared value; *U* = Mann-Whitney *U* test value; \* =  $p < 0.05$ ; \*\* =  $p < 0.01$ . Sample size for each case is 50.

tribal leaders had the authority to accept newcomers, to select a new cultivation field, and to allocate plots among the farmers. The role of tribal leaders had declined when the socialist constitution introduced formal village headman directly appointed by township administrator. The constitution also required educated young leaders as village headmen in order to collaborate with township administrative activities. Since most tribal leaders did not have modern education, they became less interested in working as village headmen. Changes in local religious beliefs have also diminished the role of village shaman in land governance activities. Since the villagers who have converted to Christian religion no longer accept the spiritual beliefs, the village shaman could not any more influence local land-use practices.

## 6.2 Livelihood Strategies and Forest Income

### 6.2.1 Sectoral income by livelihood activities

Being located in the same geographic region, households in all three case studies engage in similar livelihood activities. In all three cases, the livelihood activities can be categorised into five different groups namely, forest, agriculture, livestock, wage labour, and non-farm employment activities. Despite having similar livelihood activity, the income contribution from each livelihood source differs across the three cases. In Case-I, total household income is mainly dominated by forest income which contributes about 49% of total income. In Case-II, household income is equally dominated by forest (35%) and livestock (27%). In Case-III, income is fairly distributed among forest (29%), agriculture (28%), and non-farm employment (24%) (Figure 6.3a). The contribution of cash income from each income source also differs across three cases. In Case-I, cash income is mainly contributed by agriculture (33%) and wage labour (23%). In Case-II, livestock (34%) and agricultural income (32%) dominate cash income. In Case-III, cash income is mainly contributed by non-farm (39%) and agriculture (37%) (Figure 6.3b).

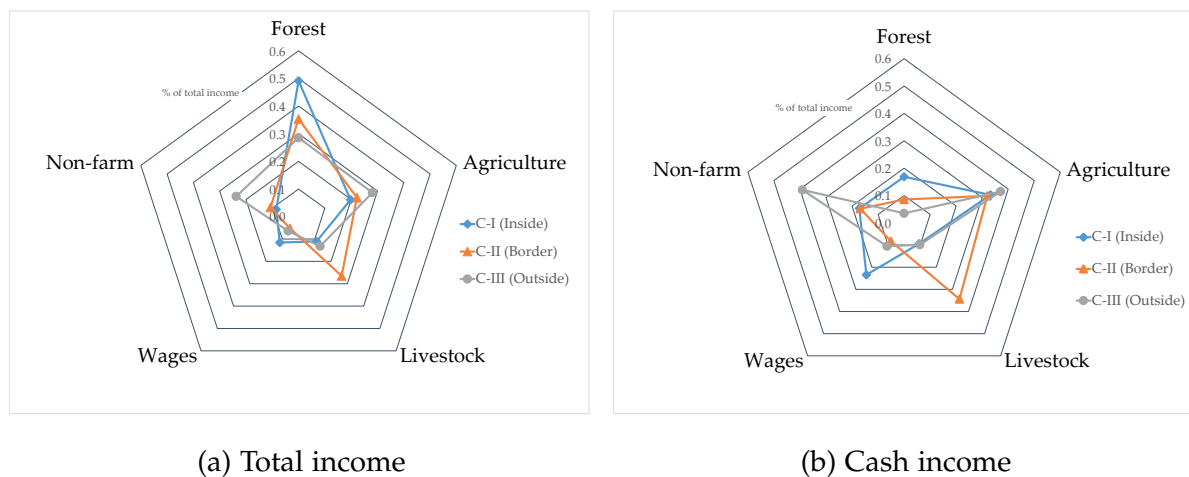


Figure 6.3: Income portfolio by each source across three case studies

In terms of livelihood strategies, the majority of households in Case-I (52%) and Case-II (40%) adopt *Agriculture–Wage* strategy to generate cash income. This result implies that agriculture is still an important livelihood activity in these two cases. In Case-III majority of households (44%) adopt *Non-farm–Agriculture* strategy because there are more non-farm employment opportunities such as government services and petty trades in this village tract. Only households in Case-I (12%) have adopted forest dominated livelihood strategy for generating cash income. It means that forest is an important cash-earning activity in this village tract despite being located inside the

national park. In the other two cases, forest income is regarded as secondary livelihood activity to generate cash income.

The average annual household income is about 1,385 USD in Case-I, 2,671 USD in Case-II, and 1,702 USD in Case-III (see details in Appendix A). The distribution of total household income is significantly different across the three cases ( $\chi^2=40.70, p<0.001$ ). Multiple comparisons indicate that total income is significantly higher in Case-II than Case-I and Case-III (Figure 6.4a). However, there is no significant difference in total income between Case-I and Case-III ( $p>0.05$ ). A similar distribution is observed for cash income where only Case-II is significantly different from other two cases ( $\chi^2=45.20, p<0.001$ ) and there is no significant difference between Case-I and Case-III (Figure 6.4b). Both results indicate that despite the restrictions from the national park, total income is similar between households located inside and outside the park.

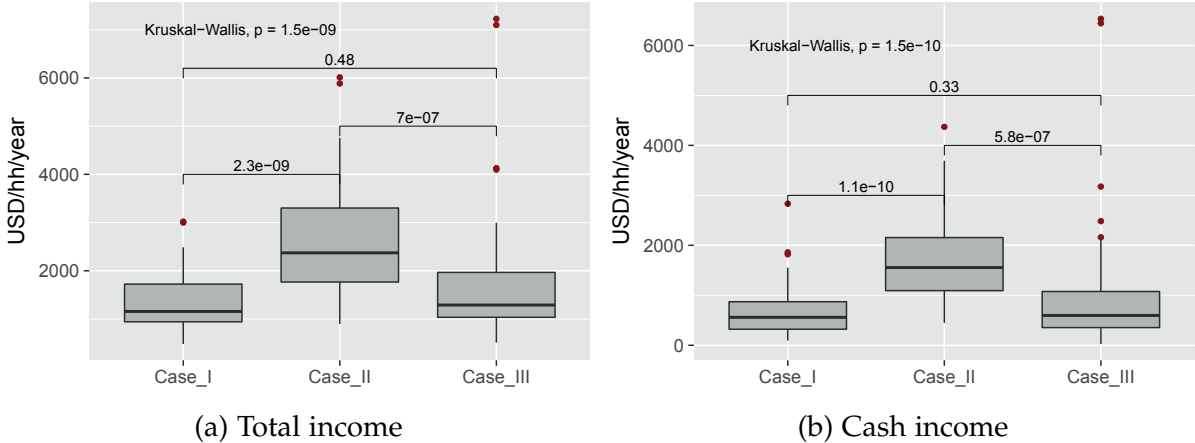


Figure 6.4: Income distribution across three case studies

The average per capita income is about 406 USD in Case-I, 650 USD in Case-II, and 433 USD in Case-III. The level of per capita income is significantly higher in Case-II than Case-I and Case-III. The Cumulative Density Function (CDF) for Case-II is lower than Case-I and Case-III at all income levels (Figure 6.5). It means that income distribution in Case-II stochastically dominates that of Case-I and Case-III. The results indicate that households bordering the park have higher per capita income at all income levels than households inside and outside the park. The CDF curves also show that the proportion of households below the national poverty line is lower in Case-II than Case-I and Case-III. It indicates that there are less poor households among communities bordering the park than inside and outside the park. Comparison of CDF curves between Case-I and Case-III shows that there is no first-order stochastic dominance at lower income levels. It means that the distributions of per capita income for poor households are similar between inside and outside the park. At higher income levels, the CDF curve for Case-III stochastically dominates the Case-I, indicating that

per capita income for better-off households living inside the park is lower than those living outside the park.

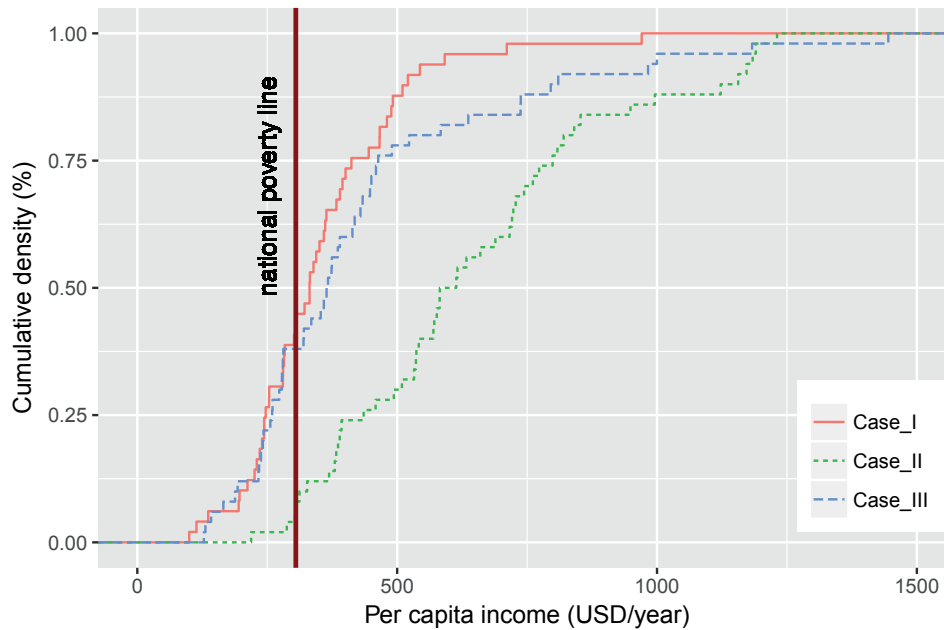


Figure 6.5: Cumulative distribution of per capita income across three case studies

The poverty headcount ratio is significantly lower in Case-II (0.06) than Case-I (0.42) and Case-III (0.38). This indicates that the proportion of people living below the poverty line is lower in households bordering the park than households inside and outside the park. Similarly, both poverty gap and severity indices are lower in Case-II than Case-I and Case-III. This is mainly because households bordering the park have higher income opportunities both from livestock and forest products. When comparing poverty measures between Case-I and Case-III, poverty headcount ratio is higher among households inside the park (0.42) than households outside the park (0.38). The poverty gap and severity indices are similar between Case-I (0.1 and 0.03 respectively) and Case-III (0.1 and 0.04 respectively). The results indicate that although the proportion of poor households is slightly higher inside the park than outside the park, the magnitude and intensity of poverty is similar between the two cases despite having different regulations from the park. In other words, the national park does not have a significant impact on the poverty gap and severity among local households.



### 6.2.2 Distribution of forest income across three case studies

Every household in all case studies uses forest products as one of the important income sources. On average, households receive about 680 USD in Case-I, 944 USD in Case-II, and 486 USD in Case-III. Comparative analysis shows that forest income is significantly different across the three cases ( $\chi^2=16.27$ ,  $p<0.001$ ). Multiple comparisons indicate that absolute forest income is significantly lower in Case-III than Case-I and Case-II. However, there is no significant difference in absolute forest income between Case-I and Case-II (Figure 6.6a). The results imply that despite restrictions from the national park, households located closer to the park receive more forest income than those located outside the park.

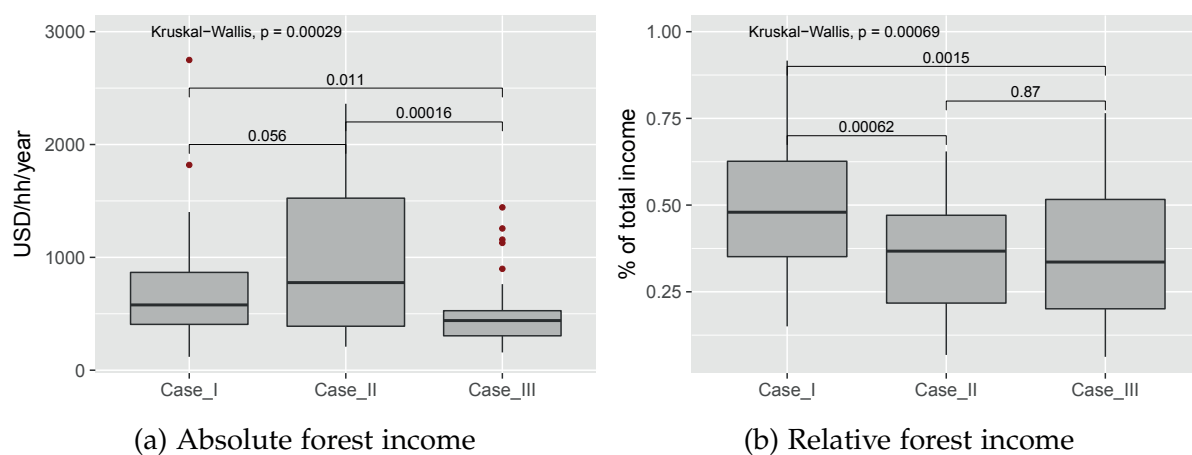


Figure 6.6: Distribution of absolute and relative forest income across three case studies

The distribution of relative forest income is significantly different across the three cases ( $\chi^2= 14.56$ ,  $p<0.01$ ). Multiple comparisons indicate that relative forest income is significantly higher in Case-I than Case-II and Case-III. However, there is no significant difference between Case-II and Case-III (Figure 6.6b). This implies that households living inside the park depend more on forest income than households bordering and outside the park.

In terms of cash forest income, households receive about 115 USD in Case-I, 145 USD in Case-II, and 36 USD in Case-III. Comparative analysis shows that cash forest income is significantly higher in Case-II than Case-I and Case-III ( $\chi^2= 19.67$ ,  $p<0.01$ ). However, there is no significant difference between Case-I and Case-III (Figure 6.7a). The results indicate that households bordering the park receive more cash forest income than households living inside and outside the park. This is because households in Case-II have better opportunities to get forest income than in the other two cases. On the one hand, households in Case-II have better access to forest resources than Case-III because

they are located closer to the park. On the other hand, they have less restriction from park authorities than Case-I so that they have better chances to sell forest products.

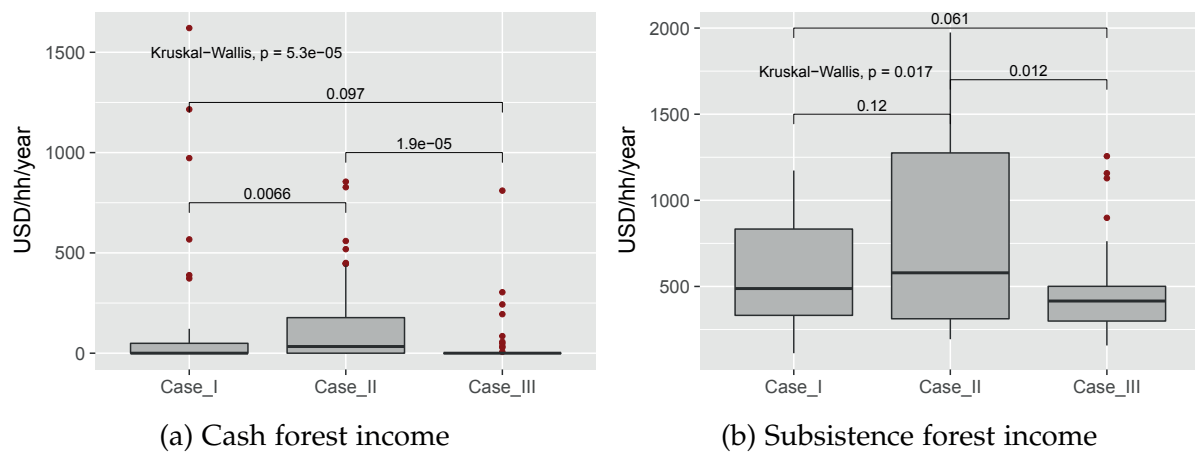


Figure 6.7: Distribution of cash and subsistence forest income across three case studies

The subsistence forest income is about 565 USD in Case-I, 799 USD in Case-II, and 449 USD in Case-III. The distribution of subsistence forest income is significantly different across the three cases ( $\chi^2 = 8.10$ ,  $p < 0.05$ ). Multiple comparisons show that households in Case-II receive more subsistence forest income than Case-III ( $p < 0.05$ ). This is mainly because households in Case-II use more construction wood than Case-III for village resettlements. However, there is no significant difference in Case-I compared to Case-II and Case-III (Figure 6.7b). This indicates that households living inside the park use a similar amount of forest products for subsistence purposes compared to households bordering and outside the park. The main reason for this similarity is because there is no restriction against subsistence use of forest products even inside the national park so that every household has equal opportunity to use forest products for subsistence purposes.

The effect of forest income on poverty is higher in Case-I than Case-II and Case-III. Specifically, forest income reduces the poverty headcount ratio of about 46% in Case-I, 24% in Case-II, and 32% in Case-III. A similar distribution is observed in terms of poverty gap and severity, where the effect of forest income is higher in Case-I than Case-II and Case-III. Particularly, the effects of forest income on poverty gap and severity are significantly higher in Case-I than Case-III, although both cases have similar poverty indices. This indicates that forest income is more important for households inside the park than outside the park. Therefore limiting access to forest resources may increase poor households inside the park than bordering and outside the park. Decomposing forest income into cash and subsistence income also shows that all three FGT poverty measures become higher when subsistence forest income is excluded from poverty analysis (Figure 6.8). This indicates that limiting access to subsistence forest resources

will increase local poverty more than limiting access to cash forest activities.

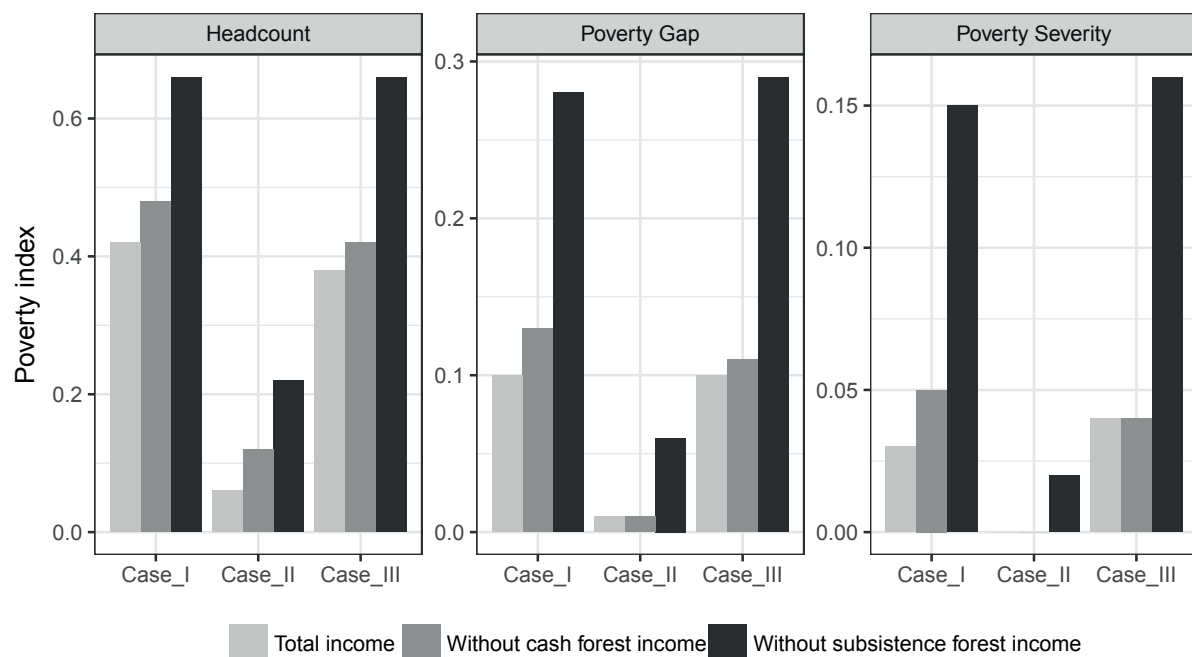


Figure 6.8: Comparison of poverty indices without cash and subsistence forest income

In addition to poverty, forest income also reduces local inequality among households. The Gini coefficient is reduced by 17% in Case-I, 4% in Case-II, and 26% in Case-III due to forest income. This means that the role of forest income in reducing inequality is lower in Case-II compared to Case-I and Case-III. However, forest income highly influences local income inequality in Case-III than in the other two cases. This is mainly because poor households in Case-III depend more on forest income than the better-off households.

The Gini decompositions by income sources also show that only Case-III has a negative marginal effect (MEF=-0.2) on total income inequality by forest income. It means that increasing forest income will reduce income inequality among households in Case-III. In Case-I and Case-II, forest income shows positive marginal effects on total income inequality (MEF=0.02 and MEF=0.08, respectively). It means that increasing about 10% of forest income will also increase total income inequality in Case-I and Case-II by 0.2% and 0.8% respectively. The results indicate that promoting forest income will increase total income inequality among households living inside and bordering the park. This is mainly because the collection of forest products is restricted inside the national park so that only a few households have engaged in forest activities for commercial purposes. Therefore, increasing forest income opportunities for households inside the park will not improve income inequality since it will only affect households that engage in commercial forest activities.

### 6.2.3 Pattern of changes in local livelihood system

Despite local households are still highly dependent on forest resources, the resource use patterns have changed in the last ten years. Household surveys show that there is an increasing trend in using construction wood, firewood, and forest food among case study households (Figure 6.9). Specifically, about 44% of households in Case-I, 50% in Case-II, and 10% in Case-III reported that they have increased the use of wood for house constructions. The increasing use of construction wood is reported more in Case-I and Case-II than Case-III. This is mainly because the former two cases have more forest resources than the latter one. Regarding the firewood, about 26% in Case-I, 32% in Case-II, and 16% in Case-III reported that they have increased the use of firewood within the last ten years. In addition to firewood, the use of forest food has also increased reported by 22% in Case-I, 12% in Case-II, and 12% Case-III. The respondents mentioned that forest food is still important for them because it is free and easily available in the surrounding forests.

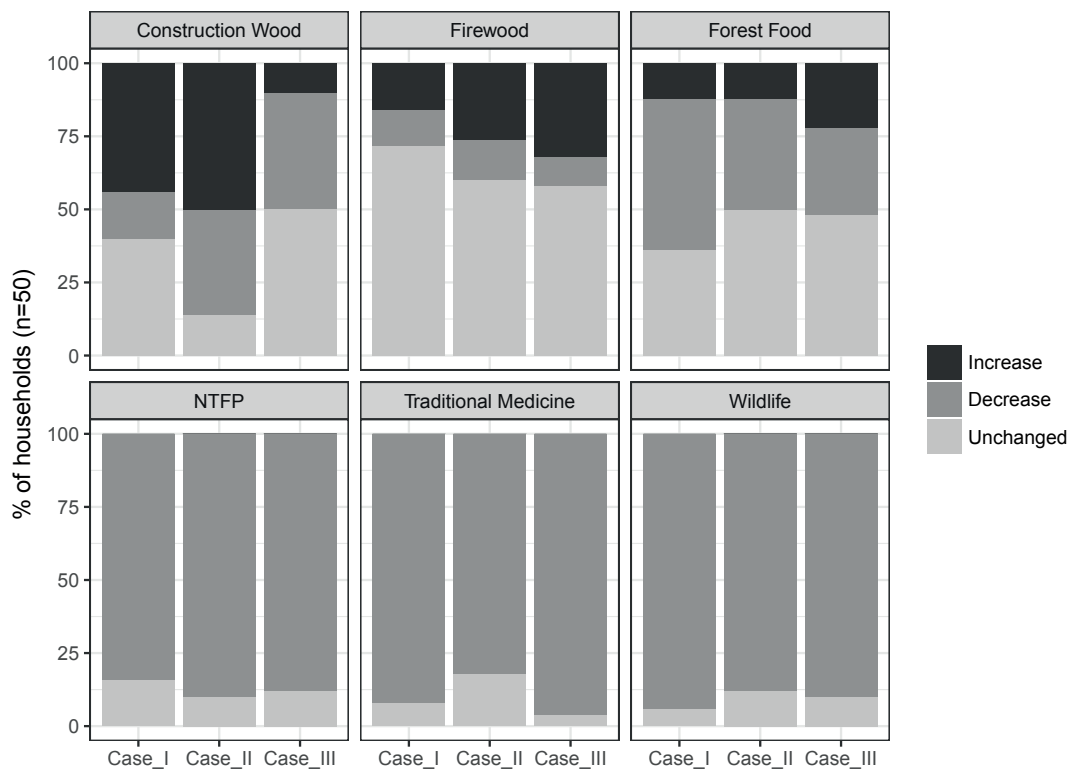


Figure 6.9: Changes in household use of forest products across three case studies

The main reason for the increased use of forest products is due to socio-cultural changes in the region. For instance, more than 50% of responses in Case-I and Case-II indicated that the use of construction wood has increased due to the construction of wooden houses (Table 6.7). Traditionally, the Chin people prefer bamboo house because it is easier to build and less expensive to be abandoned if there is a tribal

conflict. Since tribal conflicts have declined, they have started to construct wooden houses in order to settle permanently in one village. Improving market access for cash crops helps them to buy construction materials. The introduction of chainsaws enables to get construction wood easily from the surrounding forests. Another important factor that influences the increased use of forest products is the population increase. At least 30% of responses in all cases indicate that local use of forest products such as firewood and forest food has increased due to higher number of household members. The increasing numbers of livestock and the limited availability of alternative sources also motivate them to use more forest products.

Table 6.7: Reasons for changing the use of forest products

Responses	Frequency*		
	Case-I	Case-II	Case-III
<i>Reasons for increasing use</i>			
More house construction	20 (61%)	24 (59%)	3 (10%)
More household members	13 (39%)	13 (32%)	21 (70%)
More livestock	0 (0%)	4 (10%)	4 (13%)
Limited alternative sources	0 (0%)	0 (0%)	2 (7%)
<i>Reasons for decreasing use</i>			
Resource decline	66 (40%)	67 (50%)	67 (40%)
Alternative sources available	44 (27%)	38 (28%)	44 (27%)
Limited resource use knowledge	22 (13%)	16 (12%)	26 (16%)
Park regulations	18 (11%)	1 (1%)	0 (0%)
Less visit to forest	10 (1%)	6 (4%)	8 (5%)
Less labour to collect forest products	2 (1%)	7 (5%)	16 (10%)
Migration of household members	2 (1%)	0 (0%)	5 (3%)

Note: \* Multiple responses possible. Sample size for each case is 50.

On the contrary, there is a decreasing trend in local uses for some forest products. In all cases, more than 80% of households reported that the use of NTFP, traditional medicine, and wildlife products have declined within the last ten years. The decreasing use of forest products is mainly influenced by ecological changes in the surrounding forests. For example, more than 40% of total responses mentioned that the use of forest products, particularly NTFP and wildlife have reduced due to the decline in the availability of forest resources. At least 27% of total responses indicated the declining use of forest products due to the increased availability of alternative resources. The use of medicinal plants has reduced mainly due to the introduction of modern medicines<sup>1</sup> in village clinics. The introduction of home-gardens has also substituted local needs for forest food.

<sup>1</sup>Modern medicines also include commercial products of traditional medicine which are cheap and easily available at the local shops and village clinics.

The decline in resource use knowledge contributes to the decreasing use of forest products. This factor represents about 13% of responses in Case-I, 12% in Case-II, and 16% in Case-III respectively. The respondents mentioned that the use of certain forest products such as wildlife or medicinal plants has declined because they no longer have any knowledge about hunting or using medicinal plants. The influence of park regulations was mentioned only in Case-I (11%) and Case-II (1%). The response rates are very low despite being located inside and bordering the park. Other influencing factors that represent less than 10% of responses include reducing the frequency in visiting forest, less labour to engage in forest activities as well as the migration of household members to the city.

In addition to forest resources, other livelihood activities are observed to be changed compared to traditional practices. Particularly, households have engaged more in cash-oriented activities than traditional subsistence livelihood practices. According to household surveys, more than 50% of households indicated that they have increased cash crops within the last ten years (Table 6.8). Cash crops have become more common in Case-II (88%) and Case-III (70%) than Case-I (58%). This indicates that households living inside the park are less likely to engage in market-oriented activities than those bordering and outside the park.

Table 6.8: Changes in livelihood activities in the last ten years

Livelihood activities		% of households*		
		Case-I	Case-II	Case-III
Agriculture	Increase cash crop	58	88	70
	Increase food crop	0	0	0
	Unchange	42	12	30
Livestock	Increase sale	30	60	30
	Increase consumption	10	0	2
	Unchange	60	40	68
Off-farm	Increase	38	18	48
	Decrease	0	0	0
	Unchange	62	82	32

Note: \*Sample size for each case is 50.

Regarding the livestock, about 30% in Case-I, 60% in Case-II, and 30% in Case-III reported that they have increased livestock for commercial purposes rather than subsistence uses. The response rates are higher in Case-II than Case-I and Case-III mainly because households in Case-II have traditionally more livestock than the other two cases. Nevertheless, the majority of households in Case-I and Case-III reported that livestock breeding has not changed within the last ten years. Off-farm engagements have become more common in Case-III (48%) than Case-I (38%) and Case-II (18%).

This is mainly because households outside the park have better accessibility to the township market and they have more government projects than those living inside and bordering the park.

## 6.3 Traditional Ecological Knowledge and Practices

### 6.3.1 Summary of TEK practices in three case studies

A total of 32 different types of TEK based management practices are identified across the three case studies. Depending on their functions and characteristics, the identified TEK practices can be classified into four main categories. The first category includes TEK practices that are associated with local *resource use practices*. These practices have evolved based on the local understanding of resource status and related ecological processes. For example, the selection of a new shifting cultivation field requires an understanding of different ecological stages regarding forest successions and their impacts on soil formation processes. Based on this knowledge, the farmers select a new cultivation field in order to achieve optimum soil conditions and to ensure the long-term availability of fallow forests for future cultivations. Similarly, controlled burning practices also require to understand the nature of forest fire and its potential impact on neighbouring fields. Other practices such as rotational grazing, selective cuttings of bamboo, or preparation against rat outbreaks also require to understand the nature and ecological processes of each resource.

The second category belongs to *rules and regulations* that are locally formulated to protect critical resources. Rules and regulations are the common agreements within communities that define whether to use or not to use the particular resources. Violators are usually imposed either with fines or sanctions within the community. In all three cases, communities develop rules and regulations either to avoid negative ecological consequences of a particular activity or to complement the application of other TEK practices. For example, rules that prohibit cutting trees near the water sources are developed in order to avoid ecological consequences of reducing water availability. Rules that prohibit shifting cultivation outside the chosen field ensures the application of rotational fallow management practices. Rules that define local compensation for fire accidents also encourage the application of controlled burning practices.

The third category is related to *customs and rituals* that define specific social behaviours regarding the conservation and sustainable use of ecosystem services. Similar to rules and regulations, this type of TEK also support either directly or indirectly to the application of TEK based practices. For example, local customs for sharing of plots,



labour, bamboo, and wildlife provide flexible conditions for the villagers to practice sustainable resource management practices. Local conflict resolution mechanism also supports the application of sustainable land management practices within the community. Ritual ceremonies such as hunting festivals or feast-of-merit also increase social cohesion and thereby facilitate to get common agreements in local rule formulations.

The fourth category relates to *taboos and totems* that refrain community members from collecting and use of particular resources. Unlike rules and regulations, taboos and totems have evolved based on spiritual beliefs rather than local understandings of pure ecological processes. For example, local people do not usually cut the trees from sacred forests or village ritual places since they believe that those activities will have negative consequences to their daily life. Deeply rooted in local spiritual world-view, taboos protect environmental resources with a minimum cost of monitoring and sanctioning. Another aspect of taboo is the connection with local ancestors rather than their spiritual beliefs. For example, some key informants mentioned that they are still complying with some types of taboos not because they believe in spiritual beings but because their ancestors forbid them. This strong connection with local ancestors also creates foundations to organize new communal agreements for sustainable land-use and resource management practices. Table (6.9) presents the awareness and compliance scores of TEK practices in the three case studies.

Table 6.9: Summary of TEK practices in three case studies

Sr.	Type of TEK practices	Case-I		Case-II		Case-III	
		A	C	A	C	A	C
<b>A</b>	<b>Resource use practices</b>						
1	Rotational selection of swidden fields.	100	90	100	96	92	72
2	Stumps are left standing to promote coppicing.	80	50	82	74	58	20
3	Preparing fire brakes before burning.	100	98	100	100	100	90
4	Burning is done during waxing moon only.	46	30	46	28	34	20
5	Starting fire from the top or near fire brake.	100	100	86	86	90	74
6	Rotational grazing and pasture management.	50	44	40	30	28	28
7	Selective cutting of bamboo culms.	100	100	100	96	80	78
8	Preparation against pest outbreak during bamboo flowering.	88	72	60	40	100	96
<b>B</b>	<b>Rules and regulations</b>						
1	No shifting cultivation outside chosen field.	100	90	98	98	94	76
2	Compensation if fire spread outside the fields.	86	86	98	96	90	78
3	No cutting of trees near village water sources.	92	92	100	100	100	92
4	No selling of trees from village-use forests.	64	60	78	74	86	82

*Continued on next page*

Table 6.9: (continued)

Sr.	Type of TEK practices	Case-I		Case-II		Case-III	
		A	C	A	C	A	C
5	No cutting of trees at mountain tops.	88	52	82	42	94	36
6	No hunting by outsiders within village territory.	80	36	82	50	22	4
7	No taking of animals from others' traps.	96	74	96	80	94	70
8	No taking of honey without permission.	96	52	98	86	58	24
<b>C Customs and rituals</b>							
1	Sharing of plots within selected field.	100	80	100	98	100	100
2	Labour sharing during land clearing.	100	50	98	54	100	66
3	Custom of earth-eating to resolve conflicts.	96	60	96	20	96	38
4	Ritual selection of person to start fire.	84	36	56	10	84	24
5	Bamboo sharing system among owners.	98	92	94	86	76	72
6	Hunting festivals after crop harvesting.	94	14	96	4	96	8
7	Giving hind leg of wildlife to village headman.	100	34	100	38	100	26
8	Giving bird meat to the newly-wed family.	98	90	100	86	98	86
9	Feast of merit by killing mithan.	100	44	98	2	100	38
<b>D Taboos and totems</b>							
1	No cutting of trees within the sacred forests.	98	64	94	10	100	50
2	No cutting of trees within village ritual places.	98	72	96	40	96	74
3	No cutting of big trees in settlement areas.	94	66	70	44	90	54
4	No cutting of ficus trees.	82	46	78	20	52	28
5	No killing of gibbons.	70	22	68	22	56	18
6	No clearing of land without communal rites.	98	88	98	86	100	54
7	No eating of crops before harvest ritual.	98	88	100	82	100	64

Note: A = Awareness (% of households); C = Compliance (% of households); Sample size for each case is 50.

### 6.3.2 Awareness and compliance of TEK practices

Although similar TEK practices were observed in all three case studies, individual awareness and compliance scores are different across three cases. Comparative analysis shows that total awareness scores for TEK practices are significantly different across the three cases ( $\chi^2=17.95$ ,  $p<0.001$ ). Multiple comparisons indicate that the total awareness

scores are significantly higher in Case-I (90%) and Case-II (87%) than Case-III (83%). There is no significant difference in total awareness scores between Case-I and Case-II ( $p>0.05$ ) (Figure 6.10a). This indicates that households located outside the national park are less aware of local traditional practices than those inside and bordering the park. The total compliance scores are significantly higher in Case-I (65%) than Case-II (58%) and Case-III (54%) ( $\chi^2=15.76$ ,  $p<0.001$ ). There is no significant difference in total compliance scores between Case-II and Case-III ( $p>0.05$ ) (Figure 6.10b). This implies that households inside the park are more in compliance with TEK practices than those bordering and outside the park.

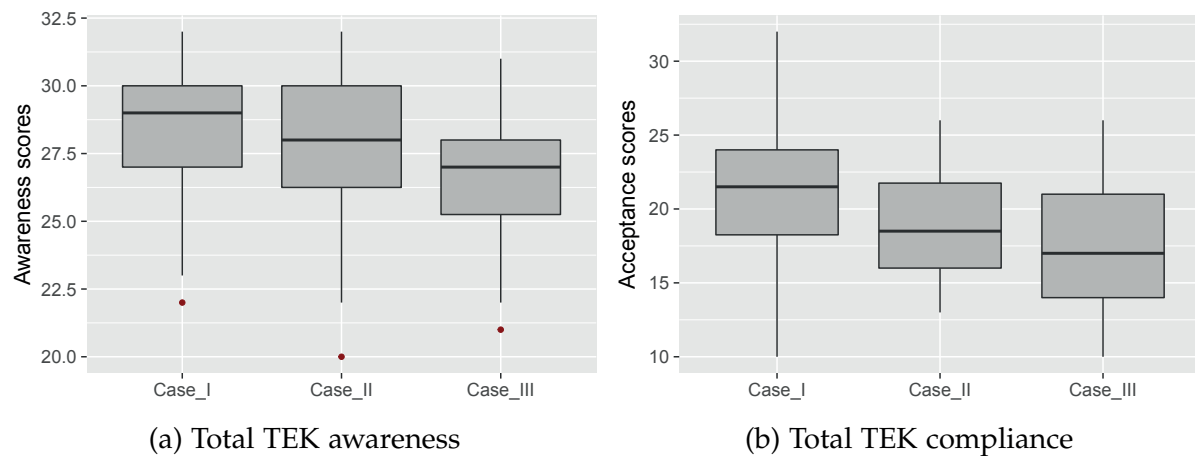


Figure 6.10: TEK awareness and compliance scores across three case studies

Regarding the distribution of TEK category, the awareness scores are significantly different in resource use practices ( $\chi^2=13.89$ ,  $p<0.01$ ), rules and regulations ( $\chi^2=26.05$ ,  $p<0.001$ ), and taboos and totems ( $\chi^2=8.78$ ,  $p<0.05$ ) across the three cases (Table 6.10). Specifically, the awareness scores for resource use practices are significantly higher in Case-I (83%) than Case-III (73%), whereas there is no significant difference for Case-II (77%) compared to other two cases. A similar distribution is observed for local taboos, where awareness scores are higher in Case-I (91%) than Case-III (85%). However, there is no significant difference in taboos awareness scores for Case-II (86%) compared to the other two cases. In terms of rules and regulations, awareness scores in both Case-I (88%) and Case-II (92%) are significantly higher than the Case-III (80%), but there is no significant difference between the former two cases. These patterns of distribution indicate that households located closer to the national park have higher knowledge about the majority of TEK practices than those located away from the national park. In terms of local customs and rituals, the awareness scores are not significantly different across the three cases ( $p>0.05$ ). It means that households living in both inside and outside the national park have similar knowledge of local customs and rituals in relation to the TEK practices.

Table 6.10: Distribution of awareness and compliance scores in TEK category across three case studies

Sr.	Type of TEK	Mean scores (%)			$\chi^2$
		Case-I	Case-II	Case-III	
<i>Awareness</i>					
1	Resource use practices	83 <sup>a</sup>	77 <sup>ab</sup>	73 <sup>b</sup>	13.89 <sup>**</sup>
2	Rules and regulations	88 <sup>a</sup>	92 <sup>a</sup>	80 <sup>b</sup>	26.05 <sup>***</sup>
3	Customs and rituals	97	93	94	5.92
4	Taboos and totems	91 <sup>a</sup>	86 <sup>ab</sup>	85 <sup>b</sup>	8.78 <sup>*</sup>
5	Total awareness	90 <sup>a</sup>	87 <sup>a</sup>	83 <sup>b</sup>	17.95 <sup>***</sup>
<i>Compliance</i>					
1	Resource use practices	73 <sup>a</sup>	69 <sup>a</sup>	60 <sup>b</sup>	14.64 <sup>***</sup>
2	Rules and regulations	68 <sup>a</sup>	78 <sup>b</sup>	58 <sup>c</sup>	32.50 <sup>***</sup>
3	Customs and rituals	56 <sup>a</sup>	44 <sup>b</sup>	51 <sup>ab</sup>	14.09 <sup>***</sup>
4	Taboos and totems	64 <sup>a</sup>	43 <sup>b</sup>	49 <sup>b</sup>	16.55 <sup>***</sup>
5	Total compliance	65 <sup>a</sup>	58 <sup>b</sup>	54 <sup>b</sup>	15.76 <sup>***</sup>

Note: Values marked with the same superscript letters are not significantly different (Dunn's test,  $p > 0.05$ );  $\chi^2$ =Kruskal-Wallis Chi-squared; \*= $p < 0.05$ ; \*\*= $p < 0.01$ ; \*\*\*= $p < 0.001$

Local compliance scores are significantly different in all TEK categories across the three cases ( $p < 0.001$ ) (see Table 6.10). Particularly, households in Case-I show higher compliance scores in terms of practices (73%), rules (68%), and taboos (64%) than Case-III (60%, 58%, 49% respectively). Households in both cases show similar compliance scores in terms of customs and rituals (56% and 51% respectively). This means that except for customs and rituals, households inside the national park show higher compliance with TEK practices than households outside the park. Comparisons of TEK compliance scores between Case-I and Case-II show that households in Case-I have higher compliance scores in terms of customs and taboos than Case-II, whereas the latter have higher compliance scores in terms of rules and regulations than the former case. This indicates households inside the national park are more in compliance with local customs and taboos, but less compliance with rules and regulations than households bordering the park.

### 6.3.3 Pattern of changes in TEK practices

Despite local people are still aware of the identified TEK practices, local compliances have declined in all three cases. The non-parametric Mann-Whitney-U tests show that the average compliance scores are significantly lower than the awareness scores for all TEK practices ( $p < 0.0001$ ). The patterns of TEK compliances among the four TEK categories differ across the three cases (Figure 6.11). For Case-I, compliance scores for customs and rituals are significantly lower than the other three categories ( $\chi^2 = 9.21$ ,  $p < 0.05$ ). However, there is no significant difference among compliance scores for rules, practices, and taboos. In Case-II, both customs and taboos have significantly lower compliance scores than the other two categories ( $\chi^2 = 85.22$ ,  $p < 0.001$ ). In Case-III, there is no significant difference in compliance scores among the four categories ( $p > 0.05$ ).

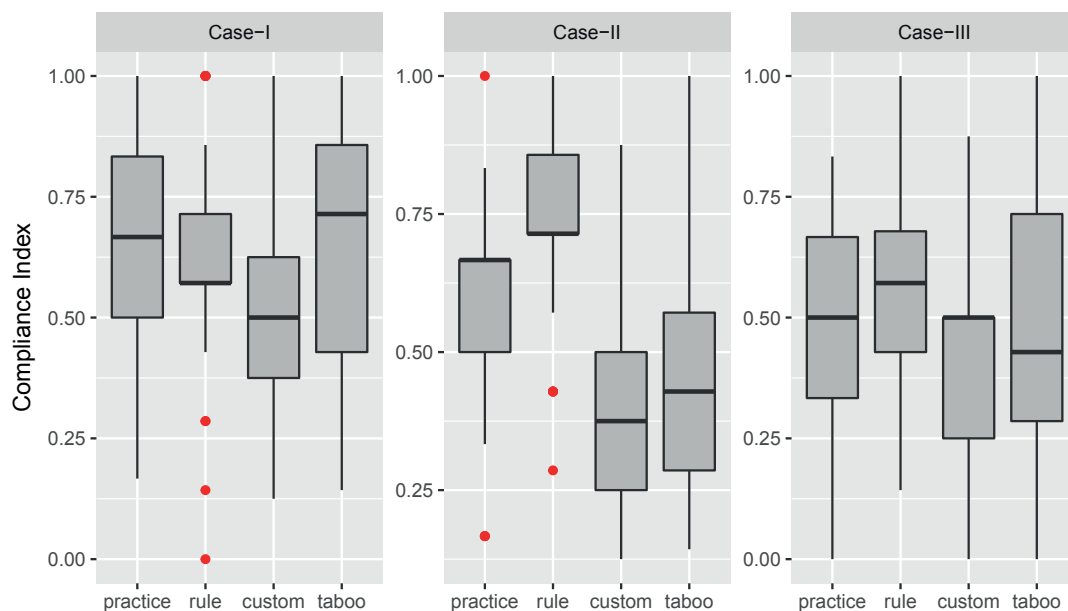


Figure 6.11: Comparison of compliance scores across different TEK categories

In addition to TEK categories, compliance scores were further divided into two different groups based on the nature of TEK development. The first group is TEK evolved based on instrumental perspectives, such as rotation field selection, systematic land clearing, controlled burning and so on. The second group of TEK is related to normative perspectives, such as customs, taboos, or ritual practices. Results from non-parametric Mann-Whitney-U tests show that local compliance scores are significantly different between the two groups in all three cases ( $p < 0.01$ ). Specifically, compliance scores for TEK related to normative perspectives are significantly lower than those related to instrumental perspectives (Figure 6.12). This further confirms that TEK based on normative belief systems are more likely to be decline than those evolved from local understanding of ecological processes.

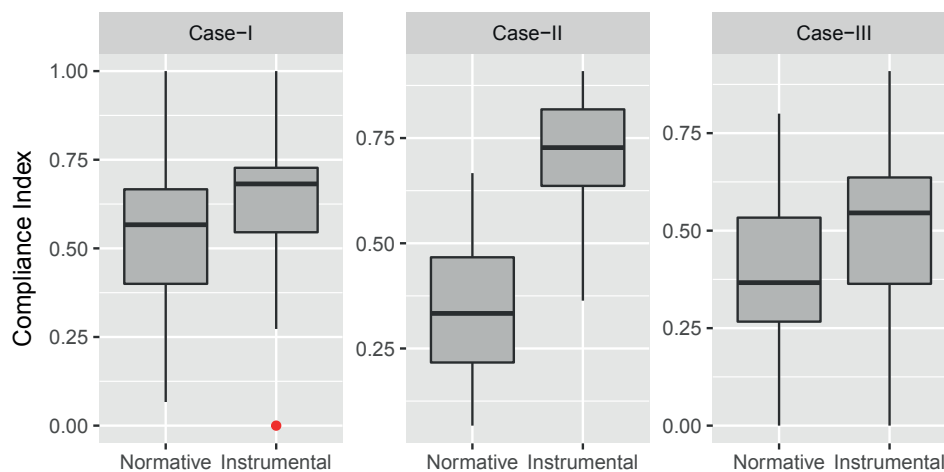


Figure 6.12: Comparison of compliance scores between normative TEK and instrumental TEK

In terms of socio-economic characteristics, local compliance scores are significantly different between religious groups (Table 6.11). Particularly, households who still believe in traditional religions show higher TEK compliance scores than those who have converted to the Christian religion. This is mainly because the majority of TEK practices such as taboos, rituals, and customs are highly associated with traditional spiritual beliefs. Within each individual case study, different socio-economic characteristics have different influences on TEK compliances. For instance, in Case-I, the compliance scores are significantly different across education categories ( $U=378$ ,  $p<0.05$ ). Specifically, respondents who have secondary and higher education levels have lower compliance scores than those who only have primary education. In Case-II, the compliance scores are significantly different across age categories, where younger respondents comply less than the medium and older respondents ( $\chi^2=7.28$ ,  $p<0.05$ ). In Case-III the compliance scores show significant differences across religion ( $U=175$ ,  $p<0.05$ ) and residency status ( $U=127$ ,  $p<0.05$ ) of the respondents. These particular results indicate that despite being situated in a similar geographical location, local compliances with TEK may differ depending on socio-economic characteristics of the respondents.

Apart from the socio-economic characteristics of the respondents, household surveys indicate ten different factors that influence local compliances with TEK practices (Table 6.12). The resulting factors can further be classified into three different categories. The first category belongs to *normative factors* that influence local perceptions of TEK practices. The most common normative factor that influences TEK compliance is changes in local religious beliefs, which represents about 27% of total responses in Case-I, 32% in Case-II, and 21% in Case-III. Key informants mentioned that some villagers no longer respect sacred forests or village ritual places after they have converted to Christianity. Another normative factor is declining the legitimacy of TEK

Table 6.11: Distribution of TEK compliance scores across socio-demographic categories

Characteristics of respondents		Mean compliance scores (%)			
		Case-I	Case-II	Case-III	Total
Age	Young	63.60	52.54 <sup>a</sup>	51.39	56.77
	Medium	66.07	59.51 <sup>b</sup>	52.99	59.33
	Old	66.41	62.50 <sup>b</sup>	57.64	61.40
	$\chi^2$	0.04	<b>7.28*</b>	1.76	2.76
Education	Primary	68.65	60.24	53.47	60.64
	Secondary & above	58.20	54.69	56.70	56.60
	<i>U</i>	<b>378*</b>	332	222	2728
Religion	Christian	62.62	n.a	51.07	57.38
	Traditional	68.22	n.a	60.24	64.80
	<i>U</i>	249	n.a	<b>175*</b>	<b>1467***</b>
Residency	Resident	64.97	58.99	56.49	60.02
	Migrant	66.41	43.75	46.88	56.51
	<i>U</i>	241	3.5	<b>127*</b>	1316

Note: Values marked with the same superscript letters are not significantly different (Dunn's test,  $p > 0.05$ );  $\chi^2$ =Kruskal-Wallis Chi-squared; *U*=Mann-Whitney U Test; \* = $p < 0.05$ , \*\*\* = $p < 0.001$ .

practices. This factor is more associated with TEK in terms of rules and regulations such as the prohibition of cutting trees at mountain tops or from village-use forests for commercial purpose. Key informants mentioned that they do not comply with these rules mainly because other village members are not complying any more. Other normative factors include increasing modernization and social conflicts which further shape on local TEK compliances.

The second category belongs to *instrumental factors* that influence local needs of TEK practices. The most common instrumental factor is the loss of knowledge of TEK practices. About 25% of total responses in Case-I, 26% in Case-II, and 32% in Case-III indicate that local compliance on TEK practices has declined mainly because the respondents do not know or recognize the identified TEK practices. For example, local knowledge on rotational grazing and pasture management practices have declined mainly because most villagers no longer have grazing animals such as mithan for their livelihood. Changes in livelihood activities also reduce local dependency on TEK practices. For example, local compliance with shifting cultivation and hunting practices has declined mainly because most farmers no longer engaged in those livelihood activities.

The third category includes *contextual factors* mainly related to the changes in eco-



Table 6.12: Reasons for decreasing compliance of TEK practices

Sr	Main reasons	Response frequency*		
		Case-I	Case-II	Case-III
<i>Normative factors</i>				
1	Changes in religious belief	141 (27%)	198 (32%)	147 (21%)
2	Decline in legitimacy of TEK practices	72 (14%)	51 (8%)	102 (15%)
3	Modernization (outdated practices)	23 (4%)	47 (8%)	47 (7%)
4	Social conflicts	3 (1%)	3 (0%)	8 (1%)
<i>Instrumental factors</i>				
5	Loss of knowledge on TEK practices	131 (25%)	164 (26%)	225 (32%)
6	Changes in livelihood activities	24 (5%)	36 (6%)	35 (5%)
<i>Contextual factors</i>				
7	Resource decline	70 (14%)	75 (12%)	80 (11%)
8	Increasing market access	34 (7%)	43 (7%)	34 (5%)
9	Increasing access by outsiders	13 (3%)	3 (0%)	21 (3%)
10	Park regulation	7 (1%)	1 (0%)	0 (0%)

Note: \*Multiple responses possible. Sample size for each case is 50.

logical, socio-economic, and regulatory conditions. Regarding ecological context, the respondents mentioned that local compliance with hunting customs and rituals has declined mainly because of decreasing wildlife population. Resource decline is reported more in Case-I (14%) than Case-II (12%) and Case-III (11%). In terms of socio-economic context, increasing access to township market has influenced local compliance with TEK practices. The respondents mentioned that local resource sharing practices such as bamboo or wildlife products have declined due to increasing market demand. Increasing access by outsiders also influences local compliance with TEK-based rules and regulations, such as the prohibition against taking wildlife from traps set up by other villagers or collection of honey without permission from the owners. In terms of the regulatory context, park regulations are reported to influence local customs for shifting cultivation and hunting rituals. This is particularly reported in Case-I and Case-II, although the proportions of responses are very low compared to other responses.

## 6.4 Synthesis of Case Study Results

The three case studies show both similarities and differences in terms of land tenure system, livelihood strategies, and traditional resource management practices. Despite the government introduces formal regulations, households in all three cases still comply more with informal tenure rules in managing land and related natural resources. This is mainly because the formal government regulations do not fit with the local customary institutions. Especially, the formal land tenure regulations are not compatible with traditional shifting cultivation practices. This particular conflict between formal and informal regulations has negative feedbacks on the social-ecological system by increasing environmental degradation and social conflicts. This finding reconfirms the conceptual explanation of the 'problem of fit' by Young et al. (2008) who argued that the mismatch between formal and informal institutions may reduce the legitimacy of resource management institutions. To reduce existing people-park conflicts, government authorities should recognise and respect the informal tenure rules particularly in developing and enforcement of conservation regulations.

Although the three case studies have similar land tenure systems, individual property rights differ depending on particular products and services. For instance, the right to cut timber is different between watershed forests and village-use forests, although the right to collect NTFP is the same for both land-use types. The types of rights assigned to each product are different across the three cases. For instance, hunting and NTFP collection by outsiders are prohibited in Case-II although these activities are permitted in Case-I and Case-III. This highlights the importance of legal pluralism, where management interventions require to look beyond the simple tenure classification and to recognise the bundle of rights associated with each tenure regime (Pradhan and Rajendra, 2002).

Apart from differences in property rights, households' compliances with tenure rules also differ across the three cases. Particularly, households located outside the national park are more in compliance with traditional tenure rules than those inside and bordering the park. The results are in line with the findings of other studies (e.g. Veit et al., 2008; Mascia and Claus, 2009), which imply that conservation regulations undermine the legitimacy of local tenure rules among communities associated with the national park. Local compliance with tenure rules differs depending on land ownership types. For instance, the compliance rate for tenure rules regarding clan and private lands are significantly different across the three cases. This dissimilarity in local rule compliance may increase people-park conflicts, particularly if the park authorities adopt the same regulations for all villages without individual consultations.

The legitimacy of local tenure rules has declined among the case study villages. Particularly, households inside and bordering the national park have lower compliance scores for private tenure rules than those living outside the national park. It means that the legitimacy of traditional landowners has declined in response to the national park regulations. The allocation of agricultural lands by the park has also created social conflicts between traditional landowners and the land recipients. Therefore, it is essential to review the existing allocated lands inside the national park and to revise the land allocation policy in line with the traditional tenure regulations. The role of tribal leaders has declined in all case study villages. This particular trend is mainly initiated by government regulations, improved access to public education and the introduction of modern religious practices. Consequently, the local perception of tenure security has declined due to increasing conflicts between formal and informal regulations. Therefore, it is important to integrate both formal and informal institutions in park management activities in order to achieve effective governance system and to reduce social conflicts.

Regarding local livelihoods, most households engage in similar livelihood activities. The combination of livelihood strategies differs across the three cases. The cluster analysis shows that households adopt four main types of livelihood strategies (agriculture, non-farm, wage, and forest) to generate cash income. Among these, agriculture-based strategies are common among households living inside and bordering the park whereas non-farm-based strategies are common among households outside the park. The forest-based strategy is observed only in a few households inside the national park. This particular trend indicates that although forest plays an important role in sustaining local livelihoods, the majority of households rely on agriculture and non-farm livelihood strategies to generate cash income. The results are similar to the findings of Kmoch et al. (2018) in the northern Chin State, except for the fact that the remittance income is relatively higher in the latter due to a higher migration rate.

In terms of total income, households bordering the park receive a significantly higher amount of income than the other two cases. This result is in line with the findings of Clements et al. (2014) where households bordering the park receive a higher amount of income than those inside and outside the park. This is mainly because households bordering the park have better access to both forest products and other livelihood options. Income comparison between inside and outside the park indicates that there is no significant difference between these two household groups. It means that although households inside the park have limited livelihood options due to conservation regulations, they have received a similar amount of income due to having better access to forest resources.

The comparison of forest income clearly shows that households inside and bordering the park receive a significantly higher amount of forest income than those outside the park. The contribution of forest income to poverty reduction is higher inside the park than bordering and outside the park. The result indicates that under the current situation, the national park does not have a significant impact on increasing local poverty due to weak law enforcement and informal permission for local resource uses. The enforcement of park regulations will have more negative impacts on households inside the park than bordering and outside the park. Therefore, it is important for policymakers to create alternative livelihood options before increasing law enforcement in accordance with the national park regulations.

The three case studies also show that forest income also reduces income inequality among households. It is no surprise since all households have equal informal rights to forest resources within their respective village territories. The results are also in line with the findings of the global study conducted by Angelsen et al. (2014) where access to natural resources equalises income differences among rural households. The effect of forest income is higher among households outside the park than inside and bordering the park. It means that lower-income households outside the park are using more forest income than higher-income households. This result indicates that forest income is more pro-poor among households outside the park than inside and bordering the park. The marginal effect analysis shows that forest income has negative marginal effect among households inside and bordering the park. It means that the promotion of forest income inside and bordering the park is likely to increase income inequality in the future. This result contradicts with the findings of other studies (e.g. M. Fisher et al., 2005; Fonta and Ayuk, 2013) which show that increasing forest income reduces income inequality among rural households. Therefore, the promotion of forest income should consider more pro-poor strategies in order to reduce income inequality in the future.

In addition to the livelihood system, the three case studies also show that local people still apply different types of knowledge and management practices in order to sustain forest resources and associated ecosystem services. Although local TEK practices are similar across the three case studies, the local compliance scores are higher among households inside the park than bordering and outside the park. This is mainly because households inside the park have better access to forests so that they have a better chance to continue TEK practices. This indicates that access to forest resources has a greater influence on local knowledge and compliance with TEK practices. The results also support the findings of previous studies (e.g. Gómez-Baggethun and Reyes-García, 2013; Kangalawe et al., 2014) and reconfirms that the differences in ecological context highly influence on the ecological knowledge possessed by the local people.

Despite local people still possess knowledge of different TEK practices, the legitimacy of these practices have declined across the three cases. Particularly, local compliance scores are significantly lower in TEK associated with taboos, customs, and rituals than TEK associated with rules, regulations, and resource-use practices. This result contradicts with the findings of Boafo et al. (2015) who found out that TEK related to rules and regulations received the lowest compliance scores compared to other types of TEK practices. The classification of TEK based on knowledge domains also shows that TEK associated with normative beliefs has lower compliance scores than the TEK based on the instrumental perspectives. It is mainly because the normative domain of TEK is highly associated with traditional spiritual belief. Therefore local compliance with these types of TEK has changed when traditional spiritual belief has declined within the society in response to modernisation and acculturation processes. The results are in line with other studies in rural Africa (e.g. Kangalawe et al., 2014; Osei-Tutu, 2017) who found out that local compliance with resource management taboos had declined due to the introduction of modern religions.

Aside from religious changes, local compliance with TEK practices has declined due to decreasing engagement in forest-based livelihood activities. Especially, younger people are less likely to comply with traditional resource management practices than older people. It is mainly because younger people have better chances to engage in non-farm activities so that they are less reliance on environmental resources for their livelihood. Consequently, they no longer need to participate in collective activities and associated cultural practices. The results are in line with the findings of other studies (e.g. Gómez-Baggethun et al., 2010; Boafo et al., 2015; Siahaya et al., 2016), where young and educated people are less likely to comply with traditional resource management practices. This particular trend highlights that integrating TEK into formal management practices should consider the consequences of cultural change within the target society (Reyes-García et al., 2014).

## CHAPTER 7

### MANAGEMENT IMPLICATIONS

#### 7.1 Identification of Management Scenarios for NTNP

Following Borrini-Feyerabend et al. (2013), this study proposes four management scenarios based on different levels of devolution and local participation in resource governance activities. The first scenario is the *business-as-usual* model, where management activities will be continued without significant changes. The second scenario is the *strict protection* model, where management activities are implemented by strict regulations without the involvement of local people. The third scenario is the *community control* model, where local people fully control the management authorities and responsibilities without state intervention. The fourth scenario is the *co-management* model, where management authorities and responsibilities are shared between the state and local people. The management scenarios were presented to the local stakeholders at the participatory scenario planning workshop. Based on the case study results, the workshop participants discussed and evaluated the four management scenarios in accordance with the three sustainable development criteria: 1) biodiversity conservation, 2) livelihood improvement, and 3) social justice (see detail in Section 3.3.4).

##### 7.1.1 Business-As-Usual (BAU) model

This model assumes that there will be no changes in park management activities in the future. Patrolling and law enforcement will still be weak due to limited budget and human resources. There will be no negotiation with local communities regarding traditional land ownership inside the park. The villages inside the park will continue to be illegal settlements without formal recognition. Shifting cultivation will continue to be illegal inside the park although there will be no clear legal sanction against

shifting cultivation on old fallow forests. Collection of forest products inside the park will still be illegal although there will be no legal action against households own consumptions.

### ***Impact on biodiversity conservation***

Biodiversity will decline due to increasing illegal activities amid weak law enforcement by the park. As indicated in case studies, wildlife population and NTFP will continue to decline mainly because of the overexploitation. Extraction of timber for commercial purpose will be increased due to improved technology and market accessibility. The numbers of households practising shifting cultivation will be decreased not only because it is considered illegal but also due to the increasing market opportunities for cash crops on permanent farms. This particular trend will have negative impacts on remaining forests since shifting cultivation will become less systematic and collective activities such as controlled burning will not be properly conducted. Encroachment by outsiders will be increased due to declining compliances with traditional tenure institutions. It will further increase deforestation and extinction of endangered wildlife species inside the park.

The conservation practices will continue to be ineffective due to limited budget and human resources. The annual park management budget is about 94 USD per km<sup>2</sup> which is relatively lower than the required budget of 240 USD per km<sup>2</sup> as indicated in the park management plan (Forest Department, 2017). According to the park manager, the potential to increase budget allocation is very low due to the country economic situation. Therefore, the park authorities are not able to implement most of the conservation activities indicated in the park management plan. There are only 16 park rangers in NTNP to conduct patrolling and law enforcement activities. The limited number of staff allocation is a major barrier to implement effective law enforcement activities in accordance with the conservation regulations. The government policy only allows recruiting educated staff in order to provide basic training on conservation practices. Most educated people are not interested to work as park rangers in remote areas with low salary payment. Therefore, the potential to increase staff is very low to achieve effective conservation.

The legitimacy of formal rules will continue to decline because of its incompatibility with local social-ecological conditions. Local people will continue to follow informal rules due to the limited alternative options for their livelihoods. At the same time, local compliances with informal rules will continue to decline mainly due to the absence of formal recognition and socio-economic changes. Furthermore, conflicts between formal



and informal land tenure system will continue to increase if the formal regulations do not compromise with existing customary institutions. This particular trend will have negative impacts on the environment as people will comply less with local resource management practices.

### **Impact on local livelihood**

Under the BAU scenario, households inside the park will continue agriculture as the primary source for cash income. Household surveys show that at least 68% of households across three cases will continue agriculture as their main livelihood choice (Table 7.1). However, income from shifting cultivation inside the park will be decreased due to limited land availability and social conflicts. It will have negative impacts on local poor who mainly rely on shifting cultivation for their livelihoods. The opportunities to step out of agriculture will still be limited because investment opportunities will still be limited due to low productivity and high transportation costs (Vicol et al., 2018).

Table 7.1: Households' livelihood priorities for the next ten years

Future livelihood options	Percent of households		
	Case-I	Case-II	Case-III
Agriculture	72	68	78
Livestock	4	6	8
Non-farm employment	10	8	8
Migrate to city	10	6	6
Do not know.	4	12	0

*Source:* Household survey 2017.

Local dependency on forest income will be increased due to limited alternative sources. Case study results have shown that at least 29% of household income is contributed by forest under current situations. Cash forest income is likely to be increased due to increasing market opportunities and accessibility. This further will reduce local poverty by increasing household income. Cash forest income is mainly received by wealthy households since it requires high input costs, such as chainsaws or gasoline, which poor households cannot afford. Therefore, the contribution of cash forest income on poverty reduction will still be limited among the poor. The cash forest income will be available only for a short period due to higher risks of over-exploitation under weak enforcement. Therefore, the role of forests for cash income will be reduced in the future under current management scenario.

***Impact on social justice***

Regarding social equity, households outside the park have more non-farm employment options than inside the park. They have more investment opportunities on permanent cultivation due to increasing market demand and less social conflicts. Households inside the park will have less non-farm options mainly because of the park regulations. They will have fewer investment opportunities in permanent farming due to tenure insecurity and increasing land conflicts. Cash forest income will still be higher inside the park because of having forest resources and increased market demand. It will further increase income inequality not only between households inside and outside the park but also among households within the same community inside the park. The Gini decomposition analysis has shown that increasing forest income will increase income inequality among community members. Some forest products such as construction woods require initial investments for tools and transportation which poor households could not usually afford to pay. It may lead to the problem of 'elite capture' where only wealthy households can exploit high-value forest products (Larson et al., 2010).

**7.1.2 Strict protection model**

This model assumes that the State will manage the national park by existing rules and regulations. The current law enforcement activities will be increased in order to achieve effective conservation. The park boundary will be demarcated in accordance with the initial park notification. Traditional lands inside the national park will be considered as state property in accordance with government regulations. Only the villages which were inside the park before the park establishment will be allowed to stay. The other illegal villages will be relocated outside the park. Local resource use practices such as shifting cultivation or extraction of forest products will be completely banned inside the national park.

***Impact on biodiversity conservation***

In this scenario, biodiversity will be increased because of the strict protection against illegal human activities. Studies have indicated that well-managed protected areas can reduce habitat losses and preserve biodiversity in the long run (Watson et al., 2014). The intensity of hunting and NTFP collection will be reduced due to patrolling and law enforcement activities. Forest cover inside the park will be increased due to strict protection against illegal logging. Shifting cultivation areas inside the park will

be decreased due to park regulations. Consequently, the flow of ecosystem services including drinking water to the nearby cities will be increased in the future.

Although this scenario has positive impacts on conservation, the prospect of achieving this scenario is far away from reality. The main issue is related to limited options to increase staff and budget allocation. At present, there are 25 staff members in NTNP including office staff and rangers. This number is relatively lower than the optimum staff requirement indicated in the park management plan, which is about 100 staff members including the park manager (Forest Department, 2017). The current annual park management budget is about 67,000 USD which is about three times lower than the required annual budget of about 175,000 USD to achieve effective implementation (Forest Department, 2017). As the probability for increasing staff and budget allocation is very low due to the economic limitations of the country, the implementation of this model will not be effective under the current situation.

Another factor that will limit the effective implementation of strict protection model is due to the decreasing legitimacy of the existing rules and regulations. As indicated by Sutinen and Kuperan (1999), people may follow the law if it is perceived as fair and appropriate and the enforcement institutions are legitimate. The three case studies indicate that the majority of households still neglect formal rules due to incompatibility with local social-ecological context. Therefore, even if the government increases law enforcement activities, local people are less likely to follow the formal rules and regulations. It may also lead to social conflicts between local communities and park authorities, which further may decrease local participation in conservation. This particular trend will have negative impacts on biodiversity since the success of conservation is highly associated with local participation in governance institutions (Persha et al., 2011). The increased enforcement of formal regulations will undermine the existence of informal rules regarding forest conservation. It can further increase the risk of tree cutting by outsiders particularly in far remote areas where park rangers are not regularly accessible.

### ***Impact on local livelihood***

The restrictions of human activities under this scenario will have a significant impact on local livelihood system. Since the existing legal framework does not allow any use of forest resource inside the park, the increase in law enforcement will decrease household income. According to the case studies, households inside the park will reduce about 49% of their income due to limiting access to forest resources. Consequently, local poverty will be increased among communities living inside the park. As indicated

in case studies, about 46% of households will likely to be below the national poverty line because of limiting access to forest resources. The poverty gap and severity will be increased by 32% and 22% respectively. Due to limited availability of construction wood, poor households will not be able to build wooden houses unless they buy timber from other villages located outside the park.

Increasing formal regulations will reduce not only forest income but also agricultural income. Case study results have shown that about 54% of farmers inside the park still rely on shifting cultivation. If these practices are not allowed inside the park, the farmers will lose at least 20% of total household income. Local livelihood strategies will be changed due to increased state regulations. The case studies have shown that about 12% of households inside the park adopt *Forest-Wage* strategy to generate cash income. If the law enforcement activities are effectively conducted, these households will have to change their livelihood strategies since forest income activities will no longer be permitted inside the park. The off-farm activities will still be limited in the future since business opportunities are still limited in the region (Vicol et al., 2018). Consequently, both regional and international migration will be increased, which in turn will reduce social resilience among remaining communities.

### ***Impact on social justice***

Strengthening law enforcement activities will increase income inequality between local communities. The three case studies indicate that there is no significant difference in total income between households inside and outside the park. However, under the strict protection scenario, the amount of forest income inside the park will be decreased due to government regulations. Since formal regulations will only affect communities living inside the park, their income will become significantly lower than outside the park. The impact will be higher in poor households because they depend more on forest income than better-off households. Similar cases have been documented in many tropical countries where government restrictions affect more to the poor who are the most forest-dependent groups among communities (Larson et al., 2010). Limiting forest income will also increase inequality among community members. As shown in the case study results, limiting forest income will increase about 17% of total income inequality among households living inside the park. Therefore, as long as there is no additional government subsidy, income inequality will likely to be increased both within and between communities inside the park. It may further lead to the social differentiation between the park and non-park communities.

Increasing formal regulations will exclude local communities from decision-making

processes. The three case studies indicate that land-use decisions are mostly made by informal village councils which are internally recognised as the legitimate governance institutions. The restrictions against traditional shifting cultivation inside the park will reduce the role of village councils in making collective decisions. This will further reduce local authority and legitimacy of village councils in resolving social conflicts. As a result, traditional tenure institutions will decline in response to strict law enforcement activities. This particular trend will have negative impacts on social resilience since previous researches have indicated that traditional institutions play a critical role in fostering the local adaptive capacity to cope with unexpected changes (see Young et al., 2008; Agrawal, 2010; Kangalawe et al., 2014).

In addition to traditional institutions, local ecological knowledge and management practices will decline in response to increasing law enforcement activities. As indicated in three case studies, local farmers apply several TEK practices regarding shifting cultivation and forest resources. More importantly, local compliances with TEK practices are significantly higher among communities living inside the park than bordering and outside the park. Therefore, restricting access to shifting cultivation and forest resources will decrease local compliances with TEK practices. As TEK reflects the cultural identity and social relationship with environment (Berkes, 2008), declining TEK will reduce the cultural identity of indigenous communities and their spiritual relationships with the natural environment. Furthermore, declining TEK will reduce collective actions and related social mechanisms among communities. This particular trend will have negative impacts on the social system by reducing social cohesions and local adaptive capacity against environmental changes (Berkes et al., 2000).

### **7.1.3 Community control model**

This model assumes that customary tenure rights regarding traditional village territories inside the national park will be granted to the respective communities. Both management authorities and responsibilities will be held by traditional governance institutions. The government will recognise customary land ownership and related property rights including communal, clan, and private lands inside the park. Traditional shifting cultivation and resource-use practices will be controlled and managed by customary tenure institutions and traditional management practices.

#### ***Impact on biodiversity conservation***

In this scenario, biodiversity will increase more than in the BAU scenario. As indicated by Larson et al. (2010), local empowerment through recognising traditional tenure will

have positive impacts on forest conservation. Previous studies have confirmed that community-managed forests have lower deforestation rates than government-managed protected forests (see Hayes and Ostrom, 2005; Porter-Bolland et al., 2012). Therefore, forest cover will be increased under this scenario particularly in watershed forests and village-use forests. Illegal logging by outsiders will be reduced since it is prohibited by local customary institutions. However, the open-access forests within the village territory will continue to decline since there is no specific regulation regarding the use of forest products in open-access forests. The population of wildlife and NTFP will continue to be decreased since customary regulations permit hunting and NTFP collection particularly among communities living inside the park.

The prospect of achieving conservation outcomes is higher than in the former two scenarios. As highlighted by Larson et al. (2010), the increasing tenure security for traditional territories will provide incentives to create new internal rules among indigenous communities. The three case studies have shown that local communities are highly aware of the potential ecosystem services provided by the forests. However, the efficiency of local institutions to effectively manage local forest resources in line with conservation goals is still in question (J. Sayer et al., 2007). As mentioned by Barrett et al. (2001), local institutions may be strong in dealing with own community members; however, they may be weak in dealing with outsiders seeking to exploit the resources. In all three cases, the customary rules do not include clear punishment systems against outsiders. Social sanctions are highly context-specific and less applicable to outsiders. Furthermore, the local community will still be inefficient regarding the conservation of endemic species that are not important for their livelihood and socio-cultural practices.

The legitimacy of tenure rules will be higher than the strict protection model. The case study results have shown that at least 85% of households are still aware of the customary tenure regulations and more than 75% of households have expressed their willingness to comply with them. However, it should be noted that tenure rules are not static but are changing over time in response to changes in social-ecological conditions. The three case studies has shown that there is a decreasing trend in local compliances mainly because of changes in livelihood strategies and local cultural context. It could further reduce the legitimacy of customary rules in the future mainly due to the increasing livelihood options that do not require collective activities. Existing sanctions against offenders are mainly related either with spiritual belief or social isolation from the communities. Therefore, the legitimacy of social sanctions is likely to decrease due to the increasing trend of Christianity. It can further diminish the local capacity to resolve social conflicts in the future (see Kangalawe et al., 2014).



***Impact on local livelihood***

The devolution of customary rights to the local community will have positive impacts on local livelihoods. As indicated by Deininger and Jin (2003), increasing tenure security tends to increase long-term investment in land-related livelihood strategies. Therefore, investments in both shifting cultivation and permanent cultivation are likely to be increased because of the increasing tenure security within the community. It will have positive impacts on cash income since the agricultural sector contributes at least 32% of total cash income across the three cases. Although shifting cultivation is highly criticised as destructive activities, other studies have shown that this practice plays an essential role in maintaining livelihood resilience and adaptive capacity of local farmers (see Cramb et al., 2009). As about 54% of households inside the park still rely on shifting cultivation, their livelihood will be more secure if customary tenure rights are recognised and protected by the state.

Forest income is likely to be increased since households will have more access to forest products, which are considered illegal under park regulations. The impact will be higher for cash forest income rather than subsistence forest income since people will have legal rights to sell forest products collected within their village territories. The increase in forest income will reduce poverty among households. Case study results has shown that a 10% increase in forest income is likely to reduce at least 4% of income poverty among households. However, this may have negative consequences on local tenure institutions since increasing the market value of natural resources tend to reduce collective tenure regulations (Fitzpatrick, 2006).

***Impact on social justice***

In this model, households inside the park will have equal livelihood opportunities than households outside the park. The three case studies have confirmed that there is no significant difference in household income between inside and outside the park. Both communities will have similar opportunities to apply TEK practices since there will be no further restriction by the park in this scenario. It can further provide equal chances to maintain cultural identity and unique social practices.

There will be an unequal distribution of forest income between inside and outside the park. Case study results have shown that forest income is significantly higher among households inside the park than outside the park. Since households inside the park have higher chances to collect forest products, they will have more forest income if the state formally recognises customary institutions. It will further increase income



inequality between inside and outside the park. The increasing opportunities for forest income will also increase inequality within communities living inside the park. This trend is clearly shown in the Gini decomposition analyses where increasing forest income increases total income inequality inside the park. However, the inequality will be lower than the BAU model because cash forest income from timber is restricted under customary regulations.

In addition to income inequality, the devolution of forest tenure often results in power inequity within local governance authorities (Ribot et al., 2008). The case study results have shown that although village councils permit all village members to participate in decision-making processes, customary landowners usually dominate the land-use decisions. This power asymmetry is more prominent within communities inside the park where the majority of households are still regarded as land borrowers who have less influence on decision-making processes. Most villages in NTNP are multi-lineage communities where one lineage may own a vast area of land. Therefore, recognising customary tenure may also increase social differences among community members. In addition, the local custom in Chin state is highly 'patriarchal', where women are always excluded from communal decisions. As indicated in case studies, customary tenure systems do not permit women to inherit the lands. Therefore, the devolution of customary tenure rights under community control model will even increase social inequity among community members.

#### **7.1.4 Co-management model**

This model assumes that management power and responsibilities will be shared between park authorities and local people. Management goals will be set collectively between park authorities and community leaders with a particular focus on conservation and livelihood improvement. Traditional village territories will be formally recognised by park authorities. Illegal logging, hunting, and NTFP collection by outsiders will be restricted within each village territory. Traditional village councils will be authorised to manage land and natural resources within their village territories. The park rangers will provide technical and legal support to enforce legal actions against offenders by traditional regulations.

#### ***Impact on biodiversity conservation***

In this scenario, biodiversity is likely to be increased compared to the other management models. Conservation of watershed forests and village-use forests will be

improved due to increased protection against outsiders. This further will enhance key ecosystem services such as drinking water and construction wood to the surrounding communities. The availability of NTFP and wildlife will be increased due to effective protection and improved management. More importantly, the conservation of endangered species will be improved due to better negotiation between park authorities and local people in setting conservation objectives.

Regarding effectiveness, co-management is regarded as the most effective strategy in reconciling tenure rights and biodiversity conservation (Kepe, 2008). Although transaction costs will be higher due to long negotiation processes (Blore et al., 2013), previous studies have shown that the co-management approach provides better conservation outcome than the other community-based approaches (see Andrade and Rhodes, 2012; Plummer et al., 2012). Local communities will have more power and authority in protecting their resources against outsiders. It will further increase community participation in resource monitoring, which in turn will result in improved conservation with fewer management costs. Conservation planning and decision-making process will be improved since there is a high potential to integrate local knowledge and management practices. The disadvantage of this model is the time constraint (Blore et al., 2013). It requires a substantial amount of time in building trust and institutional capacity to overcome power differences among community members and to find common ground among relevant stakeholders. In addition, the outcome will not be visible within a short period, which may further reduce the interests of policy-makers.

The co-management model has a better potential to improve the legitimacy of rules and management institutions. Previous studies have confirmed that the conservation rules that are crafted based on existing traditional institutions are more likely to be followed by community members (see Berkes et al., 1998; Haller et al., 2016). The three case studies have shown that at least 75% of households are still in compliance with traditional tenure regulations. Therefore, the number of complying households is likely to be increased if the rules are formalised under co-management arrangements. Moreover, there is a better chance for crafting new institutional rules if the existing ones are no longer fit with social-ecological conditions. In addition, formal recognition by the government will improve the legitimacy of traditional institutions in dealing with outsiders in accordance with existing legislations (Fitzpatrick, 2005).

### ***Impact on local livelihood***

The co-management model will have positive impacts on local livelihoods. The increased tenure security under co-management arrangements will motivate the collective

activities and improve local resilience. Improving tenure security will increase long-term investment by local households (FAO, 2002). It may further motivate permanent agriculture and livestock farming within village territories due to improved tenure security. Formalisation of customary institutions will have positive impacts on shifting cultivation. Particularly, there will be more systematic implementations of shifting cultivation activities such as rotational planning and controlled burning. It will have positive impacts on local livelihood security particularly among the poor households who mainly rely on shifting cultivation to generate cash income.

The amount of forest income is likely to be reduced as there will be new regulations in implementing co-management activities. Particularly, cash forest income will likely to be reduced since traditional rules prohibit cutting timber for commercial purposes. It means that the contribution of forest income will be reduced from 49% to 41% among households inside the park. However, limiting cash forest activities do not have significant impacts on rural poverty compared to limiting subsistence forest income. For instance, subsistence forest income alone reduces about 40% of total poverty inside the national park. Therefore, the contribution of forest income in poverty reduction will still be high as long as subsistence forest income is available. Income from wildlife will be declined since hunting is likely to be prohibited in co-management agreements. Nevertheless, there will be less impact on local livelihoods since income contribution from wildlife is relatively low compared to timber and other NTFP in all case study village tracts.

### ***Impact on social justice***

Despite having positive conservation outcomes, the co-management model has the potential to increase income inequality between inside and outside the park. The amount of forest income inside the park will be lower than outside the park due to the increased restrictions against cash forest income. Therefore, the co-management model should provide additional livelihood opportunities in order to reduce income inequality between inside and outside the park. Regarding income inequality within the community, the co-management model has a positive equalising effect on income differences among the households. For instance, the case study results show that removing cash forest income will reduce the Gini coefficient from 0.31 to 0.27 among households inside the park. Therefore, reducing cash forest income due to co-management agreements will reduce income inequality within community members. Furthermore, formal recognition of communal lands under co-management model will improve social equity mainly because poor households depend more on communal lands due to having limited private lands.

In addition to income inequality, the co-management model has the potential to reduce power differences among local actors in decision-making processes (Berkes, 2009). The formalisation of traditional land tenure will provide opportunities for every villager to participate in village council meetings. The formal recognition of traditional village councils will improve the local decision-making process. It will further enhance the legitimacy of collective decisions and reduce social conflicts. However, the implementation of this model should avoid power dominance by state actors in decision-making processes. Previous studies have shown that government authorities usually dominate the co-management decisions where local communities have limited opportunities to share their views and interests to include in the agreements (Castro and Nielsen, 2001). Therefore, implementing co-management activities should develop mechanisms to reduce state dominance in order to improve social equity between state and local actors.

The co-management model will provide opportunities to incorporate local knowledge and cultural mechanism into formal resource management practices. The recognition of traditional tenure enables local farmers to continue the TEK practices associated with shifting cultivation. It can further provide opportunities to evolve new knowledge through social learning process (see Walker and Salt, 2012). Promoting TEK practices can maintain cultural identity and social relations. It can further increase social cohesion and improve communal resilience against unexpected changes in the future (see Berkes and Ross, 2013).

## **7.2 Evaluation of Management Models**

The participatory scenario planning workshop provides an opportunity to evaluate the four management models based on local knowledge and experiences. Depending on the background profession and interest, the workshop participants were divided into three working groups: biodiversity conservation, livelihood development, and social justice. Each group discussed the strength and weakness of the four management models and presented the summary of discussions to the other groups at the plenary section. Feedbacks from the other group members were taken into account in the final workshop report (see details in the workshop report by P. S. Aung (2018)). Theoretically, the strict protection model shows the highest potential for achieving better conservation outcome. However, the participants mentioned that the prospect for effective implementation of this model is very low due to the limited financial support and the existing conflicts between the government and local people. The participants highlighted that the government did not consider the livelihood conditions of local

people in formulating the conservation regulations. Particularly, the conservation regulations will not be legitimate under this model due to the lack of transparency and accountability by the government and the limited livelihood options for local people. The participants recommended promoting alternative livelihood opportunities to achieve effective conservation and to minimise conflicts in the future.

Apart from the strict protection model, the community control model and the co-management model have potentials to improve local participation in conservation. However, the participants indicated that the community control model will have less efficiency and legitimacy due to the declining compliance with customary regulations. They also highlighted that the customary regulations will not be legitimate in the long run because they are not documented as a written statute and may become less applicable due to increasing contact with urban people. Furthermore, the local elites will take the majority of benefits if the community alone protects the forests without state intervention. To achieve effective conservation, the participants recommended that the government should introduce locally acceptable rules and provide legal protection for local people in dealing with rule-breakers and powerful outsiders.

In terms of livelihood aspects, the participants mentioned that the strict protection model will have negative impacts on local livelihood. Since there is no legal provision to permit local use forest products inside the national park, the strict protection model will increase the poverty of local households who depend on forest products inside the national park. Regarding community control model, the participants indicated that the sustainability of forest products will be decreased due to the increasing demand for forest products inside the national park. Especially, the increasing use of cash forest products will also lead to privatization and social conflicts among community members. The participants also discussed that the community control model will be more beneficial to rich people since the extraction cost of timber is expensive for poor households.

Apart from community control model, the participants indicated that the co-management model will sustainably contribute local livelihoods due to the presence of legal supports by park authorities to maintain collective institutions and to prevent land privatizations. Under this model, local people will have a chance to negotiate with park authorities to permit the utilization of certain forest products that are important for sustaining local livelihoods. Incorporating local customary rules such as restrictions against hunting and selling timber to outsiders will prevent over-exploitation of forest resources and will achieve the long-term supply of important forest products.

In terms of social justice, the participants highlighted that the BAU model will increase social inequality due to socio-economic differences within the community.

Especially, income inequality will continue to increase due to the differences in local land ownerships. The increasing conflicts between formal and informal land ownership systems will demotivate landless farmers to maintain traditional sustainable land-use practices. In regards to strict protection model, the participants mentioned that increasing government regulations will increase income inequality because only the elite farmers who can avoid the laws will get benefits from forest products due to corruption and weak law enforcement.

Under community control model, social justice will be improved due to less restriction by the government. However, the participants indicated that the risk of elite capture will continue to exist due to weak enforcement of customary regulations. Although land-use decisions will be made by community members, the participants mentioned that traditional landowners will dominate the decision-making processes. Furthermore, customary negotiation processes will create more social conflicts since the role of tribal leaders and village shaman have diminished within society. For the co-management model, participants indicated that creating a joint-implementing committee between the government and local people will reduce income inequality. For instance, it will permit negotiating with traditional landowners to allow permanent farming on the borrowed lands. It can also minimise social inequality since all villagers can participate in planning and decision-making processes. The participants agreed that the co-management model will promote the preservation of local knowledge and cultural practices by creating opportunities to learn and share between the park authorities and local people. The main limitation of this model is the risk of state domination because most government officers are reluctant to share decision-making power with local villagers.

After the group discussions, the multi-criteria decision analysis was conducted by giving subjective ranking scores to each management model based on nine different indicators as indicated in Section 3.3.4. The results show that the co-management model has the highest ranking scores (3.7) compared to the other management models (Table 7.2). The main argument for selecting the co-management model is because it provides a platform to discuss between park authorities and local communities in order to share local needs and interests in fulfilling basic livelihood needs. This model allows the authorities to formally recognise the existing local institutions. It also supports local participation in conservation and reduce management cost. The participants agreed that the co-management model will enhance social equity in decision-making and reduce the risk of elite capture among the villagers.

Apart from the co-management model, the community control and BAU models are regarded as the second and third priorities with the average ranking scores of



Table 7.2: Subjective ranking of management models by local stakeholders

Sr.	Sustainability criteria	Average ranking scores* (n=25)			
		BAU model	SP model	CC model	CM model
1	Impacts on conservation				
	• Conservation outcome	3.0	3.0	2.0	3.0
	• Legitimacy	2.0	2.0	3.0	3.0
	• Efficiency	1.0	2.0	2.0	3.0
2	Impacts on local livelihood				
	• Meeting local needs	1.0	1.0	1.0	4.0
	• Poverty reduction	1.0	1.0	2.0	4.0
	• Livelihood sustainability	4.0	1.0	2.0	4.0
3	Impacts on social justice				
	• Income equality	2.0	2.0	2.0	4.0
	• Equity in decision making	3.0	1.0	3.0	4.0
	• Maintain cultural practices	3.0	1.0	4.0	4.0
	Average scores	2.2	1.6	2.3	3.7

Note: \*Priority ranking (1=low to 5=high); BAU=Business-as-Usual; SP=Strict Protection; CC=Community Control; CM=Co-Management.

Source: Participatory scenario planning workshop, 2018.

2.3 and 2.2 respectively. The main criticism against community control model is because local people will not be able to protect forest resources against powerful outsiders without legal support from the government. The potential for meeting local needs is very low mainly because of the risk of elite capture. For the BAU model, the main arguments include poor implementation of conservation regulations and potential negative impacts on local livelihoods. The strict protection model has the lowest average ranking scores (1.6) mainly because of the potential negative impacts on livelihood and social justice. The participants argued that although the strict protection model will have positive impacts on biodiversity conservation, the applicability of this approach will be limited due to local resistance against park regulations.



## CHAPTER 8

### CONCLUSIONS

#### 8.1 Proposed Management Strategies for NTNP

This study has examined the dynamic relationship between the protected area and local communities located in and around the Natma Taung National Park (NTNP). The historical reviews highlight the long-standing conflicts between the government and local people in Chin State. The political history indicates that the Chin people have been living in the mountains for centuries without effective dominance by the state regulations. This continuous isolation in the mountains enabled them to maintain traditional institutions regarding access to land and forest resources. The limited accessibility and economic opportunities also motivated them to rely on shifting cultivation and forest resources for their livelihoods. These framework conditions have created conflicts between the government and local people, particularly when the national park introduces strict regulations without public consultation.

The in-depth analysis of the three case studies provides a further understanding of the social-ecological relationship between protected area and local people (Figure 8.1). The three case studies demonstrate that local people living around the NTNP greatly rely on forests for their livelihoods. They have the ability to organise social institutions in order to manage land and associated natural resources. They also possess a diverse array of knowledge and management practices that enable them to achieve sustainable use of natural resources. From an ecological point of view, the integrity and resilience of the national park have declined mainly because of the local encroachments for shifting cultivation and unsustainable use of natural resources. This particular trend has reduced the provision of products and services that are important for local people. From a social point of view, the local demand for products and services has increased due to changes in livelihood strategies and socio-cultural situations. The increased access to market, infrastructure and technology has motivated them to engage more in

the market economy and modern way of life. Consequently, local compliances with traditional practices and associated institutions have declined resulting in negative impacts on the natural system and its capacity to provide the ecosystem services.

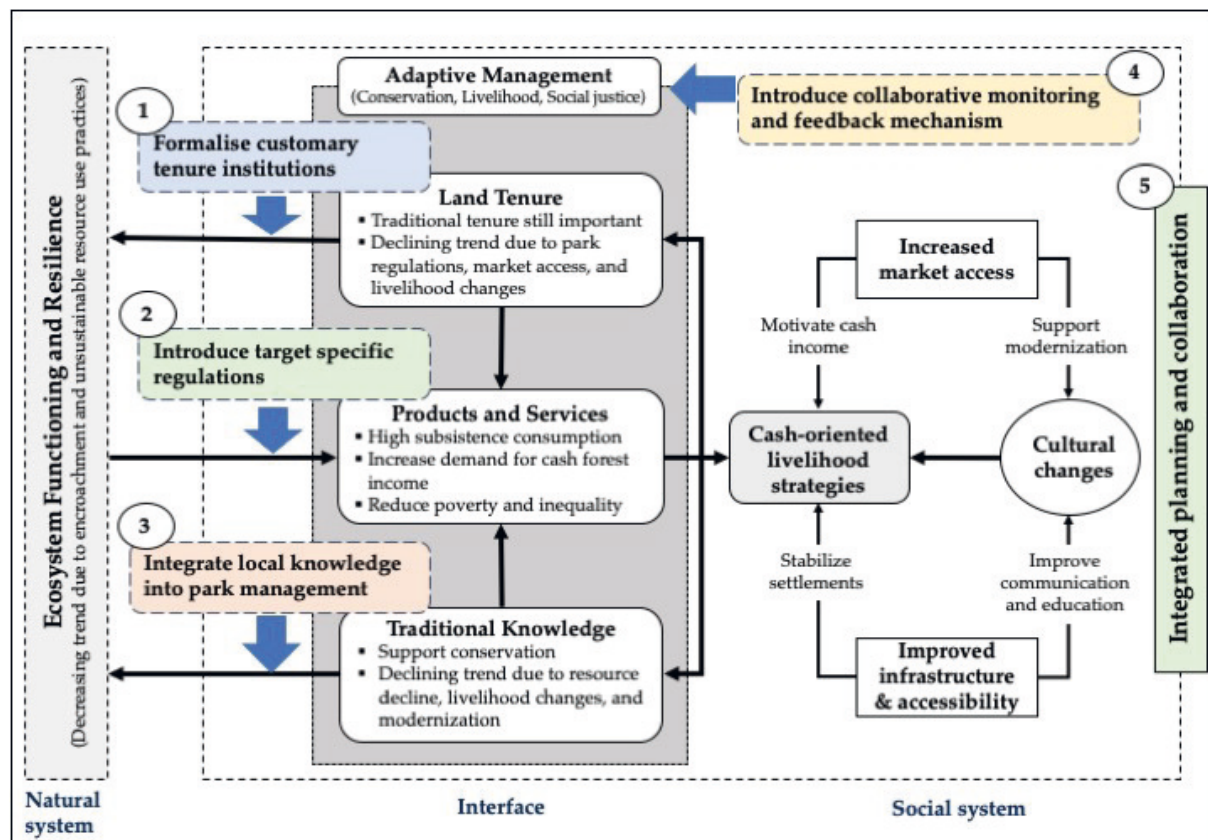


Figure 8.1: The coevolutionary linkages between protected area and local people in NTNP with proposed management interventions

Source: Adapted from Pretzsch et al. (2014)

The scenario analysis provides both opportunities and challenges in implementing conservation activities under each management model. Results from the three case studies justify the four management scenarios with different levels of local participation. The multi-criteria decision analysis indicates that integrating local stakeholders under the co-management scenario is the best option to promote effective conservation, livelihood improvement, and social justice. Based on the outcomes of three case studies and the participatory scenario planning workshop, this study proposes five management strategies in order to achieve effective conservation and to reduce social conflicts (see Figure 8.1).

1. *The recognition of customary land tenure inside the park is essential to promote conservation and reduce social conflicts.*

The introduction of state regulations without understanding local land tenure arrangements have induced conflicts between formal and informal tenure regimes.

On the one hand, state regulations have failed since they do not fit with local socio-cultural practices. On the other hand, the informal rules are not legitimate against outsiders due to the lack of legal enforcement. Therefore, the integration of informal rules into formal government institution is essential to increase both the legitimacy and effectiveness of the conservation initiatives. As indicated in the case studies, local people comply more with informal rules than with formal government regulations. However, challenges remain in determining how to integrate informal regulations without unintended consequences on the social system and natural environment.

The conventional buffer zone approach will not be sufficient to reduce people-park conflicts in NTNP. Firstly, the conventional approach tends to demarcate buffer zones based on ecological conditions without considering local needs and traditional practices. Most of the past buffer-zone projects usually demarcated the buffer zones within the degraded habitats that are unable to support sufficient products to meet the local livelihood needs (Martino, 2001). Secondly, territorial differentiation among tribal groups is still common in Chin State. Therefore, the demarcation of buffer zones outside the traditional territories will increase social conflicts among different tribal groups. Thirdly, local people are highly dependent on shifting cultivation which requires extensive areas of fallow forests to complete a rotation cycle. Therefore, demarcation of buffer zones without considering rotational fallow cycle will not be applicable unless better livelihood options are available to reduce local dependence on shifting cultivation.

Instead of creating buffer zones, one alternative approach is to formally recognise the customary land ownership and delegate power and responsibilities to manage the land (Andersen, 2016). As the customary tenure rules are complex and may vary depending on particular land-use practices, a simple classification—such as private, common, or state ownership—will undermine the complexity of local tenure arrangements and induce additional conflicts (Pradhan and Rajendra, 2002). However, the degree of legal recognition should be determined based on the nature of tenure rules and local governance institutions (Fitzpatrick, 2005). The choice of a local agency or informal governance institution should reflect the local cultural system in order to increase the legitimacy of conservation regulations (Larson et al., 2010). Nevertheless, as indicated by Ribot et al. (2008), the local political system should carefully be investigated before formal recognition in order to avoid the risk of elite capture in decision-making processes.

Existing policies and regulations provide enabling conditions to implement the formal recognition of customary lands under the co-management scenario.

For example, the National Land Use Policy (2016) encourages to recognise the customary tenure and related institutions among indigenous ethnic people (Government of Myanmar, 2016). The National Biodiversity Strategy and Action Plan (NBSAP) also includes targets and action plans to promote co-management activities in biodiversity conservation (Forest Department, 2015). The presence of these policy frameworks will enhance the legitimacy and effectiveness of this scenario in NTNP since the success of co-management approach highly depends on enabling policy conditions (Armitage et al., 2009).

2. *Conservation regulations should be flexible and site-specific in order to support poverty alleviation and increase public participation in conservation.*

The conservation laws in Myanmar do not permit any resource use within the national park. On the contrary, this study shows that local communities are highly dependent on forest products for their livelihoods. Particularly, the subsistence use of forest products is crucial for reducing poverty within the community. Limiting access to subsistence forest uses will put local people more into poverty. The study also shows that there is no significant difference in subsistence forest use between inside and outside the park. Limiting subsistence forest uses inside the park will increase inequality between the communities. It means that enforcement of existing conservation regulations will increase local resistance against the park. To achieve both conservation and livelihood objectives, park regulations should be flexible and target-specific to allow local communities to continue their way of life.

One possible solution is to permit local people the subsistence-use of forest products inside the park. Focus group discussions with park rangers revealed that they informally permit subsistence use of forest products by local villagers although it is prohibited by the law. Nevertheless, local people still perceive the park as a major constraint for their livelihoods. Although they continue to use forest resources inside the park, they consider that the park has prohibited their rights over land and forest resources inside the park. In order to reconcile between the park and local people, the park needs to deliver more tangible benefits that are visible and recognised by local people (Hoole and Berkes, 2010). Therefore, formal permission of subsistence forest uses will change local perception of the park and will improve collaboration for conservation. However, the government should provide formal permission in line with the customary regulations. The regulations should be site-specific and adaptive to local cultural conditions. For instance, the collection of NTFP within village territories can be permitted in Case-I but it will lead to social conflicts if it is legally permitted for outsiders

in Case-II. Similarly, cutting trees within the sacred forest can be permitted in Case-II although it will not be applicable in Case-I due to the potential conflicts between traditional and modern religions.

A major constraint of this approach is that the policymakers are usually reluctant to permit local resource use inside the conservation areas. Previous studies have shown that one of the factors that contributed to the failure of community-based conservation projects was the presence of too little incentives for local communities to participate in collaborative management practices (see Berkes, 2004; Winkler, 2011). The win-win scenario, as expected by most policymakers, is hardly realistic between the competing goals of conservation and development initiatives (Ferraro and Hanauer, 2011). In order to achieve conservation with minimum livelihood impacts, the policymakers need to prioritise key conservation objectives and should allow activities that could impact to less important objectives (McShane et al., 2011).

3. *The conservation authorities should incorporate local knowledge and experiences to improve collaboration and social learning.*

The three case studies have shown that local people apply diverse knowledge and management practices to ensure the sustainable provision of ecosystem services and to minimise future livelihood risks. The majority of these practices share the same purpose as the park management objectives. Therefore, incorporating these practices into formal park management plan will achieve effective conservation and reduce administrative costs (Colding et al., 2003). For instance, providing legal assistance to watershed protection and village-use forests will improve local conservation initiatives and reduce additional management cost. Similarly, participating in field selection meetings for shifting cultivation will support effective land-use practices and will help to negotiate to avoid critical habitats for conservation.

People-park reconciliation is a long-term process and should not be implemented by using top-down interventions (Hoole and Berkes, 2010). First, it is essential to re-establish trust between the park authorities and local people in order to achieve a long-term collaboration (Wells and McShane, 2004). Establishing a communication platform between park authorities and local people is essential to induce local trust-building process (Berkes, 2009). Such platform should be simple and less bureaucratic where the stakeholders could easily share their knowledge and negotiate competing interests among them. Community-based innovation tools, such as Participative Innovation Platform (PIP), will serve as a bridge between park authorities and local people to share knowledge and to



improve social learning processes (Alemu and Auch, 2016). Second, the park should support the implementation of local cultural practices such as collective rituals or traditional ceremonies to promote cultural transmission and social learning processes. These activities will improve communication and interaction among community members and will support achieving collective agreements through interactive discussions and feedbacks (Muro and Jeffrey, 2008).

4. *Adaptive monitoring and feedback mechanisms should be established in order to cope and adapt with unforeseen social-ecological changes.*

The historical reviews show a wide range of changes among the social system in NTNP in response to the changing political and social-cultural conditions. Case study results indicate that changes in the social system have influenced local resource demand and management practices which in-turn produce impacts on biodiversity and ecosystem services. Moreover, these changes are mostly induced by external drivers that are beyond the control of the park management office. In order to minimise the adverse impacts of these changes, the park authorities need to revise and adjust the conservation goals regularly in line with the changes in societal needs and ecological conditions (Andrade and Rhodes, 2012). Therefore, it is essential to integrate adaptive management principles into conservation planning in order to cope with unforeseen changes in the future.

Effective implementation of adaptive management in NTNP requires three main preconditions. First, adaptive management requires continuous monitoring and feedback mechanism to modify conservation goals and management options (Allen and Garmestani, 2015). Generally, the park managers in Myanmar are allowed to revise annual management activities within the framework of allocated budget (Emerton et al., 2015). The monitoring and evaluation processes are usually conducted by the general audit department where the auditors mainly focus on accounting and financial procedures rather than the conservation outcomes. Therefore, the establishment of an impact monitoring mechanism is essential to evaluate management outcomes and provide feedback for setting new conservation goals.

Second, the key process of adaptive management is setting conservation goals, management objections, and implementation options based on the outcome from continuous evaluation and feedbacks (Allen and Garmestani, 2015). However, conservation goals in Myanmar are mostly determined by high-level authorities rather than local park management office (M. Aung, 2007). This process limits to predict future scenario at the local level in order to minimise uncertainty in decision making. Therefore, it is essential to establish a decision-making

mechanism at the local level in order to reflect actual conditions and reduce uncertainty. This can be achieved by using Participative Innovation Platform (PIP) that allows participation of all stakeholders to diagnose complex social-ecological problems, identify opportunities based on local experiences and find options to achieve common goals in a more transparent way (Pali and Swaans, 2013; Alemu and Auch, 2016). Third, the success of adaptive management approach greatly relies on the role of managers in facilitating decisions, in incorporating local knowledge, and in collaboration with external organisations (Allen and Garmestani, 2015). Therefore, capacity building programs at park management level should focus on creating visionary leaders in order to facilitate the adaptive governance processes effectively.

5. *Integrated planning and management approach is essential, particularly at the regional level, in order to improve collaboration among local government organisations.*

The problems facing in NTNP are not merely a local level issue. As indicated in the three case studies, the majority of conservation and livelihood issues had evolved in response to the long-term political conflicts between the central government and local ethnic people. For centuries, the Chin people had enabled to avoid state domination due to limited accessibility and the failures in government institutions (Scott, 2009). Therefore, most government regulations were not effectively enforced in Chin State. The local farmers were used to be living without complying with government regulations. However, the national park has introduced actual law enforcement activities with financial support from international organisations. As a result, only the communities associated with the national park have to follow the formal regulations whereas the communities outside the park are still enjoying traditional customary rights. These asymmetric legal pressures have created inequality between park and non-park communities inducing local resistance against the national park. Therefore, creating legitimate governance structures in other administrative sectors is necessary before imposing conservation regulations inside the national park.

Land tenure and poverty issues should be addressed at the regional level rather than the park authorities alone. Land tenure is a complex issue and related to other government agencies such as the departments of agriculture, livestock, and rural development. Therefore, a broader policy framework is necessary to initiate collaboration among these departments in recognising customary land tenure not only inside the park but also throughout the whole Chin State. Moreover, poverty is not a localised issue in NTNP. More than 70% of the population in Chin State is already under poverty (UNDP, 2011). Therefore, the park authorities



alone could not reduce poverty issue in NTNP. A more comprehensive regional development plan is necessary that integrates common visions and goals among relevant departments and administrative organisations.

## **8.2 Analytical Generalisation and Contributions of the Research**

The scope of this thesis is localised and context-specific so that it is not possible to generalise the results statistically to a broader population. As indicated by Yin (2009), the primary goal of case study research is to generalize the lessons learned to other studies with similar contextual situations and to contribute to further development of theoretical propositions. Unlike the large scale empirical studies that allow statistical generalization, case study findings are more useful to pose the hypotheses and propositions at a conceptual level (Mills et al., 2010). In this research, a generalisation can primarily be made in terms of the analytical framework and the phenomenon of interactions between the social system and natural environment. The social-ecological coevolution model, which is modified for this study, can further be applied in other protected areas facing conflicts with local people. Particularly, the model provides a holistic understanding of how current management issues have evolved in response to the particular changes in society and indicates future pathways to minimise them. The focus of three different thematic areas—land tenure, livelihoods, and traditional knowledge—allows explaining the inter-linkages among them. This particular aspect makes the model more robust compared to the previous studies in the region (e.g. Andersen, 2015; Vicol et al., 2018; Kmoch et al., 2018) which primarily focused on each thematic topic and undermined the inter-linkages among them.

In regard to the objective one, this study demonstrates how local land tenure system has influenced access to and control of land and ecosystem services. Empirical evidence has shown that local households tend to follow more on local tenure rules that fit with their livelihood strategies and socio-cultural context. The study argues that the top-down enforcement of formal rules undermines the legitimacy of local tenure rules and imposes social conflicts. To achieve effective conservation, the study recommends formulating formal regulations that fit with the local livelihood strategies and socio-cultural context. These particular implications can be taken into account in other conservation areas facing similar social conflicts. For instance, a global review by Garnett et al. (2018) indicates that at least 40% of the global protected areas are overlapping with customary lands owned by the indigenous people. In managing these protected areas, one should expect to face conflicts if customary land tenure systems are not taken into account in formulating conservation regulations. At the

same time, the customary land tenure systems may change in response to changes in local livelihood strategies and socio-cultural context. Therefore, integrating customary regulations into formal management practices should be adaptive to local situations and cultural context.

Objective two highlights the important role of forest income in reducing poverty and inequality of local households. The results show that households depend more on forest resources if they have better access to forest resources and limited options for alternative livelihoods. The study demonstrates that increasing law enforcement activities will increase local poverty and inequality and will escalate more conflicts between conservation authorities and local people. The study argues that formulating conservation regulations that allow subsistence use of forest products will reduce local poverty and inequality and minimise people-park conflicts. The implications for reducing poverty and inequality are important not only for NTNP but also for other protected areas in the tropics, mainly because most of the global key conservation areas are situated in the regions with population facing severe poverty issues (B. Fisher and Christopher, 2007). A global review by Soliku and Schraml (2018) has shown that restricting access to resources inside the park is one of the most commonly reported conflicts in protected area management. To minimise people-park conflicts, protected area managers should consider the important role of forest resources in reducing local poverty and inequality and should introduce adaptive regulations that allow the sustainable use of certain forest products that are important for sustaining local livelihoods. However, it should be noted that increasing forest income opportunity does not always reduce income inequality. Pro-poor management strategies are necessary to avoid the problem of elite capture by wealthy households.

Objective three explores the potential role of traditional ecological knowledge in conservation and natural resource management. Empirical evidence reaffirms that local people possess diverse knowledge and practices that are important for conservation and sustainable management of natural resources. Previous studies (e.g. Berkes et al., 2000; Hayes and Ostrom, 2005; Ruiz-Mallén and Corbera, 2013) have argued that the integration of local knowledge and experiences into formal management practices will increase local participation in conservation and will produce effective conservation outcomes. However, this study indicates that the ability to apply such knowledge is greatly influenced by local ecological conditions and cultural context of the society. Especially, knowledge and practices that are associated with normative beliefs are likely to be changed when local belief systems have changed in response to modernisation and acculturation processes. Therefore, protected area managers should consider the dynamic changes in socio-cultural context while attempting to integrate local knowledge into formal management practices.

Objective four demonstrates the selection of management options in accordance with the priorities and interests of local people. The multi-criteria decision analysis indicates that integrating local stakeholders under the co-management scenario is the most effective option to achieve both ecological and social outcomes. Although this outcome is context-specific, the analytical approach could be generalised into other protected areas facing both ecological degradation and social conflicts. The study demonstrates that the identification of different management scenarios permits local stakeholders to trade-off between conservation and development objectives based on local priorities and interests as well as the ecological conditions of natural resources. The use of participative innovation platforms (PIPs) also ensures that different stakeholder interests are taken into account in setting conservation goals and finding solutions to common challenges. This process is particularly important to promote collaboration and learning among stakeholders to ensure long-term conservation outcomes. Therefore, instead of setting top-down conservation goals, protected area managers need to adopt more collaborative approaches that consider both stakeholders' interests and local social-ecological conditions.

In regard to theoretical aspects, the thesis contributes to three major theoretical development in natural resource management. Firstly, the thesis contributes to the theory of coevolution between the social system and natural environment (Norgaard, 1994; Berkes et al., 1998) by providing an empirical case of the Chin indigenous communities in NTNP. For centuries, local people in Chin State had relied on the forest ecosystem for their livelihoods. They had adopted particular livelihood strategies that fit with the social system and natural environment. In order to sustain the local livelihood system, the people had developed tenure institutions and management practices based on traditional knowledge and past experiences. These institutions and management practices were further reinforced by various social mechanisms—such as taboos, rituals, and social sanctions—that had evolved based on local religious belief and cultural practices. These particularly social mechanisms had positive feedbacks on the natural system by maintaining the resilience of the ecological processes. Therefore, analysing resource-use conflicts requires to explore the coevolutionary relationship between the society and natural environment in order to understand the causal linkages between them and to minimise negative feedbacks in the long run.

Secondly, the thesis supports further understanding of the resilience theory by highlighting the important role of social institutions and traditional knowledge in conservation and sustainable management of natural resources. The three case studies have shown that local people are able to develop and apply customary rules and management practices in order to manage land and natural resources. This indicates that the social system has the ability to reorganise and transform its characteristics

in order to adapt to the changing natural environment. The application of different management practices based on local ecological knowledge also indicates that the social system has the ability to observe changes in the natural system and to develop new knowledge by learning through the crisis and experiences. Such knowledge is transmitted through local cultural mechanisms and shared among the communities to avoid further challenges. Therefore, maintaining traditional knowledge and cultural institutions is crucial to promote social-ecological resilience and to achieve the long-term conservation outcome.

Thirdly, the thesis contributes to the theory of change within the social-ecological system by highlighting the patterns of transformation in local tenure regulations, livelihood activities, and cultural practices. For instance, the introduction of formal rules and governance structures have disrupted local institutions by reducing local compliance with tenure regulations. The transition towards the market economy has induced to changes in local livelihood strategies and socio-economic conditions. This particular trend has contributed to the changes in local resource-use patterns by increasing the demand for commercial selling of forest products. Changes in local belief systems also influence socio-cultural practices and reduce local compliance with social sanctions and resource management practices. Therefore, managing social-ecological systems requires understanding social transformation within the society to predict future pathways and to enhance adaptive capacity against undesired changes.

### **8.3 Critical Reflections and Limitations**

The thesis applies the case-study approach to understand the relationship between the national park and local people. Previous studies have indicated that the conservation issues are complex and context-specific so that it requires a diagnostic approach to understand the problems and to identify potential solutions in a particular context (Honadle, 1999; Ostrom, 2007). The case study approach is suitable for this research as it allows to analyse the comprehensive details of the real-life situations and provides context-specific knowledge for further theoretical explanation (Yin, 2009). One critical drawback of the case study approach is the representativeness of the cases towards the whole target population (Thomas, 2014). However, this does not limit the outcome of this thesis since its primary goal is to understand the phenomenon of conflicts and to find out possible pathways for preventing such conflicts in the future.

The three cases were purposively selected rather than using random sampling techniques. This strategy is particularly useful to capture the most common conflicts between the park and local people, which may be undermined if the random sampling

techniques are applied (Flyvbjerg, 2006). The use of embedded case studies allowed applying the counter-factual technique to understand the impact of conservation regulations on local indigenous people. In particular, the comparative analyses between communities located inside, bordering, and outside the national park provided an opportunity to filter out the problems that were (not) explicitly related to the protected area regulations (Clements et al., 2014). The mixed-method approach also permitted capturing the complex societal problems in a more holistic way. Especially, the qualitative interviews provided a comprehensive description of local situations and associated challenges based on the participants' knowledge and past experiences, whereas the quantitative surveys allowed applying the inferential statistics to draw the empirical conclusions (Creswell, 2009).

Regarding analytical methods, the participatory land-use mapping exercises helped to explore the detailed arrangements of the local land tenure system. Instead of using the official cadastral maps, this method allowed understanding not only local tenure arrangements but also the history of land ownership and land-use conflicts within the community. Since local people were not familiar with the topographic maps, the use of high-resolution Google-Earth images provided visual aids during the mapping processes. The property right concept also helped to explore the detailed insights of local tenure arrangements among the case study communities. The bundle of rights associated with each property regime also offered more profound understandings of the conflicts between customary and state land tenure systems. However, as argued by Ribot and Peluso (2003), the property rights concept failed to capture the bundles of power in order to understand the local ability to enjoy the rights.

The classification between cash and subsistence income offered a unique opportunity to highlight the relative importance of forests for local livelihoods. Previous studies in southern Chin State (e.g. UNDP, 2011; Vicol et al., 2018; Win et al., 2012) primarily focused on cash income only in determining household livelihood conditions. The exclusion of subsistence income often undermined the role of forests in poverty alleviation and may lead to the conversion of forest into other land-use types. The classification of household livelihood strategies often faced challenges due to the diversification of income sources (Ellis, 1998). In this study, the agglomerative hierarchical clustering technique was applied together with the PCA to differentiate livelihood strategies of rural households. Although the clustering can be done by using Hierarchical Cluster Analysis (HCA) alone, the application PCA prior to clustering produced more homogeneous clusters than direct clustering without using PCA (see Tesfaye et al., 2011; Chilongo, 2014). In addition to simple differentiation between rich and poor (e.g. P. S. Aung et al., 2015), the comparison of forest income among different livelihood clusters further explains the inter-relations between forest dependency and

households' livelihood choices. This information is particularly important to identify targeted-oriented interventions that promote livelihood strategies with less dependency on forest resources.

The comparison of poverty measures between with and without forest income provides simple but powerful insights for policymakers regarding the impact of conservation regulations on poverty reduction. The use of FGT decomposable framework (Foster et al., 1984) allowed analysing not only the proportion of poor households but also the severity and differences in poverty impacts by conservation regulations. Moreover, the FGT method provided better understandable, theoretically sound, and applicable poverty measures compared to other assessment methods (Foster et al., 2010). Regarding the effect of forest income on inequality, the use of Gini decomposable technique proposed by Lerman and Yitzhaki (1985) offered more useful insights than using the standard Gini coefficient methods. For instance, the results show that although forest income reduces inequality in the current situation, the Gini decomposition results indicate that increasing forest income may increase income inequality among households. This particular knowledge is essential in promoting forest-related rural development strategies in order to reduce income inequality among rural households.

The informant consensus approach allowed measuring the variations in individual knowledge regarding TEK-based management practices. The use of this approach for quantitative measurement is important for policymakers in selecting a particular TEK to be integrated into formal management practices. The separation between awareness and compliance scores helped to indicate the gap between knowing a particular practice and the actual compliance with it. Therefore, the difference between these two domains should be taken into account in assessing local knowledge for sustainable resource management (Byg and Balslev, 2001).

The participatory scenario planning approach supported to identify options for trade-offs between conservation and development in the future. The combination with Multiple Criteria Decision Analysis (MCDA) method enabled to select the most relevant option to achieve the desired objectives. However, one should be noted that although MCDA provides the optimal solution, it does not necessarily mean that it will provide the right decision. The potential for achieving the right decision is usually shaped by several factors including the selection of criteria and the relative weight given to each criterion (Belton and Stewart., 2002). Furthermore, the results from the participatory scenario planning workshops are usually subjective and are highly associated with participant representation and the potential rejection by the non-participants (Rowland et al., 2014). These types of uncertainties were minimised



in this study by inviting the village administrators who are responsible for the future development of their respective villages. The criteria for MCDA were selected based on sustainable development perspectives. Moreover, each criterion was discussed with local stakeholders for approval before conducting the analysis process. Nevertheless, the results of the thesis can only be considered as subjective outcomes. Further discussions are necessary to achieve the optimal decision before actual implementation.

Apart from the methodological critics, the thesis has several limitations. First, the historical interrelations between the national park and local people were discussed based on previous literature and key informant interviews rather than based on continuous monitoring of key indicators to determine the changes. To achieve an empirical model of coevolutionary change, it is necessary to establish a long-term monitoring framework with specific indicators that can verify the reciprocal relationships among the components of the target social-ecological system (Norgaard and Kallis, 2011). Second, local compliance with tenure rules was determined based on the self-evaluated responses instead of direct monitoring of the respondents' actual compliances. However, this research tried to minimise the respondents' bias by a careful explanation of research purposes and modification of interview questions in accordance with the local context. For instance, instead of asking whether the respondent followed the identified tenure rules or not, the question was modified in a way that whether the respondent will be able to follow if the rule is legalised as formal regulation.

Third, there is a limitation regarding the seasonality of local livelihood activities. All data were mainly collected during the open season (from January to June) so that the author could not participate in major livelihood activities during the rainy season. Although the author recognises the importance of direct observations in social research, the combination of heavy rainfalls and mountainous topography made it difficult to access the study villages during monsoon period. Therefore, the majority of livelihood activities in that period had to be validated based on the focus group discussions with park rangers and local experts. Fourth, although this research tried to explore local TEK practices, it was not possible to uncover all TEK practices used by the study communities in a short period. The language barriers between the author and local respondents made it difficult to have more interactive discussions regarding TEK practices. Furthermore, it should be noted that this research is highly ethnographic and does not include ecological analyses in order to provide scientific proof regarding the actual impact of TEK practices. However, the potential effects of TEK practices were validated with local experts and workshop participants. Nevertheless, empirical assessments are still necessary in order to verify the actual effectiveness of TEK practices on the sustainability of natural resources.



## 8.4 Outlook and Suggestions for Further Research

Despite the increasing critics, protected areas are still crucial to preserve the global biodiversity and related ecosystem services. The expansion of protected areas has rapidly increased due to increasing advocates by national governments, international organisations, and conservation activists. Moreover, the purpose of protected areas has become not only to protect the endangered species and related habitats but also to achieve broader objectives including national economic development through tourism revenue, preservation of cultural identity, and improving resilience against climate change. The increasing number of protected areas has induced conflicts with local communities in fulfilling livelihood needs and economic development to step out of poverty. The conflicts have become more prominent in developing countries particularly among communities who rely on land-based economic activities. The rapid growth of rural population has increased local demand for land and forest products. The political movements for indigenous rights have worsened the conflicts since many of the remaining natural landscapes are overlapping with the land owned by indigenous people. These conflicts have driven the protected area managers to find a way to achieve conservation and minimise conflicts with local people.

The thesis indicates that the integration of local resource need, cultural institutions, and traditional knowledge into conservation practices is crucial not only to achieve long-term protection of natural resources but also to reduce people-park conflicts. These objectives can be achieved by establishing co-management arrangements that enable to share the decision-making power and management responsibilities between the government and local people. The outcomes will lead to the self-enforcement of conservation practices within the communities instead of forced regulations. The thesis highlights that local institutions, livelihood strategies, and management practices are not static but are changing over time in response to the changes in technology, market, and cultural beliefs within the society. Therefore, it is crucial to design co-management strategies that are adapted to changing social and environmental conditions.

Although adaptive co-management is a potential tool to reduce social conflicts and to enhance local participation, challenges remain in implementing this approach effectively. Particularly, adaptive co-management is a long-term process with continuous learning and adjustments in response to changes in the social-ecological system. This process requires creating a policy environment that enables better collaborations at both national and regional government organisations. The co-management arrangements should be flexible to motivate social learning and adaptation without having complex bureaucratic procedures to re-organise the management objectives. It should

minimise power asymmetry among local stakeholders to allow the actual participation of all stakeholders in decision-making processes. It should also increase public incentives to achieve the continuous commitments of the participants throughout the implementation phases.

Future studies should focus on four main thematic areas to ensure effective implementation of adaptive co-management activities. First, research on political economy is needed in order to understand the political, economic, and social forces that influence the social-ecological transformation at local levels. Second, research on social networks should be conducted in order to understand the relationship and communication networks among the stakeholders. It is particularly important to initiate social learning processes to achieve trust-building, information sharing, and collaborative decision-making practices (Calvet-Mir et al., 2015). Third, future research should focus on power relationships among the stakeholders in order to achieve the long-term implementation of local governance structure and conflict resolution processes. Careful examination of local power sources and its manifestation on collaboration and conflict resolution is essential in order to build individual trusts and social learning process among the participants (Armitage et al., 2009). Fourth, future research should find out not only alternative livelihood opportunities but also options to improve pre-existing livelihood strategies in order to increase local resilience against poverty (Sene-Harper et al., 2019). Although promoting ecotourism is considered a noble strategy to achieve both conservation and economic development (Sims, 2010), studies have shown that the majority of tourism benefits are obtained by a smaller group of powerful actors who mainly live closer to the most tourist attraction areas (see Adams and Infield, 2003; Ezebilo and Mattsson, 2010). Greater attention should be given towards livelihood diversification studies and value chains analysis of certain products in order to maintain local resilience and to achieve economic development at the regional level.

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# APPENDIX A

## SUPPLEMENTARY INFORMATION

### Case-I: Makyar Village Tract

*Biophysical information:* Makyar village tract is located in Kanpetlet township at approximately about 25 km from the town. The village tract is situated on a steep mountain slope with an elevation ranging from 1,000 m to 2,500 m above sea level. The vegetation structure around the village tract is characterised by three different forest types: laurel and stone oaks forest, semi-evergreen montane forest, and the secondary fallow forest. Most common tree species are *Schima wallichii*, *Engelhardia spicata*, *Lithocarpus xylocarpus*, and *Pinus kesiya*. There are four villages in Makyar village tract, namely *Makyar A*, *Makyar B*, *Makyar C*, and *Makyar D* villages. The general characteristics of villages in Makyar village tract is presented in Table (A.1).

Table A.1: General characteristics of Makyar village tract

Descriptions	Villages			
	Makyar A	Makyar B	Makyar C	Makyar D
Village area [km <sup>2</sup> ]	4.88	21.37	2.95	3.23
No. of household	21	26	23	42
Total population	121	145	140	241
Population density [per km <sup>2</sup> ]	24.8	6.79	47.46	74.61
No. of clans	4	4	2	2

*Source:* Field survey (2017)

*Settlement history:* Originally, Makyar village tract belongs to the *Nga* tribal group. During the pre-colonial time, there was only one village in the area, namely *Makyar* village. It was founded by one of the *Aum Laung* clan members. When the founder passed away, his younger son separated the territory and established a new settlement, namely *Makyar A* village. Later in 1945, a few migrants from Mindat requested *Makyar A* Chief to let them stay in his territory. Since they came from a different tribal group, the newcomers established a new village within *Makyar A* territory, namely *Makyar B* village. A few years later, another group of migrants from Mindat requested the Chief to establish a new village, namely *Makyar C* village. Later

in 1970, the Makyar B had divided due to social conflicts and founded a new village namely *Makyar D* village. When the national park was established, most agricultural and forest areas owned by these villages were included in the national park. However, later in 2013, all of the four settlements had moved into the national park area in order to get better access to the road. As of 2017, only one village had legal permission and the other three villages are still regarded as 'illegal settlements' inside the park (Figure A.1).

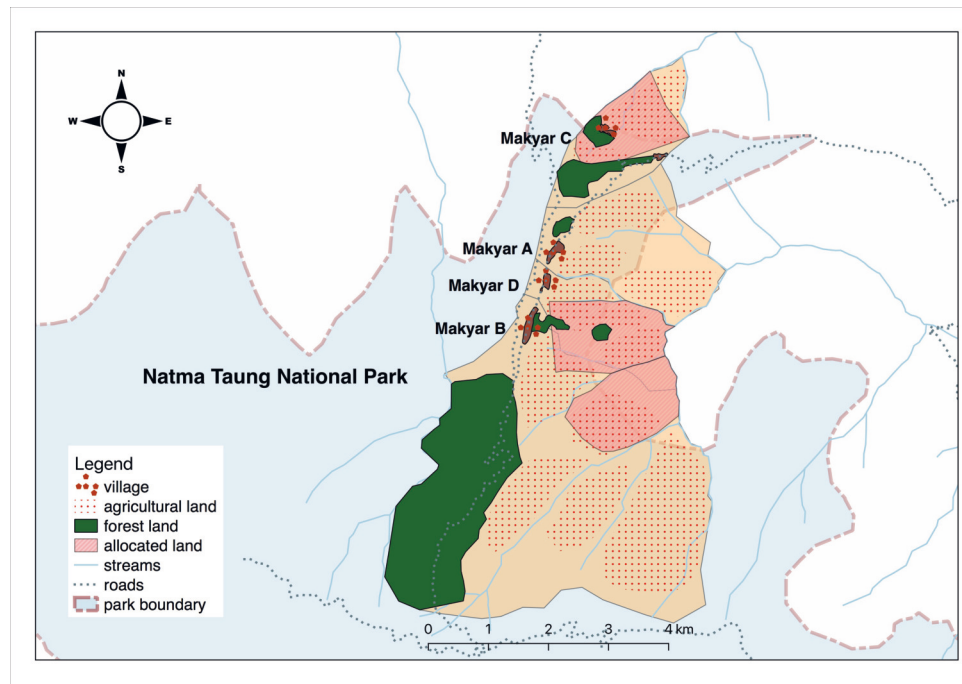


Figure A.1: Land-use map of Makyar village tract

Source: Participatory land-use mapping, 2017.

*Livelihood activities and income sources:* Collection of forest products is the most common livelihood activity in Makyar village tract. The average annual forest income is about 680.48 USD<sup>1</sup> per household. The majority of forest income is contributed by subsistence use of forest products. Only 34% of households receive cash forest income that represents about 8% of total household income (Table A.2). About 92% of households reported to engage in agriculture within the last twelve months. About 54% of farmers practise shifting cultivation whereas only a few farmers have started permanent farming. The main types of crops are maize, potato, and yam whereas a few farmers grow other cash crops such as black pumpkin, avocado, and millets. The average agricultural income is about 273.71 USD per household, of which 83% is received as cash income. More than 80% of households raise livestock with an average TLU of about 0.71 per household. The most common type of livestock is chicken raised by 82% of households. Moreover, about 72% have pigs, 66% have goats, and 10% have mithan on their farms. Livestock is raised at a small scale mainly for subsistence consumption. However, occasional selling of livestock is done within the village tract. The average livestock income is about 153.29 USD, of which cash income contributes about 41% of total livestock income.

<sup>1</sup>The exchange rate for one US Dollar is 1,234 Myanmar Kyats in 2016.

Table A.2: Income structure in Makyar village tract (n=50)

Income sources	All sample [USD/year]					Earners [USD/year]		
	mean	min	max	SD	%	hh	mean	%
Forest	680.48	118.68	2749.23	455.96	49	50	680.48	49
sale	115.35	0.00	1620.75	320.85	8	17	339.26	24
use	565.13	112.52	1172.97	307.13	41	50	565.13	41
Agriculture	273.71	0.00	1081.85	191.95	20	46	297.51	21
cash crop	227.03	0.00	1081.85	196.59	16	44	257.98	19
food crop	46.68	0.00	245.54	55.29	3	32	72.94	5
Livestock	153.29	0.00	688.82	146.33	11	46	166.62	12
sale	64.13	0.00	615.88	105.8	5	29	110.57	8
consume	89.16	0.00	421.39	96.04	6	44	101.32	7
Wages	160.36	0.00	1134.52	284.19	12	24	334.07	24
Non-farm	117.59	0.00	1653.16	297.48	8	19	309.44	22
Total	1385.42	481.52	3018.38	598.23	100	50	1385.42	100

Note: SD=standard deviation; %=share of total income; hh=income earning households

About 48% of households receive cash income from wage labour, mainly from working in other farms or at government projects near the villages. An average income from wage labour is about 160.36 USD per year which are received as cash income only. In addition to wage labour, about 38% of households engage in non-farm activities such as petty trades, gifts, and remittance from family members. The average non-farm income is about 117.59 USD per year mainly contributed from household members who are working in the cities. A total of eleven people has been working in Malaysia. However, it is reported that most emigrants do not provide any remittance to their families.

*Classification of livelihood clusters:* The principal component analysis shows three main components with eigenvalues greater than 1.0. Using the first three components, the hierarchical cluster analysis (HCA) identifies three distinct combinations of livelihood clusters as indicated in Figure A.2. Each livelihood cluster is named according to relative contributions of cash income from each source. The reason to use cash income to name the livelihood clusters is that the villagers usually mention about their livelihood strategies based on cash income sources. Among the three clusters, the first cluster is named as *Agriculture–Non-farm* cluster since the majority of cash income is contributed from agriculture (29.84%) and no-farm income sources (12.98%) (Table A.3). The second cluster is *Agriculture–Wage* cluster since the majority of cash income come from agriculture (13.97%) and wage labour (13.57%). The third cluster is *Forest–Wage* cluster as the majority of income is contributed by forest income (32.34%) and wage labour (25.13%).

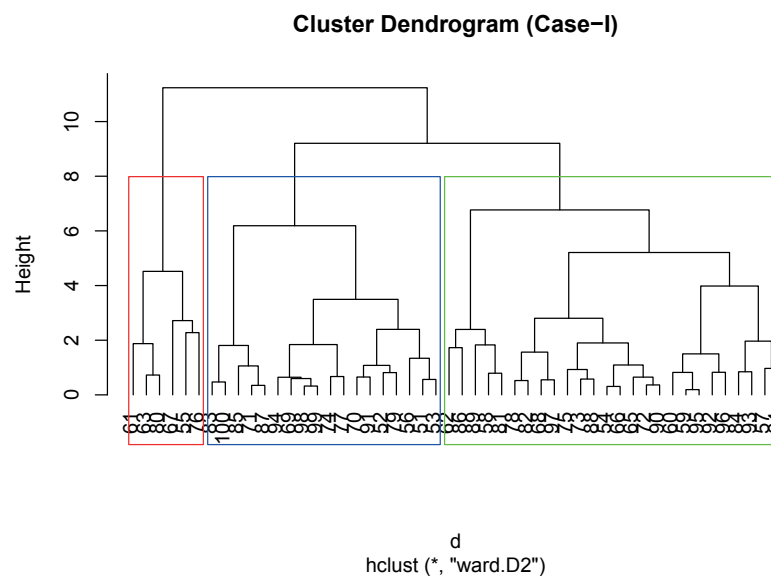


Figure A.2: Cluster dendrogram of sample households in Makyar village tract (n=50)

Table A.3: Share of sectoral income by livelihood clusters in Makyar village tract

Category	Agri–Non-farm	Agri–Wage	Forest–Wage	$\chi^2$
	Cluster 1	Cluster 2	Cluster 3	
Agri share	32.59 <sup>a</sup>	18.80 <sup>a</sup>	0.52 <sup>b</sup>	18.89 <sup>***</sup>
cash	<b>29.84<sup>a</sup></b>	<b>13.97<sup>b</sup></b>	0.45 <sup>c</sup>	19.34 <sup>***</sup>
subsistence	2.76 <sup>a</sup>	4.83 <sup>b</sup>	0.07 <sup>a</sup>	11.72 <sup>**</sup>
Forest share	37.82 <sup>a</sup>	51.85 <sup>b</sup>	60.41 <sup>b</sup>	11.53 <sup>**</sup>
cash	4.50 <sup>a</sup>	2.48 <sup>a</sup>	<b>32.30<sup>b</sup></b>	11.25 <sup>**</sup>
subsistence	33.32 <sup>a</sup>	49.37 <sup>b</sup>	28.11 <sup>ab</sup>	10.85 <sup>**</sup>
Livestock share	16.37 <sup>a</sup>	11.03 <sup>a</sup>	2.04 <sup>b</sup>	6.46 <sup>*</sup>
cash	10.21 <sup>a</sup>	2.67 <sup>b</sup>	0.87 <sup>b</sup>	9.46 <sup>**</sup>
subsistence	6.16 <sup>ab</sup>	8.36 <sup>a</sup>	1.17 <sup>b</sup>	8.98 <sup>*</sup>
Wages share	0.23 <sup>a</sup>	<b>13.57<sup>b</sup></b>	<b>25.13<sup>b</sup></b>	21.39 <sup>***</sup>
Non-farm share	<b>12.98</b>	4.75	11.90	3.52
Total income [USD]	1,162	1,392	2,026	5.13
% of households	36	52	12	

Note: Values marked with the same superscript letters are not significantly different (Dunn's test,  $p > 0.05$ );  $\chi^2$  = Kruskal-Wallis Chi-squared; Agri = Agriculture; \*= $p < 0.05$ ; \*\*= $p < 0.01$ ; \*\*\*= $p < 0.001$ . n=50.



## Case-II: Ung Village Tract

*Biophysical information:* Ung village tract is located in Mindat township. The village tract is characterized by steep mountainous terrains with an elevation ranging from 900 m to 2,500 m at its peaks. There are three different forest types in Ung village tract: i) degraded secondary forest, ii) montane evergreen forests, and iii) pine forests. Most common tree species are *Lithocarpus xylocarpus*, *Quercus semecarpifolia*, *Pinus kesiya*, and other sub-tropical montane species. Ung village tract is composed of four villages namely, *Ung A*, *Ung B*, *Ung C*, and *Ung D*. The general characteristics of Ung village tract is presented in Table (A.4).

Table A.4: General characteristics of Ung village tract

Descriptions	Villages			
	Ung A	Ung B	Ung C	Ung D
Village area [km <sup>2</sup> ]	31.8	24.61	16.16	23.38
No. of household	58	55	26	22
Total population	340	327	165	119
Population density [per km <sup>2</sup> ]	10.69	13.29	10.21	5.09
No. of clans	1	1	2	1

*Settlement history:* All villages in Ung village tract are located along the western border of the national park. The villages were established since the pre-colonial period. Originally, the villages were situated in the valley near to the *Mon Chaung* stream. Later, they have moved closer to the national park in order to avoid landslides and to have better access to the roads. The village territories and locations are presented in Figure (A.3).

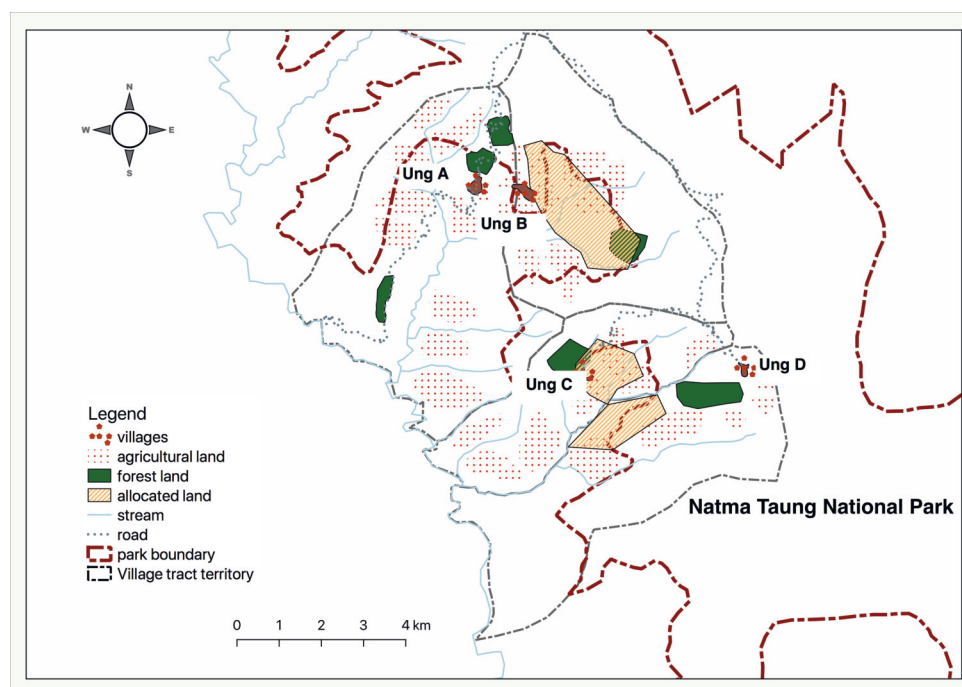


Figure A.3: Land-use map of Ung village tract (Source: Participatory land-use mapping, 2017)

*Livelihood activities and income sources:* Collection of forest product is the most common livelihood activity in Ung village tract. On average, households receive about 944.16 USD per year from the sale and consumption of forest products. About 62% of households reported to receive cash forest income with an average of about 145.36 USD per year (Table A.5). The average agricultural income is about 592.86 USD per year contributing about 22% of total household income. The most common cash crop is yam cultivated by 94% of households. Other important crops include red millet, maize, and potato.

Table A.5: Income structure in Ung village tract (n=50)

Category	All sample [USD/year]					Earners [USD/year]		
	mean	min	max	SD	%	hh	mean	%
Forest	944.16	208.31	2361.22	610.31	35	50	944.16	35
sale	145.36	0.00	854.94	215.68	5	31	234.46	9
use	798.79	193.68	1974.31	548.39	30	50	798.79	30
Agriculture	592.86	85.09	1495.14	316.97	22	50	592.86	22
cash crop	543.14	85.09	1456.65	301.00	20	50	543.14	20
food crop	49.71	0.00	184.18	49.53	2	36	69.05	3
Livestock	707.97	0.00	3330.63	679.62	27	47	753.16	28
sale	584.70	0.00	2917.34	612.81	22	44	664.43	25
consume	123.27	0.00	729.34	166.59	5	40	154.09	6
Wages	140.23	0.00	1215.56	324.72	5	15	467.42	18
Non-farm	285.74	0.00	2431.12	528.16	11	19	751.94	28
Total	2670.95	897.65	6011.82	1214.00	100	50	2670.95	100

Note: SD=standard deviation; %=share of total income; hh=income earning households.

The average income from livestock is about 748.49 USD per year, of which 80% is contributed as cash income. The most common livestock is Mithan raised by 68% of total households. Other important livestock includes pig and chicken, raised by 56% and 64% of households respectively. About 36% of households have reported receiving income from wage labour mainly working for wealthy farmers during weeding and crop harvesting. The average wage income is about 140.23 USD per household that contributes about 5% of total income. In addition to wage labour, about 34% receive income from non-farm employment activities such as trade business, remittance, gifts, and support from rural development projects. The average non-farm income is about 285.74 USD per year contributing about 11% of total income.

*Classification of livelihood clusters:* The principal component analysis produces four main components with eigenvalue greater than one. The hierarchical cluster analysis (HCA) indicates three distinct combinations of livelihood clusters in Ung village tract (Figure A.4). Each cluster is named based on the contribution of cash income from each source (Table A.6). The first cluster is considered as the *Agriculture–Wage* strategy because the majority of cash income is contributed by agriculture (31.39%) and wage labour (14%). The second cluster is *Non-farm–Livestock* strategy, where the majority of cash income is received from non-farm employment (28%) and livestock farming (25.88%). The third cluster is *Livestock–Agriculture* strategy because cash income is mainly contributed by livestock (26.15%) and agriculture (18.76%).

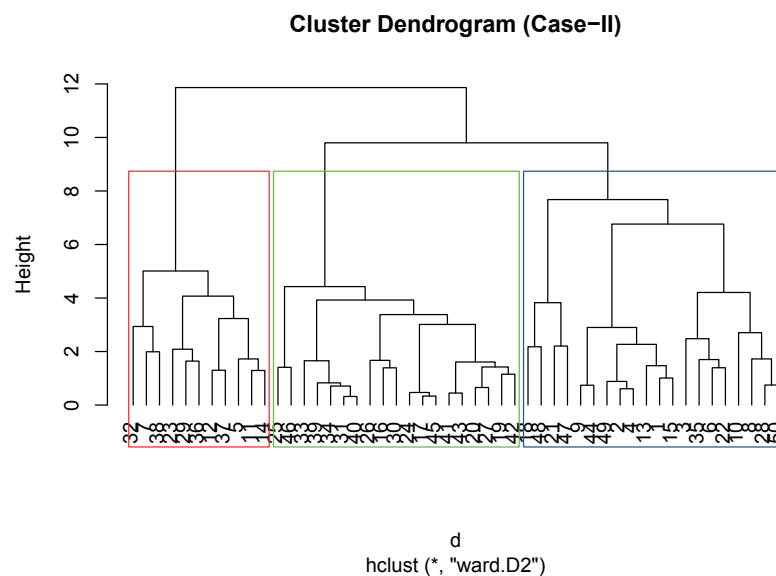


Figure A.4: Cluster dendrogram of sample households in Ung village tract (n=50)

Table A.6: Share of sectoral income by livelihood clusters in Ung village tract

Category	Agri-Wage	Non-farm- Livestock	Livestock-Agri	$\chi^2$
	Cluster 1	Cluster 2	Cluster 3	
Agriculture share	33.98 <sup>a</sup>	8.84 <sup>b</sup>	21.02 <sup>a</sup>	20.12 <sup>***</sup>
cash	<b>31.39<sup>a</sup></b>	8.84 <sup>b</sup>	<b>18.76<sup>a</sup></b>	17.99 <sup>***</sup>
subsistence	2.59 <sup>a</sup>	0.00 <sup>b</sup>	2.26 <sup>a</sup>	23.99 <sup>***</sup>
Forest share	30.26 <sup>a</sup>	32.85 <sup>a</sup>	39.65 <sup>b</sup>	14.89 <sup>***</sup>
cash	4.90 <sup>a</sup>	4.03 <sup>a</sup>	6.43 <sup>b</sup>	7.83 <sup>*</sup>
subsistence	25.36 <sup>a</sup>	28.82 <sup>ab</sup>	33.22 <sup>b</sup>	14.25 <sup>***</sup>
Livestock share	16.59 <sup>a</sup>	29.94 <sup>ab</sup>	31.07 <sup>b</sup>	13.10 <sup>**</sup>
cash	12.05 <sup>a</sup>	<b>25.88<sup>ab</sup></b>	<b>26.15<sup>b</sup></b>	14.57 <sup>***</sup>
subsistence	4.54	4.06	4.92	5.50
Wages share	<b>14.00<sup>a</sup></b>	0.37 <sup>b</sup>	2.07 <sup>b</sup>	7.90 <sup>*</sup>
Non-farm share	5.17 <sup>a</sup>	<b>28.00<sup>b</sup></b>	6.19 <sup>a</sup>	15.17 <sup>***</sup>
Total income [USD]	1990 <sup>a</sup>	2678 <sup>ab</sup>	3383 <sup>b</sup>	6.36 <sup>*</sup>
% of households	40	22	38	

Note: Values marked with the same superscript letters are not significantly different (Dunn's test,  $p < 0.05$ );  $\chi^2$  = Kruskal-Wallis Chi-square; Agri=Agriculture; \*= $p < 0.05$ ; \*\*= $p < 0.01$ ; \*\*\*= $p < 0.001$ ; n=50.

### Case-III: Kitaw Village Tract

*Biophysical information:* Kitaw village tract is located in Kanpatlet township. The village tract is situated on rough mountains ranging from 800 m to 2,100 m above sea level. The vegetation structure is characterised by secondary dipterocarpus forests in lower altitudes and several patches of alpine forests at top ridges. Most common tree species are *Pinus kesiya*, *Dipterocarpus tuberculatus*, *Shorea obtusa*, and *Alstonia spp.*. There are four villages in Kitaw village tract, namely Kitaw A, Kitaw B, Kitaw C, and Kitaw D. The general characteristics of Kitaw village tract is presented in Table A.7.

Table A.7: General characteristics of Kitaw village tract

Descriptions	Villages			
	Kitaw A	Kitaw B	Kitaw C	Kitaw D
Village area [km <sup>2</sup> ]	7.87	25.85	6.53	0.67
No. of household	40	44	33	10
Total population	208	268	217	64
Population density [per km <sup>2</sup> ]	26.43	10.37	33.23	95.52
No. of clans	1	1	2	1

Source: Field survey (2017)

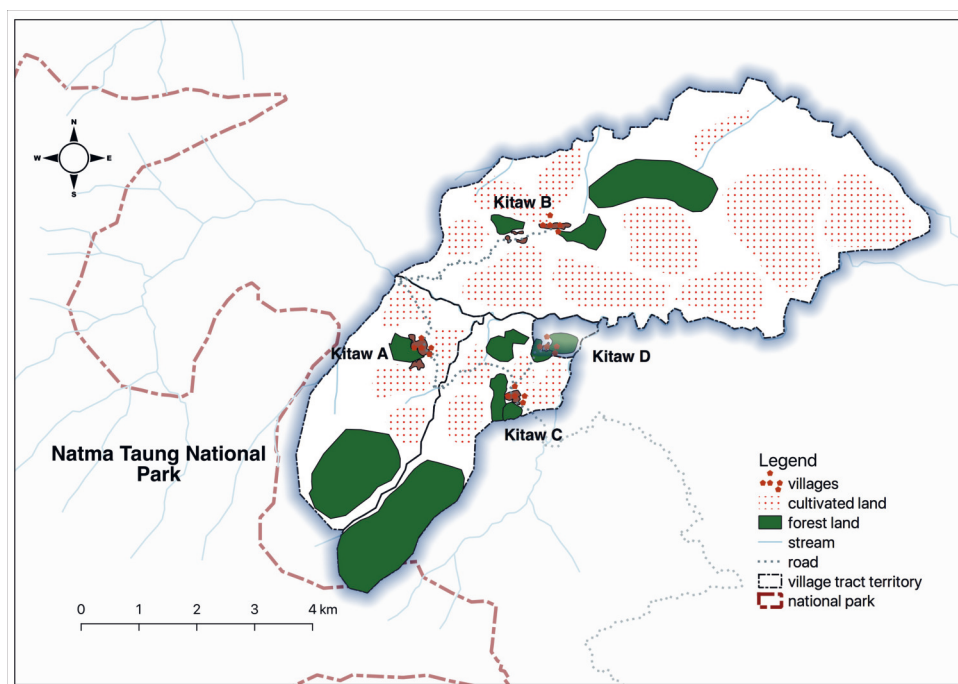


Figure A.5: Land-use map of Kitaw village tract

Source: Participatory land-use mappings, 2017.

*Settlement history:* All villages in Kitaw village tract are located outside the national park (Figure A.5). Among the four villages, *Kitaw A* was established before the British occupation. *Kitaw B* and *Kitaw C* were established during British administration, and *Kitaw D* was established after

the independence. All villages are located outside the national park. Originally, the settlements were located on the steep mountain slopes. The old locations were closer to the streams where they had better defence position and easier access to the stream water. Later, the settlement areas were moved up to the mountain ridges where they had better access to the roads.

*Local activities and income sources:* Forests contribute the highest share of income in Kitaw village tract. The average forest income is about 485.67 USD per year. The majority of forest income is contributed by subsistence use of forest products, where only 20% of households receive cash income from selling forest products (Table A.8). The average contribution of cash forest income is 2% which is relatively low compared to subsistence forest income (26%).

Table A.8: Income structure in Kitaw village tract (n=50)

Category	All sample [USD/year]					Earners [USD/year]		
	mean	min	max	SD	%	hh	mean	%
Forest	485.67	157.41	1442.95	280.65	29	50	485.67	29
sale	36.22	0.00	810.37	127.39	2	10	181.12	11
use	449.45	157.41	1256.12	243.61	26	50	449.45	26
Agriculture	477.65	0.00	1799.03	347.81	28	49	487.40	29
cash crop	383.52	0.00	1799.03	350.24	23	44	435.82	26
food crop	94.13	0.00	357.37	84.93	6	38	123.86	7
Livestock	225.35	0.00	1455.43	304.72	13	47	239.73	14
sale	101.81	0.00	1280.39	222.38	6	29	175.54	10
consume	123.53	0.00	1049.43	179.64	7	43	143.64	8
Wages	109.32	0.00	1458.67	262.13	6	23	237.65	14
Non-farm	403.79	0.00	6320.91	1136.22	24	18	1121.65	66
Total	1701.79	511.14	7225.36	1366.44	100	50	1701.79	100

Note: SD=standard deviation; %=share of total income; hh=income earning households.

About 98% of total households reported receiving income from agriculture within the last twelve months. The main crops used for agriculture are yam and maize, which are grown by 84% and 82% of households respectively. The average income from agriculture is about 477.65 USD per year representing about 28% of total household income. About 94% of households raise livestock in their farm. The most common livestock are chicken, pig, goat, and mithan with an average TLU of 0.7 per household. The average income from livestock is about 225.35 USD per year contributing about 13% of total household income. About 58% of households reported receiving cash income from livestock contributing about 45% of total livestock income.

About 46% of households received cash income from wage labour, particularly in government construction projects as well as weeding and harvesting of yam in other farms. The average income from wage labour is about 109.32 USD per household, contributing about 6% of total household income. Income from non-farm activities is also common in Kitaw village tract. About 48% of households reported receiving cash income from non-farm activities, particularly from government salaries, petty trades, and remittance from family members. The average

income from non-farm activities is about 403 USD per year contributing about 24% of total household income. The maximum amount of non-farm income is about 6320.91 USD per year, mainly received from government salaries of the family members.

*Classification of livelihood clusters:* The principal component analysis produces four main components with eigenvalue greater than one. The hierarchical cluster analysis (HCA) indicates three distinct combinations of livelihood clusters in Ung village tract (Figure A.6). Each cluster is named based on the contribution of cash income from each source (Table A.9). Among the three clusters, the first cluster is considered as *Non-farm–Agriculture* cluster mainly because households in this cluster receive the highest share of cash income from non-farm employment (32.36%) and agriculture (25.78%). The second cluster is considered as *Non-farm–Agri–Wage* cluster, where households received the majority of cash income from non-farm employment (27.42%), agriculture (22.84%), and wage labour (14.30%). The third cluster is named as *Wage–Agriculture* cluster where households receive the majority of cash income both from wage labour (14.99%) and agricultural crops (14.49%). In contrast to the first two clusters, households in this cluster do not receive any income from non-farm employment.

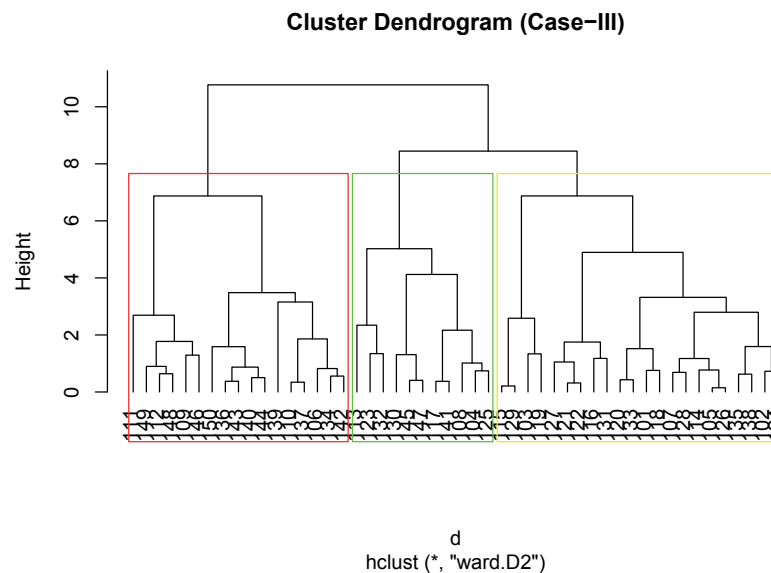


Figure A.6: Cluster dendrogram of sample households in Kitaw village tract (n=50)

Table A.9: Share of sectoral income by livelihood clusters in Kitaw village tract

Category	Non-farm– Agri–Livestock	Non-farm– Agri–Wage	Wage–Agri– Forest	$\chi^2$
	Cluster 1	Cluster 2	Cluster 3	
Agri share	30.08 <sup>a</sup>	28.49 <sup>ab</sup>	22.89 <sup>b</sup>	15.87 <sup>***</sup>
cash	<b>25.78<sup>a</sup></b>	<b>22.84<sup>ab</sup></b>	<b>14.49<sup>b</sup></b>	14.96 <sup>***</sup>
subsistence	4.30	5.65	8.40	1.61
Forest share	21.82 <sup>a</sup>	19.24 <sup>b</sup>	52.17 <sup>c</sup>	15.70 <sup>***</sup>
cash	0.17 <sup>a</sup>	0.04 <sup>a</sup>	<b>8.51<sup>b</sup></b>	8.34 <sup>*</sup>
subsistence	21.64 <sup>a</sup>	19.20 <sup>b</sup>	43.67 <sup>a</sup>	11.02 <sup>**</sup>
Livestock share	15.51 <sup>a</sup>	10.55 <sup>ab</sup>	9.94 <sup>b</sup>	7.87 <sup>*</sup>
cash	<b>9.39<sup>a</sup></b>	0.36 <sup>b</sup>	2.31 <sup>b</sup>	21.27 <sup>***</sup>
subsistence	6.13	10.19	7.63	3.22
Wages share	0.23 <sup>a</sup>	<b>14.30<sup>b</sup></b>	<b>14.99<sup>b</sup></b>	22.12 <sup>***</sup>
Non-farm share	<b>32.36<sup>a</sup></b>	<b>27.42<sup>a</sup></b>	0.00 <sup>b</sup>	13.79 <sup>**</sup>
Total income [USD]	2211	1476	1189	10.70
% of households	44	22	34	

Note: Values marked with the same superscript letters are not significantly different (Dunn's test,  $p < 0.05$ );  $\chi^2$  = Kruskal-Wallis Chi-square; Agri = Agriculture; \*= $p < 0.05$ ; \*\*= $p < 0.01$ ; \*\*\*= $p < 0.001$ ;  $n = 50$ .



## APPENDIX B

### LIST OF KEY INFORMANTS AND WORKSHOP PARTICIPANTS

Table B.1: List of key informant interviews

ID	Date	Interviewee	Organization/village
KI-1	18/5/2016	Park Warden	Natma Taung National Park
KI-2	20/5/2016	Assistant engineer	Kanpatlet Municipality
KI-3	2/6/2016	Township Officer	Mindat Municipality
KI-4	20/5/2016	Township Officer	Rural Development Department
KI-5	23/5/2016	Township Officer	Department of Agriculture
KI-6	23/5/2016	Township Officer	Department of Cooperatives
KI-7	24/5/2016	Township Officer	Township Forest Department
KI-8	2/6/2016	Assistant Director	District Forest Department
KI-9	8/2/2017	Traditional head	Makyar A village
KI-10	8/2/2017	Villager	Makyar A village
KI-11	19/2/2017	Committee member	Ung B village committee
KI-12	18/2/2017	Administrator	Ung village tract
KI-13	19/2/2017	Committee member	Ung B village committee
KI-14	22/2/2017	Village headman	Ung C village
KI-15	23/2/2017	Village elder	Ung C village
KI-16	23/2/2017	Village elder	Ung C village
KI-17	24/2/2017	Village headman	Ung D village
KI-18	24/2/2017	Village council member	Ung D village
KI-19	25/2/2017	Village elder	Ung A village
KI-20	11/2/2017	Village headman	Makyar B village
KI-21	9/2/2017	Village elder	Makyar A village
KI-22	24/3/2017	Administrator	Kitaw village tract
KI-23	13/5/2017	Village elder	Ung A village
KI-24	1/4/2017	Village elder	Kitaw C village

*Continued on next page*

Table B.1: (continued)

ID	Date	Interviewee	Organization/village
KI-25	2/4/2017	Village elder	Kitaw A village
KI-26	2/4/2017	Village headman	Kitaw A village
KI-27	31/3/2017	Village headman	Kitaw C village
KI-28	3/4/2017	Village headman	Kitaw D village
KI-29	3/4/2017	Village headman	Makyar C village
KI-30	15/2/2017	Village headman	Makyar D village
KI-31	14/5/2017	Village priest	Ung B village
KI-32	1/4/2017	Village elder	Kitaw C village
KI-33	16/5/2017	Township Officer	Department of Agriculture
KI-34	16/5/2017	District Officer	Land Administration Department
KI-35	15/5/2017	District Officer	Department of Livestock and Veterinary Science
KI-36	16/5/2017	Chairman	Cho Ethnic Association, Mindat

Table B.2: List of focus group discussions

Sr.	Date	Location	Topic of discussion
1	6/4/2016	Ung A village	Situational analysis: village information, land-use, livelihoods, local traditions
2	25/5/2016	Kitaw A village	Situational analysis: village information, land-use, livelihoods, local traditions
3	15/6/2016	Park office	Status and challenges regarding law enforcement activities
4	20/6/2016	Makyar village	Situational analysis: village information, land-use, livelihoods, local traditions
5	9/2/2017	Makyar A village	Participatory mapping, land use, and traditional practices
6	10/2/2017	Makyar B village	Participatory mapping, land use, and traditional practices
7	13/2/2017	Makyar C village	Participatory mapping, land use, and traditional practices
8	15/2/2017	Makyar D village	Participatory mapping, land use, and traditional practices
9	17/2/2017	Ung B village	Participatory mapping, land use, and traditional practices
10	22/2/2017	Ung C village	Participatory mapping, land use, and traditional practices

*Continued on next page*

Table B.2: List of focus group discussions (continued)

Sr.	Date	Location	Topic of discussion
11	24/2/2017	Ung D village	Participatory mapping, land use, and traditional practices
12	25/2/2017	Ung A village	Participatory mapping, land use, and traditional practices
13	4/3/2017	Kitaw A village	Participatory mapping, land use, and traditional practices
14	4/3/2017	Kitaw D village	Participatory mapping, land use, and traditional practices
15	24/3/2017	Kitaw B village	Participatory mapping, land use, and traditional practices
16	31/3/2017	Kitaw C village	Participatory mapping, land use, and traditional practices

Table B.3: List of workshop participants

Sr.	Name	Position	Organization/Village
1	U Lane Aum	Administrator	Kitaw village tract
2	U Hone Htang	Administrator	Markyar village tract
3	U Kee Hong	Village headman	Htang Aum village
4	U Kee Manar	Village headman	Chaing village
6	U Htang Lane Lway	Village headman	Ung village
6	U Aung Kee	Administrator	Makyar village tract
7	U Khaw Gay Ngai	Administrator	Khat Chan village tract
8	U Aung San	Staff member	KawNuCun Region Development Organization
9	U Hone Kee	Village headman	Hla Laung Pan village
10	Dr. Hnin Sandar Bo	Deputy Officer	Department of Livestock and Veterinary Science
11	U Phyo Min Oo	Deputy Administrator	General Administration Department
12	U Kee Manar Hong	Staff member	Tong Nge village tract
13	U Ye Yint Aung	Range Officer	Forest Department
14	U Lane Maung Shane	Staff member	Department of Hotels and Tourism
15	U Htang Aum	Village headman	Htet Shwe village
16	U Tam Lane	Village headman	Kauk Tu village
17	U Lane Kee	Forester	Natma Taung National Park
18	U Maung Nu	Ranger	Natma Taung National Park

*Continued on next page*

Table B.3: List of workshop participants (continued)

Sr.	Name	Position	Organization/Village
19	Daw The Ei Hlaing	Deputy Officer	Department of Agriculture
20	Daw Nane Manar	Staff member	Department of Agriculture
21	U Nay Shine Tun	Forester	Natma Taung National Park
22	U Tin Mya Soe	Park Warden	Natma Taung National Park
23	U Ye Lin Aung	Research assistant	Wildlife Conservation Society
24	U Pyi Soe Aung	Doctoral student	Technical University Dresden
25	Prof. Jürgen Pretzsch	Professor	Technical University Dresden

# APPENDIX C

## LIST OF QUESTIONNAIRES

### Interview Guide for Land Tenure System

1. Please indicate the village territory and the history of village establishment. Please indicate private, communal and open-access areas within village territory?
2. How do people usually acquire private own land within the community?
3. Who has the right to own private land? Are there any limitations in terms of area of land owned by a household or individual?
4. What kind of rights does the customary landowner have in relation to his property? How has the customary land ownership system changed within the last 10 years?
5. What are the rights of tenants in relation to the private land and what are their duties and responsibilities? Are there any changes in the rights of tenants within the last 10 years?
6. What are the rights of other villagers in relation to the private land? Are there any changes in the rights of villagers within the last 10 years?
7. What are the rights of villagers in relation to village communal lands? Are there any changes in the rights of villagers compared to the last 10 years? What are the rights of outsiders in relation to village communal?
8. What are the rights of villagers in relation to open access land? Are there any changes in the rights of villagers compared to the last 10 years? What are the rights of outsiders in relation to open-access land?
9. How has the boundary for land property defined within the community? Who has the authority in defining boundary for land property and how has it changed within the last 10 years?

10. Who has the authority to give permission for different types of rights within the community? How does it changed compared to the last 10 years?
11. How do you know if someone breaks the rules? Is there any monitoring system in relation to communal regulations?
12. What kinds of sanctions are practiced if someone violates local rules? How many violations have already sanctioned within the last 12 months? Are sanctions the same for the repeated violators? What would be further actions if violators do not accept local sanctions?
13. How many conflicts have occurred within the last 12 months? How do the conflicts among the community members are solved within the community? How does it changed compared to the last 10 years?
14. How are the rules and regulations created within the community? Who participate in local rule making? How has it changed compared to the last 10 years?

## Questionnaires for Household Survey

Village name: .....

Date: .....

Household ID: .....

Name of HH head: .....

### PART-I

#### A. BASIC INFORMATION OF THE HOUSEHOLDS

##### 1. Household composition

1.1. How many household members do your household have? \_\_\_\_\_ numbers

1.2. Please indicate details on the members of your household.

Sr.	Name	Sex	Age	Education	Current employment
1.					
2.					
3.					

1.3. Was the household head born in this village?  Yes  No

1.4. If 'no', how long has the household head lived in this village? \_\_\_\_\_ years

1.5. Which ethnic groups does the household head belong to? \_\_\_\_\_

1.6. What is the religion of the household head?  Christian  Buddhist  Others, \_\_\_\_\_

1.7. How many family labours are available in your household?

Employment category	Number of available labour	
	Full time	Part time
Agriculture		
Off-farm		
Non-farm		
Others,		

1.8. How many houses (including farm hut) do your household own? Please describe in detail.

Sr.	Dimension	Materials used			Year	Source of materials	Estimated price [MMK]
		Wall	Floor	Roof			

##### 2. Land ownership

2.1. Do you own any agricultural land?  Yes  No

2.2. If 'yes', please describe the area of agricultural land that you own. \_\_\_\_\_ acres

2.3. How many hours does it take to reach to your current agricultural land? \_\_\_\_\_ hours

2.4. Do you also own fallow lands other than agricultural land?  Yes  No

2.5. If yes, how many plots of fallow land that your household own?

Plot no.	Area [acre]	Fallow period	Location	Current status

2.6. Have you ever rented any land from other people?  Yes  No

2.7. If yes, how much do you have to pay as rent for the land? \_\_\_\_\_ kyats/ \_\_\_\_\_

2.8. Have you also rented out your land to other households?  Yes  No

2.9. If yes, how much did you get for rent of your land within the last 12 months?

Type of payment	Amount [MMK]	Remarks
Cash		
In-kind		

2.10. Do you also own forest land other than agriculture and fallow land?  Yes  No






3.2. How many household members work full-time for agricultural activities?

3.3. Did you hire any daily labour for your agricultural activities?  Yes  No

3.4. If yes, please indicate the number of labour that you paid within the last 12 months.

Activity	No. of Labour	Working days	Daily wages [MMK]	In-kind payment	Price [MMK]
Land preparation					
Planting					
Weeding					
Harvesting					
Transport					
Others					

3.5. Did you change the main crops in compare to the last 10 years ago?  Yes  No

3.6. If yes, what type of main crop did you grow in the last 10 years ago?

Type of crops	Reasons for change

3.7. How have the functions of agriculture for your household changed in compare to the last 10 years?

Increased subsistence crop  Increased commercial crops  Unchanged

3.8. If there are changes, what would be the main reason for these changes?

Reasons:
----------

3.9. How has the productivity of your land changed in compare to the last 10 years ago?

Increased  Decreased  Unchanged

3.10. What would be the main reasons for changing crop productivity?

Reasons:
----------

3.11. Do you use additional fertilizers to improve the productivity of your land?  Yes  No

3.12. If yes, please indicate the amount of fertilizer that you use within the last 12 months.

Main crops	Quantity of fertilizer	Price (MMK)

3.13. Did your household need to buy rice from market in last 12 months?  Yes  No

3.14. If yes, how many months did your household rely on extra food in addition to own product? \_\_\_\_\_

3.15. Where do you usually sell your products?  Within the village  At township market

3.16. Do you think you have good communication with traders or middle-men?  Yes  No

3.17. If yes, how many of them you have with good relationship? \_\_\_\_\_ numbers

3.18. How often do you go to the market?  Weekly  Monthly  Quarterly  Occasionally

3.19. How do you usually go to the market?  By car  Motorbike  On-foot  Others, \_\_\_\_\_

3.20. What was your main reason to go to the market?

Reasons:
----------

3.21. Do your household own any transport facility to go to the market?  Yes  No

3.22. If yes, please describe the type of transport facility and the estimated price.

Type	Number	Years owned	Estimated price

3.23. How has access to market changed compared to the last 10 years?

Improved  Worse  Unchanged

3.24. If there are changes, what would be the main reasons for these changes?

Reasons:
----------

3.25. How does changes in access to market influence the livelihood of your household?

Reasons:
----------

#### 4. Livestock

4.1. Does your household own livestock?  Yes  No

4.2. If yes, please indicate the number of livestock that your household own.

Type of livestock	Adult male	Adult female	Juvenile male	Juvenile female

4.3. Where do you usually get the fodder for your livestock?

Own farm  Communal land  National park  Open access land

4.4. What would be your main reasons for farming livestock?

Reasons:
----------

4.5. How many livestock did you sell within the last 12 months?

Type of livestock sold	Quantity	Market price	Purpose

4.6. How many livestock did your household consume within the last 12 months?

Type of livestock sold	Quantity	Market price	Purpose

4.7. Do you use family labour for livestock husbandry activities?  Yes  No

4.8. How has the number of livestock changed in compare to the last 10 years ago?

Increased  Decreased  Unchanged

4.9. What would be the main reason for decreasing or increasing number of livestock in compare to the last 10 years ago?

Reasons:
----------

4.10. How have the functions of livestock for your household changed in compare to the last 10 years?  Increased consumption  Increased sale  Unchanged

4.11. If there are changes, what would be the main reason for these changes?

Reasons:
----------

4.12. Have your household ever faced any conflict in relation to livestock raising?  Yes  No

4.13. If yes, what kind of conflicts have you faced within the last 12 months?

Type of conflict/challenges	Resolutions	Rank (1-5)

**5. Off-farm activities**

5.1. Did you or any other household members undertake off-farm activities to generate income within the last 12 months?  Yes  No

5.2. If yes, please indicate the types of activities and income generated from each activity.

Off-farm activities	Working days	Daily rate	Income

5.3. How do you get access to the above mentioned off-farm activities?

Direct contact with employer  Contact from relatives  Contact from other community members  Others, please specify \_\_\_\_\_

5.4. How has engagement in off-farm activities by your household changed over the last 10 years?  Increased  Decreased  Unchanged

5.5. If increased, what would be your reason for increasing engagements in off-farm activities?  Decline in crop productivity  Decline in forest resources  Less availability of agricultural land  Improve market access  Others, \_\_\_\_\_

5.6. How do you expect future livelihood activities of your household?

Increase agriculture  Increase livestock  Increase off-farm  Migrate within localities  Migrate to cities  Others, \_\_\_\_\_

5.7. What would be your main reasons for these changes?

Reasons:
----------

**6. Gifts, transfer or remittances**

6.1. Did you or any of your household member receive any gifts from relatives, friends etc. within the last 12 months?  Yes  No

6.2. If yes, please indicate the types, sources, and value of the gifts that you had received within the last 12 months.

Types of gift	From whom	Value [MMK]	Remark

6.3. Did you or any of your household member receive remittances from relatives, friends etc. within the last 12 months?  Yes  No

6.4. If yes, please indicate the amount of remittances that you had received within the last 12 months.

From whom	Amount [MMK]	Remark

**7. Social capital**

7.1. How many households who are relatives to you within the community? \_\_\_\_\_

7.2. Do you have relatives in the city?  Yes  No

7.3. If yes, how often do you communicate with them?  Regularly  Sometimes  Seldom

7.4. With whom do you communicate if you need any help?

Within community  Relatives at city  Both  Never asked for help

7.5. If yes, what would be the main reasons that you asked for help?

Reasons:
----------

7.6. Are you currently a member of any social organization?  Yes  No

7.7. If yes, please indicate the name of the organization and your responsibilities.

Name of organization	Year*	Main responsibilities


7.8. How often do you participate in village meetings?  Regularly  Sometimes  Seldom

### 8. Financial capital

8.1. Do you participate in local saving groups?  Yes  No

8.2. If yes, what would be your main reason to participate in local saving group?

Reasons:
----------

8.3. When did you start to participate in the cash saving groups?

8.4. Can you state how much do you have to contribute to the saving groups? \_\_\_\_\_ kyats

8.5. Did you borrow any cash or other cash equivalent assets within the last 12 months?

8.6. If yes, please describe details of cash or cash equivalent assets that you borrowed in the last 12 months?

Amount (mmk)	Purpose	Source of credits	Interest rate

### 9. Future plan

9.1. How do you expect the future of your households?

Continue to stay in this community  Likely to move other community

Likely to migrate to the cities  Others, \_\_\_\_\_

9.2. Please indicate the main reasons for the above answer.

Reasons:
----------

## PART - II HOUSEHOLD USE OF FOREST RESOURCES

### 10. Timber

10.1. How many timber species have you used within the last 12 months?

Sr.	Species	Quantity	Market price	Purpose	Labour cost	Sources	Other inputs
1.							
2.							

10.2. How has the use of timber species by your household changed over the past 10 years?

Declined  Unchanged  Increased

10.3. If it has changed, what would be the main reasons for these changes?

Reasons:
----------

10.4. Had your household planted any woodlots or trees within the last 10 years?  Yes  No

10.5. If 'yes', please indicate the area and purpose of the woodlots? \_\_\_\_\_

### 11. Fuelwood

11.1. How much firewood do you usually need per day?

Types	Quantity/day (Summer)	Quantity/day (Winter)	Estimated price [MMK]
1.			
2.			

11.2. How many days per week do your household spend to collect fuelwood? (\_\_\_\_ days/week)

11.3. In general, how has the use of firewood by your household changed over the past 10 years?  Declined  Unchanged  Increased

11.4. If it has changed, what would be the main reasons for these changes?

Reasons:

## 12. Forest food

12.1. How many species of edible plants do you collect from the forest within the last 12 months?

Sr.	Species	Usage	Quantity	Market price
1.				
2.				

12.2. From which area, do you usually harvest forest food?

Private  Communal  Government  Open access

12.3. In general, how has the use of forest food by your household changed over the past 10 years?  Declined  Unchanged  Increased

12.4. If it has changed, what would be the main reasons for these changes?

Reasons:

## 13. NTFPs

13.1. Did your household collect NTFP within the last 12 months?  Yes  No

13.2. If yes, please describe the type of NTFP and estimated amount within the last 12 months.

Type of NTFP	Quantity	Unit price	Source	Trend	Purpose	
					Sale	Consumption

13.3. In general, how has the use of NTFPs by your household changed over the past 10 years?

Declined  Unchanged  Increased

13.4. If it has changed, what would be the main reasons for these changes?

Reasons:

## 14. Wildlife

14.1. Did your household capture any wildlife within the last 12 months?  Yes  No

14.2. If yes, please describe the type of animal and estimated amount within the last 12 months.

Wildlife	Quantity	Unit price	Source of collection	Trend	Purpose	
					Sale	Consumption

14.3. In general, how has the use of wildlife by your household changed over the past 10 years?

Declined  Unchanged  Increased

14.4. If it has changed, what would be the main reasons for these changes?

Reasons:

## 15. Medicinal plants

15.1. How many species of medicinal plants do you collect from the forest within the last 12 months?

Sr.	Species	Usage	Quantity	Market price	Sources
1.					
2.					

15.2. How has the use of medicinal plants by your household changed over the last 10 years?

Declined  Unchanged  Increased

15.3. If it has changed, what would be the main reasons for these changes?

Reasons:

## Questions for Awareness and Compliances with Tenure Rules

1. Traditionally, each Chin village has clear village territory that are recognised by neighbouring communities. Do you know the boundary of your village territory? Will you accept if the current boundaries are formalised by legal land title?
2. Traditionally, every villager has access to the village communal lands. Do you know that this rule exists within your community? Will you accept if this rule is adopted as formalised Statues by the village administration?
3. Traditionally, no one is permitted to clear the private land for shifting cultivation without prior consent from the customary land owner. Do you know that this rule exists within your community? Will you accept if this rule is adopted as formalised Statues by the village administration?
4. Traditionally, no one is permitted to cut the tree on private land for timber production without prior consent from the customary land owner. Do you know that this rule exists within your community? Will you accept if this rule is adopted as formalised Statues by the village administration?
5. Traditionally, no Clan member is permitted to clear the land owned by his own Clan for shifting cultivation without prior consent from other members of the Clan. Do you know that this rule exists within your community? Will you accept if this rule is adopted as formalised Statues by the village administration?
6. Traditionally, no Clan member is permitted to cut the tree on the land owned by his own Clan for timber production without prior consent from other members of the Clan. Do you know that this rule exists within your community? Will you accept if this rule is adopted as formalised Statues by the village administration?
7. Traditionally, no Clan member is permitted to sell the whole or part of the land owned by his own Clan without prior consent from other members of the Clan. Do you know that this rule exists within your community? Will you accept if this rule is adopted as formalised Statues by the village administration?
8. Traditionally, no one is permitted to clear the land for shifting cultivation, to cut the tree for timber production, or to produce gravels or stones for construction within the village communal land without prior consent from village head and other villagers. Do you know that this rule exists within your community? Will you accept if this rule is adopted as formalised Statues by the village administration?
9. Traditionally, every villager whoever clear the unoccupied virgin forests within village communal land with prior consent from villagers is regarded as the owner of the land. Do you know that this rule exists within your community? Will you accept if this rule is adopted as formalised Statues by the village administration?
10. Traditionally, no one is permitted to cut the trees from village use forests for commercial purposes. Do you know that this rule exists within your community? Will you accept if this rule is adopted as formalised Statues by the village administration?
11. Traditionally, no one is permitted to cut the trees or clear the forests for cultivation near the village water springs. Do you know that this rule exists within your community? Will you accept if this rule is adopted as formalised Statues by the village administration?
12. Even though the land is located within the national park, the customary land owner still maintains his rights to control the land. Do you know that this rule exists within your community? Are you still in compliance with this practice in your daily life?



13. Traditionally, the customary land owners are not permitted to sell the whole or part of his own land to non-community members without prior consent from the community. Do you know that this rule exists within your community? Will you accept if this rule is adopted as formalised Statues by the village administration?
14. In former times, the lands were granted as inheritance to all the Clan members without proper allocation to each individual. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
15. In former times, women do not have the rights to inherit the land owned by family or the Clans. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?

## Questions for Awareness and Compliances with TEK Practices

1. In former times, it is prohibited to clear the land for shifting cultivation or to cut the trees in sacred areas where the Spirits were believed to stay. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
2. In former times, it is prohibited to cut the trees or clear the land in areas where villagers perform customary offerings to the Spirits. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
3. Traditionally, village-use forests were demarcated in order to achieve sustainable timber supply, where no one is allowed to cut trees for commercial purposes inside these forests. Do you know that this rule exists within your community? Are you still in compliance with this practice in your daily life?
4. Traditionally, village water sources are protected in order to increase water supply, where no one is permitted to cut the trees or clear the land near the water sources. Do you know that this rule exists within your community? Are you still in compliance with this practice in your daily life?
5. In former times, it is taboo to cut the big fig trees (*ficus* spp.) which are believed to be a home for the Spirits. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
6. In former times, it is prohibited to cut the big trees within the village settlement areas. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
7. Traditionally, bamboos were planted for household uses and were inherited from generations to generations. No one is permitted to cut the bamboos around the village without prior consent from the owner. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
8. Traditionally, one villager can request bamboo from other villagers for household uses if he does not have enough mature stocks of his own. In return, he also has to share his bamboo to other villagers in the future. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
9. Traditionally, it is believed that crops will be destroyed and the village will face food shortage if the bamboo start flowering. Do you know that this belief exists within your community? Are you still in compliance with this practice in your daily life?

10. Traditionally, the beehives in the forests have owners and no one is permitted to collect honey from beehives without prior consent from the owner. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
11. Traditionally, every farmer has to practice shifting cultivation in one or two large fields chosen collectively by all farmers. No one is permitted to clear the land individually outside of the commonly chosen fields. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
12. Traditionally, new agricultural fields are selected collectively by holding taungya meetings with farmers and villagers. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
13. Traditionally, farmers usually celebrate ritual ceremonies collectively before opening the new agricultural fields in order to increase crop production and reduce risks. No one is allowed to cultivate his agricultural plot without celebrating this ritual to the guardian spirits of the field. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
14. Traditionally, every family residing in the village have access to the agricultural plots within the selected field. For landless farmers, the landowners have to allocate some plots within the selected agricultural field depending on the labour availability of the landless families. In return, the landless families had to pay some portion of their harvest or a chicken and a pot of local beer as land rent. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
15. Traditionally, the land borrower could never become the landowner even though he is the one who cleared the borrowed land for the first time. Do you know that this rule exists within your community? Are you still in compliance with this practice in your daily life?
16. In former times, it is prohibited to clear the trees located either at the top of the ridges or close to the streams in order to protect landslides and soil erosions. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
17. In former times, the farmers usually cut only the branches of big trees and left the stumps in clearing the land for shifting cultivation, in order to increase the rate of soil recovery as well as to reduce erosion. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
18. Traditionally, the farmers have to clear the boundary of the fields as fire breaks before burning in order to protect the spread of fire to the neighbouring fields. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
19. Traditionally, every farmer had to compensate if the fire spread outside of the target field and destroy the fields owned by other villages. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
20. Traditionally, taungya burning should be done during the period of waxing moon in order to avoid accidents, instead of waning moon. Do you know that this belief exists within your community? Are you still in compliance with this belief in your daily life?
21. Traditionally, farmers adopted control burning practices, where they started to set fire from the top-ridges or from the area where the fire brakes were constructed. The centre of the field is usually burned once the fire has become stable. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?

22. In former times, the farmers usually select the most appropriate person to start the fire based on the blessing from the prophets and previous experiences in order to minimize accidents. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
23. In former times, farmers usually share labour to each other for labour-intensive activities such as land clearing or weeding the field. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
24. In former times, farmers usually celebrate harvest rituals to field spirits after the crops have been harvested. No one is permitted to eat the crops before the harvest rituals. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
25. In former times, hunting rituals were usually performed before hunting to avoid accidents and to get more animals. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
26. In former times, outsiders are not permitted to hunt within the village territory without prior consent from village headman. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
27. In former times, those who killed the big animals had to share the meat to all the member of the communities. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
28. In former times, it is taboo to take animal shot by other hunters. Those who brake those rules had to compensate the requested amount of cash or other things (usually a Mithan) once the hunter knows about if in the future. Do you know these rules still exist within the community? Are you still in compliance with this practices in your daily life?
29. In former times, it is common to give wild birds as a token of friendship among the two families. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
30. In former times, the ritual killings of Mithan was usually performed to increase social status or to be healthy among family members. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
31. In former times, farmers adopt rotational grazing in fallow lands, in order to increase the soil fertility for next cultivation seasons. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?
32. In former times, it was taboo to kill or capture the whole group of the group-living species such as primate species. Do you know that this practice exists within your community? Are you still in compliance with this practice in your daily life?

## Appendix D: Photo Templates

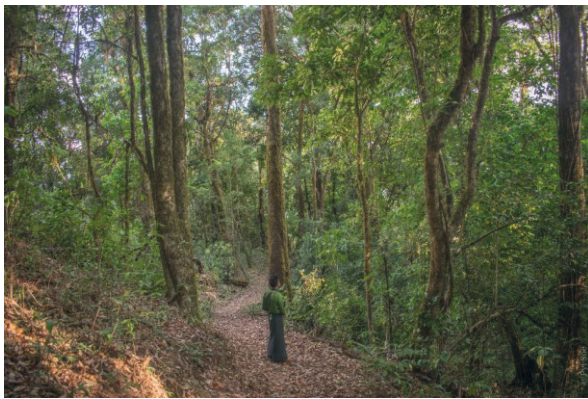
### D.1. Local Initiatives for Forest Conservation



**Photo 1.** Watershed Forest in Makyar B village



**Photo 2.** Watershed Forests in Kitaw A village



**Photo 3.** Village-use forest in Ung C village



**Photo 4.** Village-use forest in Kitaw B village



**Photo 5.** Sacred Forest In Makyar D village



**Photo 6.** Sacred Forest in Kitaw B village



## D.2. Examples of Traditional Resource Management Practices



**Photo 7.** Leaving forests at mountain ridges to protect against wind and soil erosion



**Photo 8.** Leaving tree stumps in shifting cultivation area to enhance recovery of fallow land



**Photo 9.** Creating fire brakes to prevent forest fire in secondary fallows



**Photo 10.** Controlled burning to ensure proper burning and minimize risks



**Photo 11.** Selection felling of bamboo culm to ensure sustainable bamboo production



**Photo 12.** Maintaining natural beehives to ensure sustainable honey production



### D.3. Key Forest Products and Services used by local villagers



**Photo 13.** Local use of timber for house construction



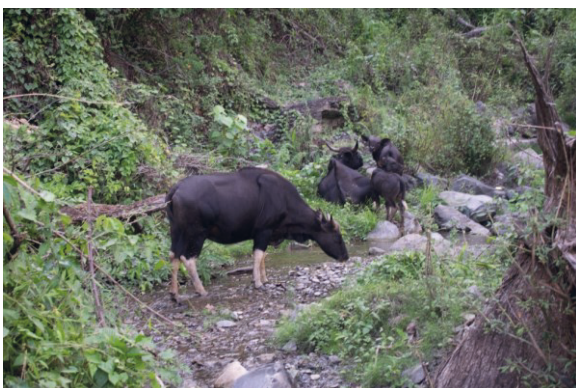
**Photo 14.** Non-timber forest products (wild turmeric) collected from the park



**Photo 15.** Collecting water from water sources inside the national park



**Photo 16.** Fuelwood collection for household uses



**Photo 17.** Livestock (Mithan) grazing inside the national park



**Photo 18.** Memorial posts indicating the number of Mithan offered to the local spirits while celebrating feasts of merit.



### D.4. Photo Records of Data Collection



**Photo 19.** Household face-to-face interview



**Photo 20.** Key informant interview with a local trader



**Photo 21.** Participatory land-use mapping in Makyar A village



**Photo 22.** Result of a participatory land-use mapping exercise



**Photo 23.** Village consultation at Kitaw A village



**Photo 24.** Focus group discussion with a traditional leader in Makyar B village



## D. 5. Participatory Scenario Planning Workshop



**Photo 25.** Group photo at the participatory scenario planning workshop



**Photo 26.** Discussion by local stakeholders at the workshop



**Photo 27.** Introduction by the resource person about the participatory scenario planning approach



**Photo 28.** Presentation by the park manager about challenges and opportunities for national park management



**Photo 29.** Group discussion at the participatory scenario planning workshop



**Photo 30.** Subjective ranking and feedback for each management scenario by individual participants