INAUGURAL-DISSERTATION

zur

Erlangung der Doktorwürde

der

Naturwissenschaftlich-Mathematischen

Gesamtfakultät

der

Ruprecht-Karls-Universität

Heidelberg

Vorgelegt von:

Sok, Sopheaktra

Master of Arts in Policy Science. Ritsumeikan University, Japan

Aus: Phnom Penh, Kambodscha

Tag der mündlichen Prüfung:

_____

INAUGURAL-DISSERTATION

zur

Erlangung der Doktorwürde

der

Naturwissenschaftlich-Mathematischen

Gesamtfakultät

der

Ruprecht-Karls-Universität

Heidelberg

Vorgelegt von:

Sok, Sopheaktra

Master of Arts in Policy Science. Ritsumeikan University, Japan

Aus: Phnom Penh, Kambodscha

Tag der mündlichen Prüfung:

_____

THEMA

The Impacts of Economic Land Concession on Indigenous People's Livelihoods. Ratanakiri, Cambodia.

Gutachter: Prof. Dr. Hans Gebhardt (Ruprecht-Karls-Universität Heidelberg)

Prof. Dr. Annika Mattissek (Albert-Ludwigs-Universität Freiburg)

Acknowledgement

I would like to give my sincere thanks to Prof. Dr. Hans Gebhardt for having accepted me as his student. His decision has opened the door for me to enter academic life and to explore more new knowledge again. His guidance in the field of development geography is priceless gift to me. I have learned a lot from him and from his book. And, it is my great honor to work under his supervision.

I would like to express my gratitude to Prof. Dr. Annika Mattissek for being my second supervisor. She has shared her knowledge and experiences in Cambodia especially in development issues. Again, I appreciate for her encouragement, creative, and comprehensive advice until my work has completed.

Many thanks Prof. Dr. Olaf Bubenzer for joining the committee and his inputs of physical geography to the thesis. And, special thanks to Prof. Dr. Sekson Yongvanit for being a part of supervisory committee and sharing his geographic knowledge in Mekong sub-region.

Thanks to *Landesgraduiertenförderung* for their financial support. The funding has enabled me to focus on my studies and lengthen my stay in Germany.

And, many thanks friends at Heidelberg University for their moral support which made my stay in Germany reassuring and joyful.

Sopheaktra SOK

Zusammenfassung

Wirtschaftliche Landkonzessionen werden vielerorts in ländlichen Gebieten genutzt, um neue wirtschaftliche Möglichkeiten in diesen zu eröffnen und die lokale wirtschaftliche Diversifizierung durch vorhergehende und Folgeinvestitionen zu fördern. Es wird davon ausgegangen, dass wirtschaftliche Landkonzessionen staatliche Einnahmen auf nationaler und subnationaler Ebene generieren und die Armut in ländlichen Gebieten verringern.

Dies geschieth jedoch auf Kosten von massiven Landnutzungskonflikten, sozialen Problemen und Bodendegradation. Insbesondere ländlichen Gemeinschaften, deren Lebensunterhalt auf der Nutzung lokaler natürlicher Ressourcen basiert, stehen vor großen Herausforderungen.

Meine Forschung befasst sich mit den Problemen ländlicher Gemeinschaften in der Provinz Ratanakiri in Kambodscha. Ehemals gemeinschaftliche Ressourcen wurden privaten Investoren (hauptsächlich aus Vietnam) zur Entwicklung von landwirtschaftlichen Großbetrieben gewährt. Die Studie verwendet Konzepte der Resilienz in Kontext der Sicherung traditioneller Lebensunterhalte. Der theoretische Rahmen hilft zu erklären, wie sich die wirtschaftlichen Landkonzessionen entwickeln und welche Ressourcen und Gemeinschaften von ihnen betroffen sind. Die Argumentationsweise meines Beitrags basiert auf dem Grundgedanken der nachhaltigen Entwicklung, welcher darauf abzielt, ein Gleichgewicht zwischen Umwelt-, Gesellschafts- und Wirtschaftsaspekten zu wahren. Die in dem Forschungsprojekt untersuchten ländlichen Gemeinden verloren jedoch ihren Sinn für gemeinschaftliche Resourcenprotektion und priorisierten stattdessen einen intensiven Abbau vorhandener Ressourcen.

In der Studie wird die Resilienz zahlreicher Gemeinschaften analysiert, basierend auf ihrer Pufferkapazität, Selbstorganisation und Lernfähigkeit. Außerdem sollen unerwartete Auswirkungen staatlicher Entwicklungspläne auf indigene Gemeinschaften beleuchtet werden.

Abstract

Economic land concessions are commonly believed to increase employment in rural areas, to offer new economic opportunities in the countryside, and to encourage local economic diversification through investments upstream and downstream of the concessions. ELCs are also considered to generate state revenues at national and sub-national level and reduce poverty in rural areas.

However, this possible progress is bought by massive land-use conflicts, social problems and land degradation. Natural resource-based communities face severe challenges.

My research deals with the problems of rural communities in Ratanakiri Province in Cambodia. Former common resources have been granted to private investors (mainly from Vietnam) to develop large-scale agricultural enterprises. The study uses concepts of resilience in livelihood framework to analyze these impacts caused by state development plans. The theoretical framework helps to explain how the economic land concession evolves and affects the resources and communities. The rationale of my contribution originally comes from the main idea of sustainable development which aims to balance different needs of the environment, society and economy. Communities in the research area lost their sense of commonality in resources protection and push on the degradation of existing resources.

In the study the resilience of each community is analyzed based on its buffer capacity, self-organization, and capacity for learning. And, it aims to disclose the unpredicted impacts of state development plans on indigenous communities.

Table of contents

Acknowledgement v

Zusammenfassung vii

Abstract ix

Table of contents xi

List of figures xv

List of photos xvii

Abbreviations xviii

Chapter 1: Development as a threat to livelihoods and environment 1

1.1 Livelihood impacts: 1

1.2 Research questions: 5

1.3 Research rationales: 5

1.4 Research structure: 6

Chapter 2: Impact Assessment and Indigenous Livelihood Strategies. 9

2.1 Cambodia: 9

2.1.1 Environmental Impact Assessment Process 9

2.1.2 The concessions in research area: 12

2.1.2.1 Development issues: 12

2.1.2.2 Crisis response: 13

2.1.2.3 The remaining common property regimes: 16

2.1.2.4 Cash crop farming: 18

2.2 Lao: 20

2.2.1 EIA process: 20

2.2.1 Development issues: 21

2.3 Vietnam: 23

2.3.1 EIA process: 23

2.3.2 Development issues: 24

2.4 Thailand: 26

2.4.1 EIA process: 26

2.4.2 Development issues: 27

Chapter 3: The conceptual framework 29
3.1 Research concepts: 29
3.2 The progression of vulnerability: 32
3.3 Vulnerability: 34
3.3.1 Exposure: 34
3.3.2 Sensitivity: 35
3.4 Resilience analysis: 36
3.4.1 Buffer capacity: 43
3.4.2 Self-organization: 44
3.4.3 Capacity for learning: 45
3.5 Livelihood dynamics: 46
3.6 The Actor and the link of social and ecological resilience: 47
Chapter 4: Research procedures 49
4.1 Site selection: 49
4.2 Structure of data collection and analysis: 51
4.3 Data collection: 52
4.3.1 All livelihood dynamics: 52
4.3.2 Livelihood activities: 53
4.3.3 Subsistence and non-subsistence: 53
4.3.4 Resilient livelihoods: 53
4.3.5 Redefinition of root causes: 54
4.4 Data analysis: 54
4.4.1 Livelihood dynamics: 54
4.4.2 Resilience analysis: 55
4.4.3 Interrelationship in livelihood resilience: 56
4.4.4 Resilience in comparative analysis: 56
Chapter 5: Making a living under Post-ELC conditions 58
5.1 The reaction to changed land-use situation: 58
5.1.1 KANAT village: 60
5.1.2 MALIK village: 62
5.1.3 MASS village: 64

5.2 Land-use change: 66
5.2.1 Kanat village 71
5.2.2 Malik village 73
5.2.3 Mass village 75
Chapter 6: The Social Transformation Among Indigenous Communities 78
6.1 Kachok minorities: 78
6.1.1 Buffer Capacity: 78
6.1.2 Self-organization: 86
6.1.3 Capacity for learning: 88
6.2 Tampoun minorities: 90
6.2.1 Buffer Capacity: 90
6.2.2 Self-organization: 94
6.2.3 Capacity for learning: 96
6.3 Kreung minorities: 99
6.3.1 Buffer Capacity: 99
6.3.2 Self-organization: 105
6.3.3 Capacity for learning: 107
6.4 Summary of the findings: 109
6.5 Conclusion - the actual situation in the villages: 110
Chapter 7: Sustainability under difficult circumstances-results of empirical findings in the villages. 113
7.1 Chronological facts of livelihood practice: 113
7.1.1 The impact of land concessions - voices from the villages: 114
7.1.2 New livelihood strategies: 118
7.1.3 Historical analysis of livelihoods: 119
7.2 Identification of livelihood activities in the face of exposure: 121
7.3 Recovery pathway analysis to maintain livelihood resilience: 125
7.4 Resilience in win-lose situation: 126
7.5 Pragmatic findings in the concepts of development studies: 127
7.5.1 Exposure to resource trends: 127
7.5.2 Resilience: 127
7.5.3 Sensitivity to resource dependency: 130

7.5.4 Strengthening resilience 134
Chapter 8: Conclusion 137
8.1 The domino effect of state development: 137
8.2 The gap in sustainability in practice: 138
8.3 The loss of commitment among actors: 138
References: 140
Annex: 155

List of figures

FIGURE 1: ECONOMIC LAND CONCESSIONS CATEGORIZED BY OWNERSHIP 1
FIGURE 2: ECONOMIC LAND CONCESSIONS CATEGORIZED BY CROP 3
FIGURE 3: RESEARCH STRUCTURE 8
FIGURE 4: CAMBODIAN EIA PROCESS 10
FIGURE 5: DEFORESTATION IN CONCESSION AREA 13
FIGURE 6: STATUS OF COLLECTIVE LAND REGISTRATION OF INDIGENOUS COMMUNITIES 15
FIGURE 7: MAP OF COMMUNITY FOREST IN RATANAKIRI 18
FIGURE 8: LAND COVER FROM OPEN DEVELOPMENT CAMBODIA 19
FIGURE 9: REGIONAL RESETTLEMENT 28
FIGURE 10: CONCEPTUAL FRAMEWORK 31
FIGURE 11: PRESSURE AND RELEASE 32
FIGURE 12: SCALE DROUGHT CONDITION INDEX 2016 41
FIGURE 13: A CONCEPTUAL AND ANALYTICAL FRAMEWORK FOR CHARACTERIZING LIVELIHOOD RESILIENCE 43
FIGURE 14: RESEARCH AREA (SATELLITE VIEW) 50
FIGURE 15: DATA COLLECTION AND ANALYSIS IN ZIG-ZAG APPROACH 51
FIGURE 16: LIVELIHOOD DYNAMICS. 55
FIGURE 17: LIVELIHOOD RESILIENCE 56
FIGURE 18: SOURCES OF LIVELIHOODS 58
FIGURE 19: VILLAGES ON 3D ELEVATION 59
FIGURE 20: DEFORESTATION 67
FIGURE 21: LAND COVER VIEW OF CAMBODIA 68
FIGURE 22: LAND COVER CONVERSION 69
FIGURE 23: LAND USE CHANGE 70
FIGURE 24: DEFORESTATION IN KANAT 71
FIGURE 25: LAND USE CHANGE IN KANAT 72
FIGURE 26: DEFORESTATION IN MALIK 73
FIGURE 27: LAND USE CHANGE IN MALIK 74
FIGURE 28: DEFORESTATION IN MASS 75
FIGURE 29: LAND USE CHANGE IN MASS 76
FIGURE 30: CAMBODIA'S VEGETATION INDEX AND PHENOLOGY 2014 82
FIGURE 31: NORMALIZED DIFFERENCE VEGETATION INDEX IN ANDOUNG MEAS DISTRICT 82
FIGURE 32: SOIL TYPES OF CAMBODIA AND RESEARCH AREA 85
FIGURE 33: STREAMS AND PONDS 94
FIGURE 34: THE DECREASE OF EVERGREEN BROADLEAF FOREST FROM 2009 TO 2015 120
FIGURE 35: FROM SATELLITE IMAGE TO POLYGON 122
FIGURE 36: THE EVOLUTION OF LAND COVER FROM 2009 TO 2015 124
FIGURE 37: CROPS ON DEGRADATION PRONE AREA 132

FIGURE 38: CO-EVOLUTIONARY OF ECOSYSTEM AND SOCIAL RESILIENCE 133

List of tables

TABLE 1: FACTORS OF VULNERABILITY CONTEXT 34
TABLE 2: RESILIENCE CONCEPTS 37
TABLE 3: THE TANGO RESILIENCE ASSESSMENT FRAMEWORK 42
TABLE 4: RESILIENCE IN COMPARATIVE ANALYSIS 57

List of photos

PHOTO 1: CENTER OF KANAT VILLAGE 60
PHOTO 2: KACHOK MINORITY HARVESTING LOWLAND RICE 60
PHOTO 3: TRAVELING SALEMAN SELLING HIS GROCERIES 61
PHOTO 4: CENTER OF MALIK VILLAGE 62
PHOTO 5: BANNER OF MALIK COMMUNITY FOREST 62
PHOTO 6: OLD CASHEW NUT FARM ALONG CART TRACK 63
PHOTO 7: CENTER OF MASS VILLAGE 64
PHOTO 8: STREAM DIVIDING MASS AND KRESS 64
PHOTO 9: ILLEGAL LOGGING DONE BY KACHOK IN YAK POY 65
PHOTO 10: FORESTLAND CLEARED FOR FARMING 65
PHOTO 11: YOUNG CASHEW NUT FARM NEAR YAK POY 77
PHOTO 12: KACHOK WOMAN WITH HER CHILDREN 78
PHOTO 13: PUMPKIN NEAR UPLAND RICE 79
PHOTO 14: KACHOK MAN MAKING BASKET 80
PHOTO 15: RECENT BURNED FARMLAND 83
PHOTO 16: AUTHORITIES DISTRIBUTED WATER TO VILLAGERS 83
PHOTO 17: HAND WATER PUMP 84
PHOTO 18: ILLEGAL LOGGING IN TON BLON 86
PHOTO 19: CASSAVA PLANTED ON STREAM'S BANK 90
PHOTO 20: TAMPOUN STUDENTS GO TO SCHOOL 90
PHOTO 21: TRUCK LOADING WITH CASHEW NUT 97
PHOTO 22: MASS PRIMARY SCHOOL 99
PHOTO 23: KREUNG WOMAN DIGGING WILD POTATO 100
PHOTO 24: PEACOCK MUSHROOM IN YAK POY 100
PHOTO 25: KREUNG BOY PREPARING TO PLANT CASSAVA 101
PHOTO 26: WOOD SMUGGLING THROUGH KRONG BUK 102
PHOTO 27: BANNER OF YAK POY COMMUNITY FOREST IN MEETING HALL OF MASS VILLAGE 103
PHOTO 28: WATER STORAGE TANK 104
PHOTO 29: KREUNGS PREPARE TO PLANT CASSAVA ON SLOPE AREA 104
PHOTO 30: MEETING IN MASS 105
PHOTO 31: INTERVIEW AT HIGHLANDERS ASSOCIATION 113
PHOTO 32: GROUP DISCUSSION IN KANAT BEFORE ON-SITE OBSERVATION 114
PHOTO 33: MRS ROMJONG PHEUY PICKING CASHEW NUT 114
PHOTO 34: MR. SAL KNERCH SHOWING THE EFFECTED LAND 115
PHOTO 35: CHIEF OF TALAO COMMUNE 116
PHOTO 36: MR. HENG SOKHA WITH ENVIRONMENTAL OFFICERS 118

Abbreviations

ADHOC : Cambodian Human Rights and Development Association
CCHR : Cambodian Center for Human Rights
CDC : Council for Development of Cambodia
CIDSE : Coopération Internationale pour le Développement et la Solidarité
CLT : Collective Land Title
DFID : The Department for International Development
EIA : Environmental Impact Assessment
ELC : Economic Land Concession
EMMP : Environmental Management and Monitoring Plans
EMP : Environmental Management Plan
ERC : Expert Review Committee
FAO : The Food and Agriculture Organization
FIDH : Fédération Internationale des ligues des Droits de l'Homme
GIZ : Gesellschaft für Internationale Zusammenarbeit
GVN : Government of Vietnam
IEE : Initial Environmental Examination
IGBP : International Geosphere Biosphere Program
ILO : International Labor Organization
LAMPD : Land Administration, Management and Distribution Program
LASSP : Land Administration Sub-Sector Program
LICADHO : Ligue Cambodgienne pour la Promotion et la Défense des Droits de l'Homme
LIWG : Land Issues Working Group
LMAP : Land Management and Administration Project
MAFF : Ministry of Agriculture, Forestry, and Fisheries
MLMUPC : Ministry of Land Management, Urban Planning, and Construction
MOE : Ministry of Environment
MOI : Ministry of Interior
MONRE : Ministry of Natural Resources and Environment
MPI : Ministry of Planning and Investment
MRD : Ministry of Rural Development (Cambodia)
MARD : Ministry of Agriculture and Rural Development (Vietnam)
NGO : Non-Governmental Organization
NDVI : Normalized Difference Vegetation Index
NTFP : Non-Timber Forest Products
ONEP : Office of Natural Resources and Environmental Policy and Planning
PPC : Provincial People's Committee
RGC : Royal Government of Cambodia

SES : Socio-Ecological System

SMMP : social management and monitoring plans

TOR : Term of Reference

UNDP : The United Nations Development Programme

UNHRC : United Nations Human Rights Council

USGS : United States Geological Survey

VIP : Vegetation and Phenology

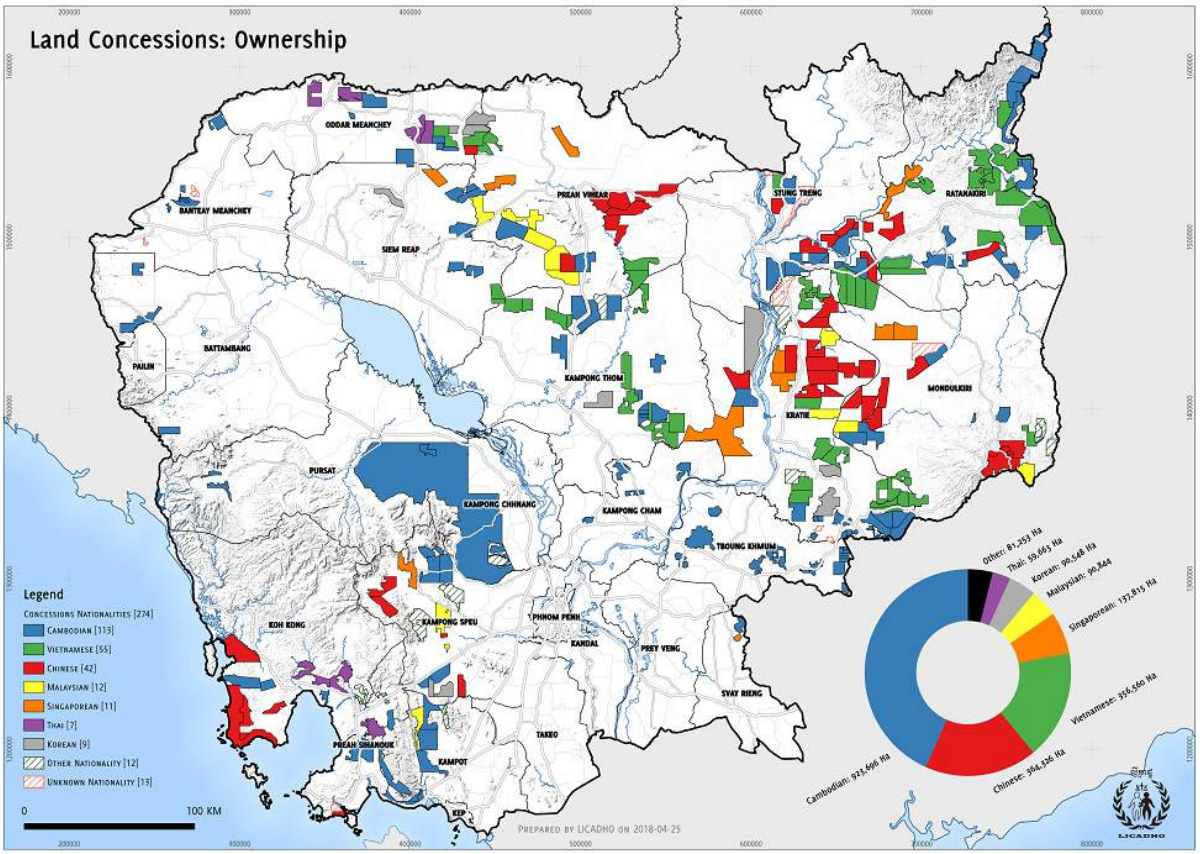
VRG : Vietnam Rubber Group

Chapter 1: Development as a threat to livelihoods and environment

1.1 Livelihood impacts:

In Ratanakiri, the northeastern province of Cambodia, agrarian change has been mostly influenced by the large-scale plantation of rubber as it is observed at national level. Ratanakiri is a richly forested province located in remote Northeast Cambodia. In 1997, the forestland was estimated to cover 70%-80% of the province. And, the ethnic minorities (highlanders) who for centuries have made their living in and around the forest represent over 85% of the population of this province (Bann, 1997). This forest remained intact before 1990s as there were many rebels living in and there was no chance for economic investment. The Paris Peace Accords 1991 and the final elimination of armed insurgency groups inside the country in 1998 has secured peace for Cambodia, especially for foreign investors. Most of them come from Asian countries such as Vietnam, Chinese, Malaysia, Singapore, Thai, and Korea (LICADHO, 2016). Vietnam shares the largest proportion of ownership of land concessions in Cambodia after its local investors. And, they were granted with areas in the provinces which formerly had an abundance of forest.

Figure 1: Economic Land Concessions categorized by ownership



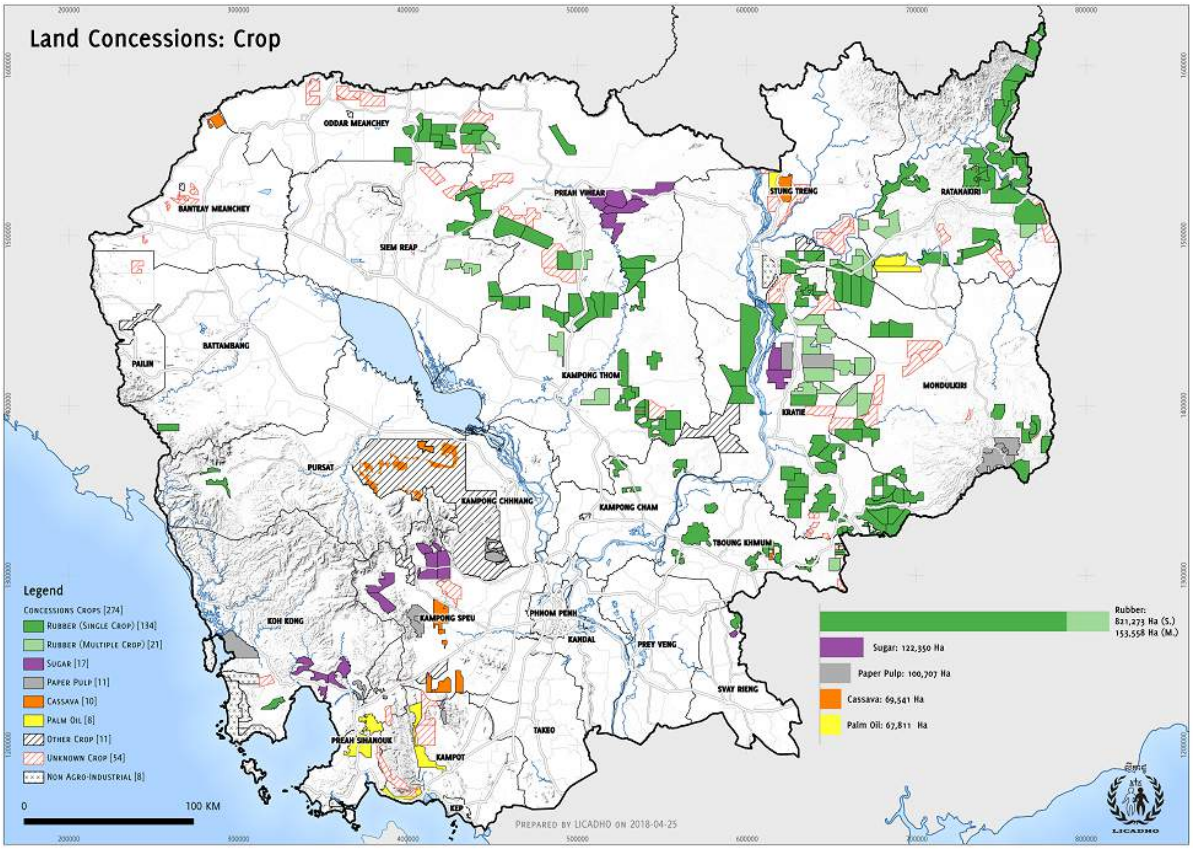
Source: LICADHO, 2016

Driven by neoliberal economic development, the government removes restrictions on industries to attract foreign capital or private investors (Young, 2016). For instance, tax holiday has been used as incentives for the new investors in Cambodia (CDC, 2017). Investors can get profit tax exemption up to 9 years and many other incentives. There are more and more both local and international companies investing in natural resources in Ratanakiri, especially Economic Land Concessions (ELCs). The key driver of conversion of forest land in Cambodia are Economic Land Concessions (ELC), the main tool used for investment in agricultural and plantation crops on an industrial scale (Fujisaki, 2013). "Economic Land Concessions were expected to stimulate agro-industrial activities and to develop so-called "under-utilized" land. They were intended to increase employment in rural areas, to offer new opportunities for labor and employment in the countryside, and to encourage local economic diversification through investments upstream and downstream of the concessions. ELCs were also meant to generate state revenue at national and sub-national levels." (Diepart et al., 2017). Indeed, this kind of land use does benefit the economy of the country from this commercial development by creating jobs for the villagers, paying tax to the government, exporting their products to foreign markets, etc (Marschke, 2016). With the approval from the government, the activities that the private companies carry out on the ground sound like assisting growth rather than harming the environment and society.

There has been considerable progress towards economic sustainability, particularly in terms of poverty reduction and growth in the rural economy. However, this progress is made possible only at the expense of social and environmental conditions, where the theft of natural resources in particular has compromised livelihoods within rural communities (Young, 2016). In recent decades, rapacious and inequitable exploitation of natural resources has put many rural people's livelihoods under threat in a manner that is closely linked to environmental quality and poor environmental stewardship (Hall et al., 2011). Will the growth be sustainable, will the development last long? Development, in Cambodia, is often conceived of having been hindered as state-sponsored violence and interpersonal direct violence have not abate. And, this calls the concept of development into question (Springer, 2015). While there is recognition of the contribution that private investments have had on economic growth in general, the contribution to social and environmental sustainability in rural areas is far from explicit (Young, 2016). Instead of promoting development and poverty reduction, economic land concessions have compromised the economic, social and cultural rights of rural communities in Cambodia (UNHRC 2007). International investors frequently concern themselves only with the economic bottom line or the assurance that natural resources and cheap goods continue to flow regardless of the localized environmental damage and repressive labor conditions, which are treated econometrically as mere externalities (Springer, 2015). In order to attract foreign investment and to avoid the relocation of foreign investment to other countries with lower standards, the government opts not to heighten social and environmental benchmarks. In this sense, social inequity and environmental degradation are widely accepted by the government in order to achieve greater development goals (Young, 2016). Besides Cambodian elite-owned concession area, Vietnamese and Chinese companies have made their way to clear and take

possession of thousand hectares of former forestland through state level decision making based on low standard social impact assessment. The government has used the former forestland which locally provided subsistence livelihoods for villagers to generate tax revenue and royalties in its new form of land use. History has proclaimed that neoliberal land policies[1] have progressively shaped vulnerabilities of poor people embedded by root causes, dynamic pressures and unsafe conditions making them highly susceptible to shocks (De Zoysa, 2013). For instance, a root cause of vulnerability can be an ethnic minority residing in a remote rural region of a country and facing marginalization from political power. This group would face 'dynamic pressure' if there was a lack of press freedoms to advocate for rights. This scenario is further aggravated by macro-forces such as rapid population change, urbanization and deforestation as it intensifies the limited resources available (De Zoysa, 2013). The sudden loss of forestland has put the source of their subsistent livelihoods at risk.

Figure 2: Economic Land Concessions categorized by crop



Source: LICADHO, 2016

[1] Neoliberal land policies emerge from a pro-market critique of conventional (generally state-directed) land policies. It refers to land reform seeking to privatize or lease property of the remaining public/communal lands in order to attract investment either through domestic or FDI (Borras, 2006, p. 102).

The forestland in the northeastern part of Cambodia, especially along the border with Vietnam, has been excessively converted to large scale rubber plantations. This loss hinders the nearby communities as the resource has served as sources of subsistent livelihoods for them for generations. Even there are adverse impacts on environment and societies, more and more concessions have been granted for plantations of rubber, sugar, pepper pulp, cassava, and palm throughout the country (LICADHO, 2016). Vietnam who shares the largest proportion of ownership has converted their granted forestland to large-scale rubber plantation. The environmental and social impacts that can be seen today are minor in comparison with the future ones if the companies ignore potentially dangerous impacts or fail to present satisfactory mitigation measures. "From the late 1990s, Ratanakiri, with its mainly intact forests and rich volcanic soils, emerged as resource frontier. The central government granted land concession to domestic and foreign companies with little or no consultation with the provincial government. Indeed, so poorly coordinated were the concession and the overlapping establishment of protected area that at one stage it was calculated that 115 per cent of the province's land area had been allocated to these uses. The first that many of the shifting cultivators who form the majority of people indigenous to Ratanakiri knew of the concessions was when loggers protected by armed guards arrived to clear forestland and fence off the concession areas. The area enclosed included villagers' swidden plots, fallows, and sometimes even paddy lands, as well as large areas of forest from which villagers collected non-timber forest products.", (Hall et al., 2011). The land availability is drastically declining due to the large granting of Economic Land Concessions (ELC) to foreign and domestic agribusinesses (Scheidel et al. 2014).

The amount of land under economic land concession (ELC) has rapidly increased throughout the 2000s. It results in an obvious imbalance of social, economic and environmental concerns. The rapacious and inequitable exploitation of natural resources has put many rural people's livelihoods under threat in a manner that is closely linked to environmental quality and poor environmental stewardship (Hall et al., 2011, p.75-76). Fruits, resins and other traditional medicines that they can get from the forest have shrunken. At present, ELCs are not integrated into a comprehensive and holistic vision for land development that centers family farming as key to rural development of Cambodia. Instead, ELCs remark rural contexts in ways that lead to varying degrees of land dispossession of small-scale farmers and exacerbate the resource to wage labor, which usually does not compensate for the loss of the resources that local people depend on (Diepart et al., 2017).

Highlanders in Cambodia are today faced with a deepening land crisis, threats to their livelihoods, and increasing marginalization within the process of development (Padwe, 2016). This research will analyze also the recent policy made by the government related to land concession and indigenous livelihoods. At the beginning of the years 2000, the government has developed agroindustry sector by granting ELCs in order to build and sustain economic growth and accelerate poverty reduction (RGC, 2010). Since a couple of years government faced with the problems the ELC's has produced. For instance, certain

concession area overlapped sacred forest and farmland of local people. This has made some of them resist the development. And, it tries to diminish the effects of ELC by reallocating land to affected households. But these efforts are not enough. In this study, I analyze the different effects ELC's had on the livelihoods of the minorities and how the problems can be managed.

1.2 Research questions:

Main research question: How do economic land concessions affect indigenous people's livelihoods? These land concessions were granted to investors to develop large scale agriculture over the former forestland and some parts of farmland where villagers have benefited from. This has made the development look more evitable result of livelihood constraints. The research attempts to explain this increasing pressure on traditional common land, the role of land rights, the vulnerability and the buffer capacities of the minority societies to arrange with the land-use change, and the effect of the extinction of traditional strategies on local ecology.

Sub questions:

- What happened to the common pool resource?
- What are the newly emerging livelihood strategies?
- What are the reasons behind the extinction of traditional livelihood strategies?
- Why did emerging livelihoods strategies cause ecological change?

1.3 Research rationales:

The study has a double task. Firstly, it is conducted as a scientific study on the impact of ELC´s on livelihoods. Secondly, it will search for practicable ways to improve the situation. Even though this research was originally written to get findings for the improvement of the current practices in assessment tools of Cambodian Ministry of Environment, it will also academically contribute to the concept of human geography ranking from livelihoods strategies, vulnerability, and resilience in a new geographical indigenous area of Cambodia. In this research, attempts are being made to focus on how local people adapt themselves to the situation where the agrarian change takes places rather than leaving the villages and looking for the subsistence in the other places.

In order to sustain their livelihoods, villagers need to adapt to the new change in their indigenous agriculture. State economic development plan through land concession need to be re-adjusted in order to assure sustainable livelihoods of indigenous people. To some extent, there must be some agrarian change of minorities living in the northeastern part of Cambodia. This research will give us more new knowledge learning from the mistakes made in real practice from one country in Southeast Asia. It also attempts:

- To analyze and document the indigenous livelihood strategies and livelihood outcomes in the

northeastern part of Cambodia.

- To improve Environmental Impacts Assessment guideline related land use/large scale agricultural concession.
- To generate a better analytical tool for indigenous livelihoods
- To reduce the uncertainties in Environmental Impacts Assessment reports from proponents.
- To increase the concept of participatory, transparency, and accountability in assessment report.

1.4 Research structure:

Chapter 1 whose title is development as a threat to livelihoods and environment provides the readers with the information of development issues caused by ELC's. It presents the rationales for preparing this paper. And, the answers to research questions are will help us to raise the awareness and improve the current situation.

The book details more facts on changes in livelihoods strategies as a result of concessions in Chapter 2. And, it depicts the empirical works to related to decision making process which leads to the development in the area. First, it provides some information related to the process of environmental impact assessment. Then, it provides some facts of livelihood strategies of indigenous people and concessions in the research area and neighbouring countries. And, the targeted groups in other countries are also hilltribes or indigenous people living in the mountainous area of relevant countries.

In chapter 3, there is an explanation of how the conceptual framework is created. And, it is supported by several concepts such as livelihood framework, vulnerability, actors, resilience, and the link between social and ecological resilience. They are combined as one common framework that corresponds to its above-mentioned development issues.

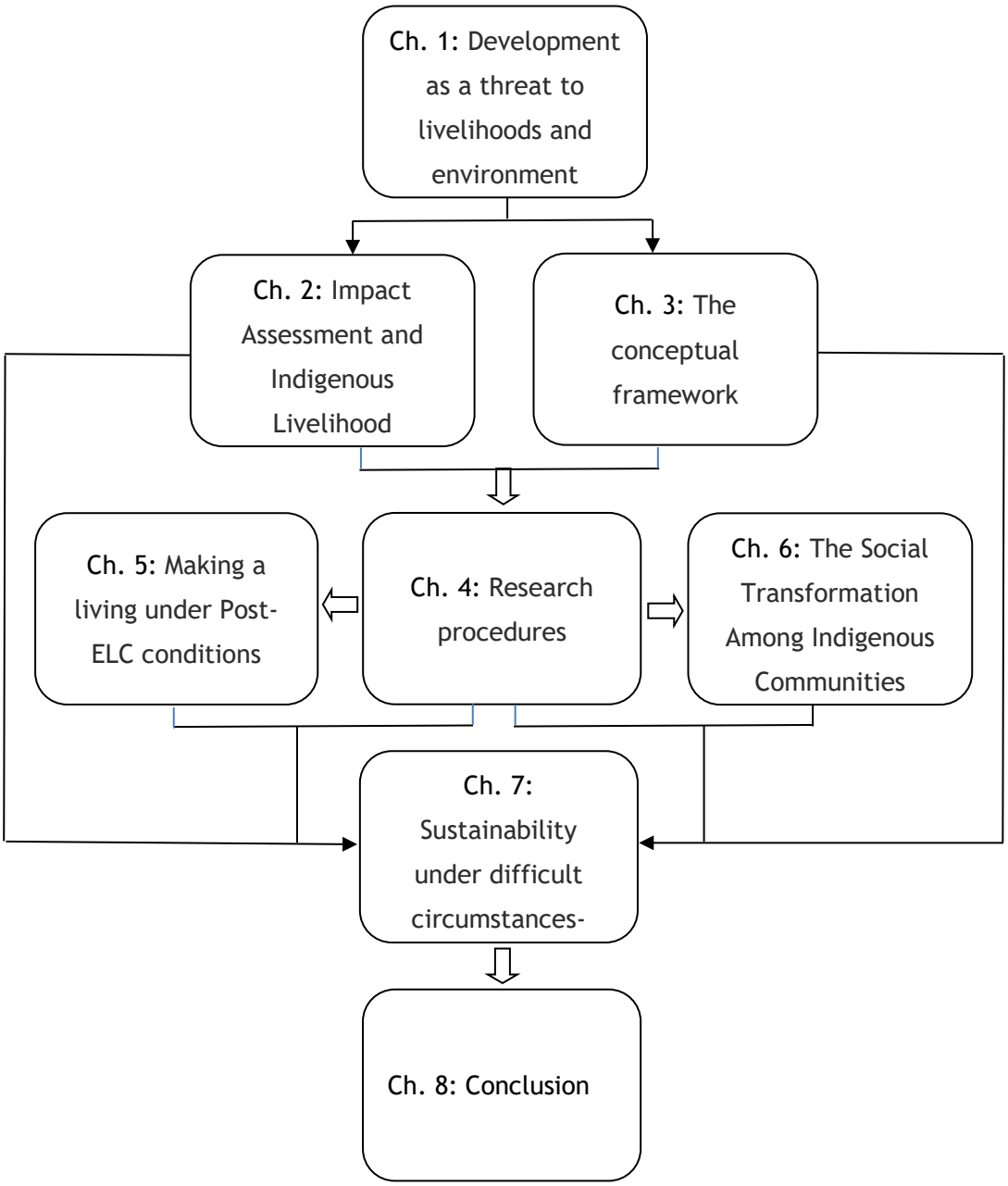
Chapter 4 of the book depicts the structure of analysis and an explanation of data collection in its first part and data analysis in its second part. Firstly, it gives the overall guidance and comprehensive steps in its process following zig-zag approach. Then, it sheds light on how the analyses of livelihood dynamics, resilience, interrelationship in livelihood resilience, and resilience in comparative analysis are made.

In Chapter 5, the data of post-ELC's livelihoods from each village is provided. And, it illustrates the villagers' reaction to the changed land-use situation by village and ethnicity. Principally, their livelihood activities are figured out to observed to its changes from time to time. Then, the chapter describes land use change, tree cover percentage in different year based on field-GPS tracking data and maps derived from satellite images and existing maps. The data of land use change, tree cover percentage is also used to verify with those of villagers' reaction to the changed land-use situation. The analysis and discussion of livelihoods will benefit from the collected data. Chapter 6 embodies the elements of social and ecological resilience. Here, the data of all elements of villagers' buffer capacity, self-organization, and

capacity for learning of each village are collected for comparative analysis. It also gives advantage to the analysis and discussion of resilience, actors, and the link of social and ecological resilience.

In Chapter 7 where the analysis and discussion are made, both social and ecological viewpoints are taken into account to re-analyse resilience in win-lose situation. Here, it focuses on the relationship between social and ecological resilience. And, the key concepts of the research are used for discussions on the exposure to resource trend, the elements of resilience, sensitivity to resource dependency, and strengthening resilience. The conclusion is drawn out in Chapter 8. In this part, all relevant actors in research itself, those working on or studying in development issues, and policy makers can benefit the most from this research as it contributes different recommendations at different fields and levels of structure.

Figure 3: Research structure



Chapter 2: Impact Assessment and Indigenous Livelihood Strategies.

Two thirds of the world's indigenous peoples are estimated to live in Asia. And, some of them have settled in the mountainous area of the southeast Asian countries-Cambodia, Lao, Thailand, and Vietnam (Errico, 2017). Their localities are rich in biodiversity-rich. However, their resources have been eroded due to dispossession or forced removal from traditional lands and sacred sites. Commercial plant varieties have replaced the many locally adapted varieties used in traditional farming systems, leading to an increase in industrialized farming methods (Persoon et al., 2007). Forced resettlement of indigenous communities is occurring in many ASEAN countries, often in connection with development programs (AIPP et al., 2007). The text below, contains the information on livelihood strategies of indigenous people living Cambodia from the early stage of development in detail. First, it illustrates the mechanism to grant state private land to investors. Then, it describes its impacts on local communities, and the changes in livelihood strategies of indigenous people, the remaining natural resources in research area. Besides Cambodia, it also provides the relevant facts of environmental impact assessment and development issues in its neighboring countries including Lao, Vietnam, and Thailand.

2.1 Cambodia:

In Cambodian, farmers comprise 85% of the total population. And, the forest land still represents 59 percent of total land. However, Cambodia is losing its natural forests at a rate of about 208,000 hectares (804 square miles) a year (Tucker, 2015). ELCs are large scale land concessions, issued in accordance with the Cambodian Land Law 2001, and in some cases of the Protected Area Law 2008 (Protected Area Law). The Protected Area Law was, in principle, formulated to govern protected areas, which total 2.2 million ha or 18 percent of the total land area of Cambodia. However, the Protected Area Law contains a significant avenue through which the Ministry of Environment (MoE) issues ELCs for agricultural development within protected areas, leading to the conversion of this land (Banks et al., 2014).

2.1.1 Environmental Impact Assessment Process

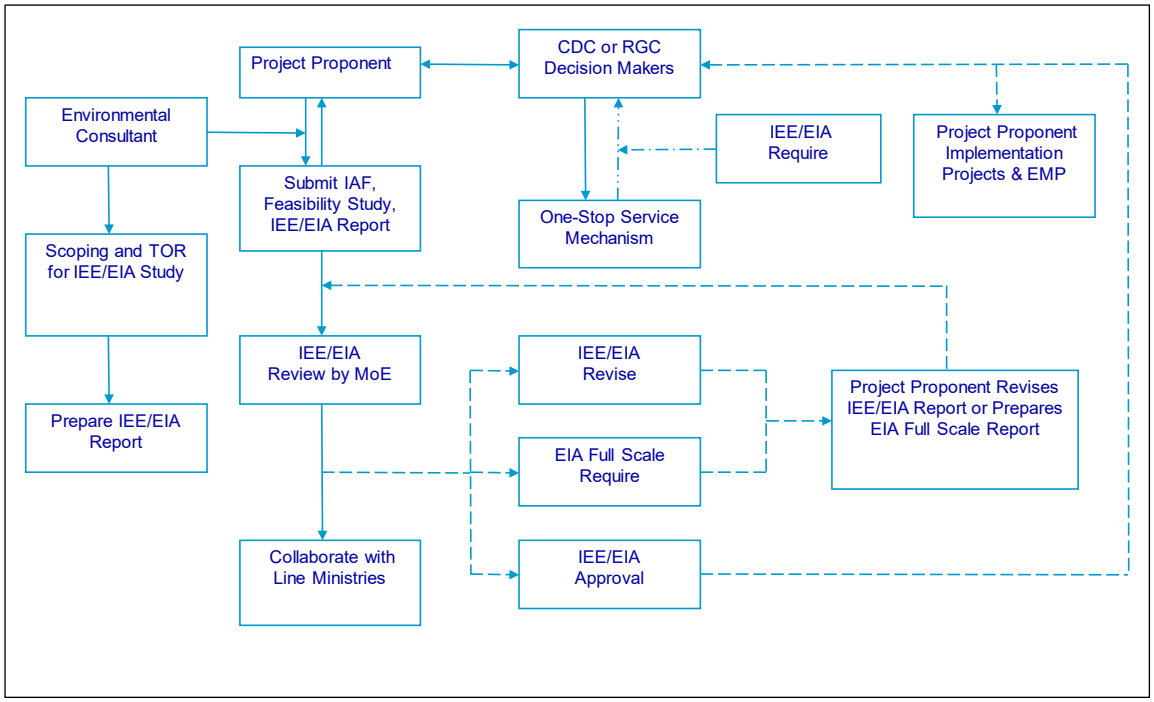
The 1999 Sub-decree on Environmental Impact Assessment Process requires that an EIA be conducted for all public or private projects involving activities that are listed in its attached annex (RGC, 1999). This includes projects for agro-industry, wood and paper production, mining, chemical plants, textiles, power plants, tourism and infrastructure, amongst others. However, the sub-decree includes an exemption for "special and crucial projects approved by the Royal Government (RGC, 1999)".

The investors firstly have to prepare and submit environmental and social impacts assessment report to Ministry of Environment (RGC, 1999). They can hire qualified consultants to write and defend this report for them. The consultancy companies send their staffs to the proposed location for ELC. They might stay there for a certain period of time collecting data related to existing ecological, social, and economic

resources. The report needs to address impact assessment and mitigation. Then, they can submit this report to the ministry of environment for the review. The sub-decree states that the MoE has the responsibility to review all EIAs in collaboration with concerned ministries, and also to conduct follow-up monitoring to ensure that the project implementer follows the environmental management plan set out in the EIA (RGC, 1999).

After receiving the report from investor and consultant, the ministry of environment will send one team of technical officers to the field. Their tasks are to verify the data written in the report, to witness the current situation of existing resources, to inform the public about the investment, and to discuss with related departments and authorities at the field. The officers have to write and submit field report to the minister. And, the ministry will set up the date for the meeting to discuss about this investment project-based EIA report and field visit. All stakeholders- NGO, representatives from all ministries, authorities, representative of community are invited to participate this meeting (shown in figure below). Before this meeting, there is already an internal meeting mostly among departments under ministry of environment.

Figure 4: Cambodian EIA process



Source: Sub decree 71 on Environmental Impacts Assessment.

If the project is found that it will give more positive impacts than adverse impacts at each level of the meeting, the ministry of environment will send a letter to prime minister for his acknowledgement. This assessment report is also submitted to the Council of Development for Cambodia (CDC) for approval through One-Stop service meeting. Finally, investors can start their operation after receiving the license

from MoE and approval from CDC. Ministry of environment still has another job to monitor the project implementation of ELC during their operating lifetime. Monitoring should take place during the period of construction, operation and closure of a project (RGC, 1999). The Department of Environmental Impact Assessment is responsible for reviewing EIA reports and conducting this monitoring role (RGC, 2000). The institution responsible for approving a project must do so only after consideration of the MoE's findings and recommendations (RGC, 2000).

The enforcement of EIA is however lax. As a result, economic-driven rural development has caused adverse socio-economic impacts on rural communities in most, but not all, places where large-scale economic development projects were endorsed by the government (Young, 2016). And, environmental impact assessment was accepted by concerned government agencies-the Ministry of Environment, and Ministry of Agriculture, Forestry, and Fisheries alike-through the quality was poor and insufficient while the legal requirements for granting ELCs have often not been complied with by both state authorities and concessionaires (Oldenburg et al., 2014).

Even there has been considerable progress towards economic sustainability, particularly in terms of poverty reduction and growth (Young, 2016), ELCs are seen limiting access of people living in rural areas to farm land, and have not led to employment creation, reforestation, or poverty alleviation (Neef et al., 2013; Scheidel et al., 2014). The villagers have depended on natural resource from generation to generation. The presence of ELC in the village has been seen as a threat to indigenous livelihoods in the eyes of NGOs, and the indigenous people themselves. "During the implementation of these large-scale agriculture investments, a number of irregularities have also been routinely reported. Logging operations regularly proceed well beyond the boundaries of the concession area." (Diepart et al., 2017). The resource that indigenous people have used can be located in the concession areas. And, they traditionally practice swidden agriculture or collect NTFP from the forestland which was granted to ELCs. The development of large scale agriculture has shrunk the forestland (Marschke, 2016). The areas for swidden agriculture are no longer available since thousand hectares of land given to large-scale agricultural investment. And, the remaining forest is small. Very often the land granted to concessionaires is already occupied and/or cultivated by people. Basic field visits to these sites would have sufficed to make it clear. In these cases, logging or land-clearing operations have led to land dispassion and forced evictions (Diepart et al., 2017).

The new rubber barons – Hoang Anh Gia Lai and the Vietnam Rubber Group – are devastating local livelihoods and the environment in their rush for rubber. Local villages impacted by rubber concessions owned by or affiliated with these companies have lost vast tracts of land and forests. As a result, households are facing impoverishment, while spirit forests and burial grounds have been destroyed (Global Witness, 2013). Local families say they have lost their livelihoods and are experiencing food shortages since the company arrived (Global Witness, 2013). One village chief told Global Witness his

community had lost over 1,000ha of forest; their spirit forests and burial forests are now under threat and livelihoods have been damaged because of the loss of access to resources such as resin, wildlife, fish and medicines (Global Witness, 2013). The recent and ongoing expansion of rubber cultivation in the Mekong Region has led to a considerable degradation of biodiversity through the loss of natural forest area and its increasing fragmentation, and through the reduction of landscape diversity by degrading potentially suitable habitats for survival of natural forest species (Pia et al., 2015).

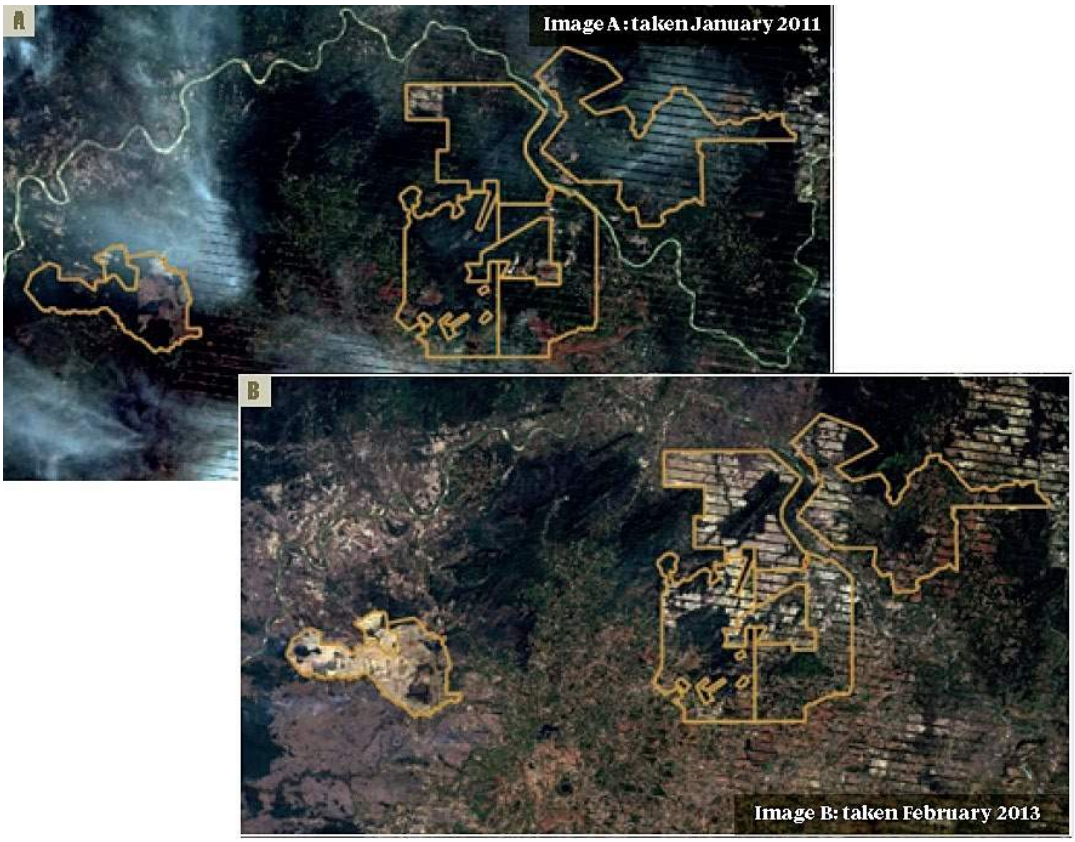
2.1.2 The concessions in research area:

2.1.2.1 Development issues:

Satellite Image below shows Rubber concessions of companies owned by or affiliated with HAGL (Hoang Anh Gia Lai) and VRG (Vietnam Rubber Group), Ratanakiri province, Cambodia. There is an extensive forest clearance within their concessions. Larger concessions marked on left of image belongs to Hoang Anh Mang Yang, jointly owned by HAGL and VRG, until HAGL sold their shares to VRG in 2010 (Global Witness, 2013). And, the small concession area sharing border with Hoang Anh Mang Yang belongs to Vietnamese company called Kiri Development. Hoang Anh Mang Yang O Ya Dav on the right of the image was granted with 9,000 hectares of land (LICADHO, 2016).

In this paper, I focus on four economic land concessions that share borders with each other forming the largest concession area in the middle of the image. In 2009, Heng Brother in the middle was granted with 2,361 hectares of land. In 2010, the government granted 6,695 hectares of land to Krong Buk on the top. In 2011, CRD on the left and Veasna Investment on the right were granted with 7,591 hectares and 5,080 hectares of land respectively. The area was formerly rich in forest before the arrival of ELC's. All the companies have well implemented their master plan of plantation by clearing the forestland and planting rubber from one sub-region to another inside concession area. And, the immense deforestation could cause a huge loss of subsistence resource which served as basic needs of indigenous people. This paper attempts to explore more the impacts and its contextual issues in both social and ecological viewpoints.

Figure 5: Deforestation in concession area



Source: Global Witness, 2013.

In addition to an obvious lack of transparency that servers the political and economic interests of the national elite, the granting of economic land concessions affects the development of upland areas in many ways (Diepart et al., 2017). After having lost agricultural land and NTFP to the companies, the indigenous people have tried to get their resources back many times. And, these events sometimes turned into violence, confrontation, and negotiation. Over the past decade, the implementation of ELCs has boosted land conflicts caused by land dispossession and forced eviction (Schneider, 2011).

2.1.2.2 Crisis response:

Development assistance for land tenure and titling began in 2002 with the multi-donor funded Land Management and Administration Project (LMAP). The World Bank, Germany, Finland and Canada provided technical support and financial support to the project. It supported the establishment of a functioning land administration system including a centralized land register and systematic land registration program.

The RGC has put in place the 15-year Land Administration, Management and Distribution Program (LAMPD), consisting of a comprehensive set of proposed reforms in land policy, systematic land registration,

management of State lands, grants of social concessions to the landless, reform of land taxation, land use planning procedures, the identification of economic zones and housing and resettlement policy (MLMUPC, 2016). Following events surrounding a land dispute over Boeung Kak Lake in Phnom Penh, LMAP was unfortunately suspended. After the termination of LMAP, the land-titling program continued under the Land Administration Sub-Sector Program (LASSP) of the Ministry of Land Management, Urban Planning and Construction (MLMUPC) (ODC, 2015a). And, land registration is primarily conducted under the Land Administration Sub-sector Program (LASSP) of the Ministry of Land Management, Urban Planning and Construction (MLMUPC). There are two forms of land registration officially established in the legal framework: systemic land registration and sporadic land registration (RGC, 2002b; 2002c). Systematic land registration (SLR) is the process by which whole districts or communes are identified for adjudication. Land registration teams enter to survey and demarcate land parcels, assess ownership documents, and adjudicate ownership (RGC, 2002c). And, sporadic land registration is possible, but it is much more expensive and less accessible to the majority of Cambodians. The concerned possessor who requests registration needs to apply for registration to the District Cadastral Administration through the Chief of Commune of the place where the land is located. (RGC, 2002d). By December 2014, Systematic land registration and sporadic land registration issued 2.6 million titles and 600,000 titles respectively (ODC, 2015a).

Even MLMUPC has made remarkable progress in developing the legal framework and distributing million land titles, land registration program has faced considerable challenges. Communities and civil society groups began to raise concerns (ODC, 2015b). Since 2005, GIZ's Land Rights Program has been advising Ministry of Land Management, Urban Planning and Construction in designing, piloting and implementing the process of the indigenous people communities land titling. So far, nine communities in Ratanakiri and Mondulkiri received their collective land title (GIZ, 2015).

The process for the registration of Collective Land Tittles (CLT) is lengthy and extremely complex, as outlined in Sub-Decree 83 (RGC, 2009). In practice, the community must complete three stages involving several steps to obtain a CLT: first the community must obtain formal self-identification recognition as a "*traditional culture*" by the Ministry of Rural Development (MRD); then the community must apply for recognition as a "*legal entity*" with the Ministry of Interior (MOI); and finally, the community has to file a collective land registration request with the Ministry of Land Management, Urban Planning and Construction (MLMUPC) to register their land and be issued with a CLT (CCHR, 2016). Only private land titles were issued over lands where indigenous people had disputes with companies, which pushed indigenous families to privatize and exacerbated disputes with companies. According to update list of collective land titling progress with support of ILO, GIZ, NGO, and target affected by Directive 01 from 2003-13/01/2015, none of the communities in Andoung Meas where field research is located has received communal land titling (Kham et al., 2016).

Figure 6: Status of collective land registration of indigenous communities

No.	District	Number of Indigenous Community	MRD		MoI		MLMUPC	
			Apply	Recogonized (MRD)	Apply	Recignized (MoI)	Apply	Tittle
1	Borkeo	10	8	7	8	7		
2	Oyadav	12	10	10	8	8	1	
3	Andoung Meas	11	11	9	5	2		
4	Ochum	15	11	11	14	12	10	5
5	Konmom	5	4	4	5	2	1	1
6	Ban Lung	0	0	0	0	0		
7	Lumphat	13	9	9	8	7	3	
8	Taveng	6	5	5	5	5	1	
9	Voeunsai	9	2	2	4	4		
	Total	81	60	57	57	47	166	6

Source: Kham et al., 2016

The RGC recognized the need to 'pressure' communities to privatize these areas to 'help resolve disputes' (Aun et al., 2013). In May 2012 Prime Minister Hun Sen issued Directive 001 (also known as Order 01BB) on 'Measures to strengthen and enhance the effectiveness of management of economic land concessions (ELCs)' announcing a moratorium on the granting of new ELCs, the review of existing ELCs and the implementation of the so-called "leopard skin" (or "tiger-skin") policy, with the aim to allow communities to live side by side with the concessions. Following this policy, the government re-demarks and gives land back to the indigenous people for agricultural purpose. And, the cooperate allows indigenous people to collect NTFP in protected forest located inside land concession area. It fundamentally means that land cultivated, inhabited, and used by farmers must be cut out of the concession areas. This made the areas look like the pattern of a leopard skin. The effected land is considered as black spot on leopard skin. These areas are houses, farmlands, community forests, cemeteries and sacred forests of villagers. And, they are supposed to be cut out from the concession area to minimize the impacts during studies, especially before land concession is granted. And, the white spot of leopard skin is technically unaffected land which can be kept and granted to the investors to implement their large-scale rubber plantation.

However, indigenous people have encountered even more issues under a new private titling policy issued by the Royal Government of Cambodia (RGC), Directive 01BB. Although the policy initially claimed it would secure the customary communal lands of indigenous peoples and would not be carried out over lands under dispute with companies, implementation and subsequent instructions proved the opposite true in practice (Rabe, 2014). And, this Order 001 was also the result of the convergence of a number of events at different scales. In addition to freezing the granting of ELCs, Order 01 initiated an

unprecedented land-titling campaign in areas where the land rights of people and companies overlap on state land, including ELCs, forest concessions, forest land, and other types of state land (Diepart et al., 2017). In the framework of the implementation of Directive 001, a new land registration campaign was implemented by youth volunteers (university students and Cambodian People's Party's youth) to speed up the process of land registration, which had been previously carried out, often ineffectually, through sporadic or systematic registration systems (ADHOC, 2014). Cambodian Prime Minister Hun Sen announced the land-titling project in June 2012, setting a goal of sending student volunteers out across the country to provide land titles to 470,000 families on 700,000 plots of land covering a total of 1.8 million hectares of land by June 2013 (Ben et al., 2014).

The implementation of Directive 01 has progressed with great speed, and human resources allocated for it are greater than those for the regular Systematic Land Registration process. Hence, it would appear that Directive 01 had the potential to speed up the communal land titling process, as volunteers deployed in indigenous peoples' areas would have been able to rapidly demarcate communal land. However, with reference to communities who have not yet been registered as a legal entity by Ministry of Interior yet, the instruction stated also that "*individual indigenous people who do not join as member of the community and wish to live privately*" can apply for private land titles provided by *Directive 01* thus postponed communal land titling to a later stage due to the lengthy process of boundary demarcation and for budget reasons (Oldenburg et al., 2013). The implementation of Directive 01 is similar to sporadic land registration where each landlord requests the officers to separately measure and register the land. However, land registration through Directive 01 is free of charge, but for limited time only. The current state of affairs needs to be addressed with a sense of urgency as indigenous peoples are being coerced to acquire private titles and sell them to make way for economic land concessions. Private titles are not consistent with the customary land tenure arrangements of indigenous peoples. They do not recognize the collective nature of indigenous communities, are limited to an area that is insufficient for traditional agricultural practices, and include other conditions that make them inappropriate (Natural Justice, 2013).

It was based on the results of the inter-ministerial committee meeting for assessment, measurement and evaluation of the economic land concessions (ELCs) dated on 15 June 2015. In this Notification, the Office of the Council of Ministers decided to permit companies to continue procedures in forces over land areas by rewriting the contracts. The investment period was shortened from 70 years to 50 years. And, the area was downsized to mitigate the impacts. 12 ELCs in Ratanakiri were subjected to the decision (RGC, 2015).

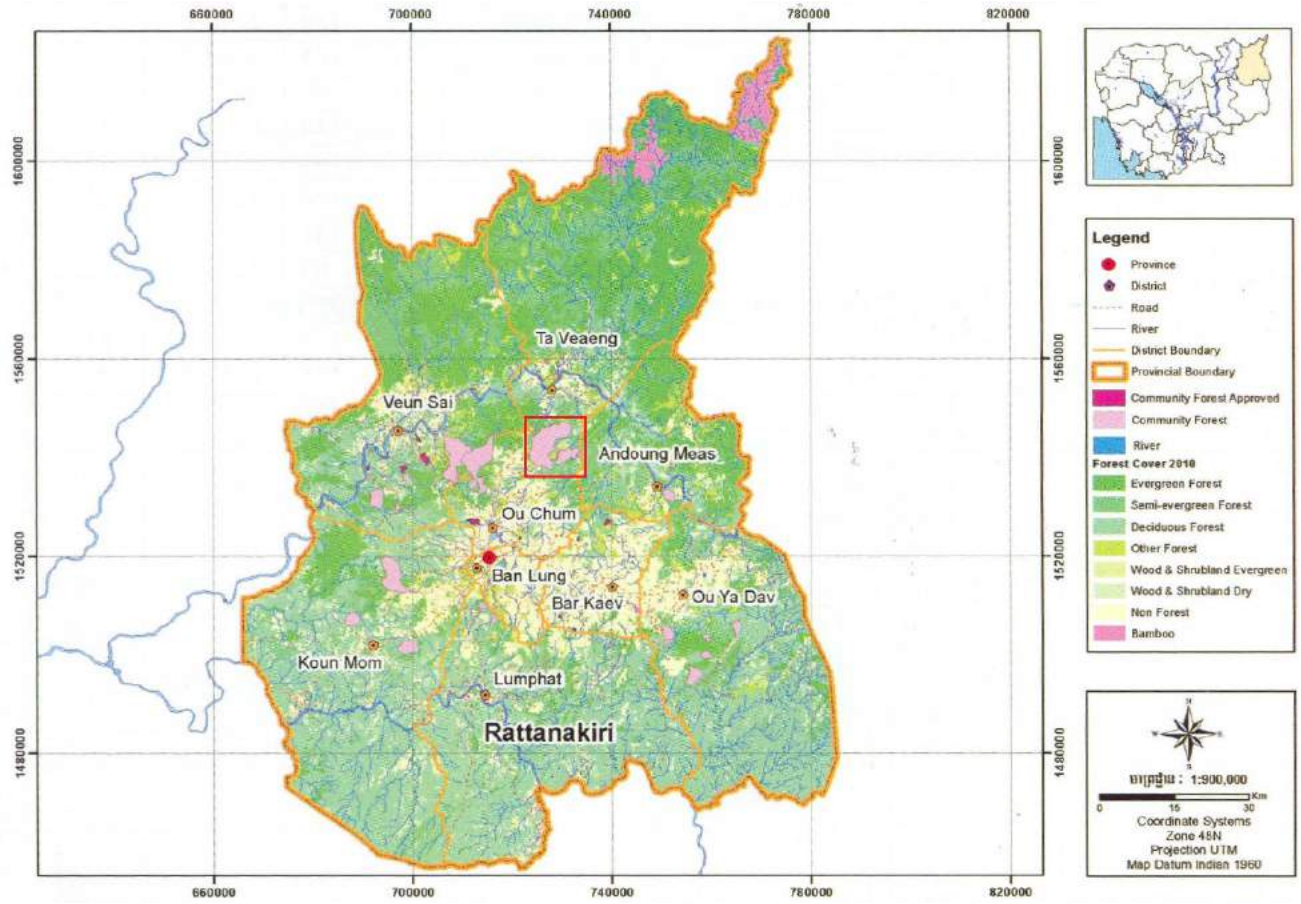
2.1.2.3 The remaining common property regimes:

Four rubber firms are responsible for destroying an estimated 1,000 hectares of community forest, including an indigenous graveyard, in Ratanakiri's Andong Meas district, a group of NGOs have claimed.

In 2009, the Kingdom began parceling land off land in Andong Meas to Heng Brother allotting the company 2,361 hectares. Two years later, 19,366 hectares of land were divided up between CRD, Veasna Investment and Krong Bok Ratanakiri Rubber Development (Phak, 2014). The huge loss of livelihoods to large scale agriculture in the area has made the resilience of local communities become the subject of curiosity, especially when the remaining resources dry up in the long run. Not only the resource itself has shrunk, but traditional livelihood activities such as animal hunting and wild fruit collection are also affected. The research will examine the fate of these livelihood strategies and the emerging livelihood activities at the same time to see how villagers sustain their living after the arrival of economic land concession.

Fortunately, there is still one official common resource that Indigenous people rely on. It is called Yak Poy community forest. Yak Poy is one of 19 community forests which have been approved by MAFF (Forestry Administration, 2013). It was officially created, on 19th February 2013, by Cambodian Ministry of Agriculture, Forestry, and Fishery. This community forest covers 4334 ha (RGC, 2013). In the above figure, Yak Poy is marked inside the red square. And, it is located close to these four ELCs. Yak Poy has become common property regime (Ostrom, 2000: Access to, withdrawal from, management and ownership of such a resource can be in the form of a common property regime, but it doesn't have to. "Examples exist of both successful and unsuccessful efforts to govern and manage common-pool resources by governments, communal groups, cooperatives, voluntary associations, and private individuals or firms"). It is still likely that villagers who have been squeezed by economic land concessions have no option but to encroach or overuse the resources in community forest even they have received individual land plots measured by youth volunteers. Moreover, Cambodian forest law said that local community can collect and use of dead wood, wild fruit, products from bee hive or comb, resin, and other NTFPs; log timber to build houses, stables for animals, fences and to make agricultural instruments. Legal-binding community forest management (RGC, 2003) seems not to effective and useful. And, this paper deepens the social resilience of the forest community in the face of exposure to resource trends.

Figure 7: Map of Community Forest in Ratanakiri



Source: Forestry Administration, 2013

2.1.2.4 Cash crop farming:

Farmland is geographically located between community forest and rubber plantation, or between rubber plantation and the village. The indigenous livelihoods are both subsistent and non-subsistent. Currently, indigenous people collect NTFP while growing cash crop. The combination of sources of their livelihoods in the research will benefit the analysis of resilience at the end. For instance, villagers in Kanat plant and sell cassava and cashew nuts to local and Vietnamese traders. They also cultivate upland rice, collect non-timber forest products (NTFPs).

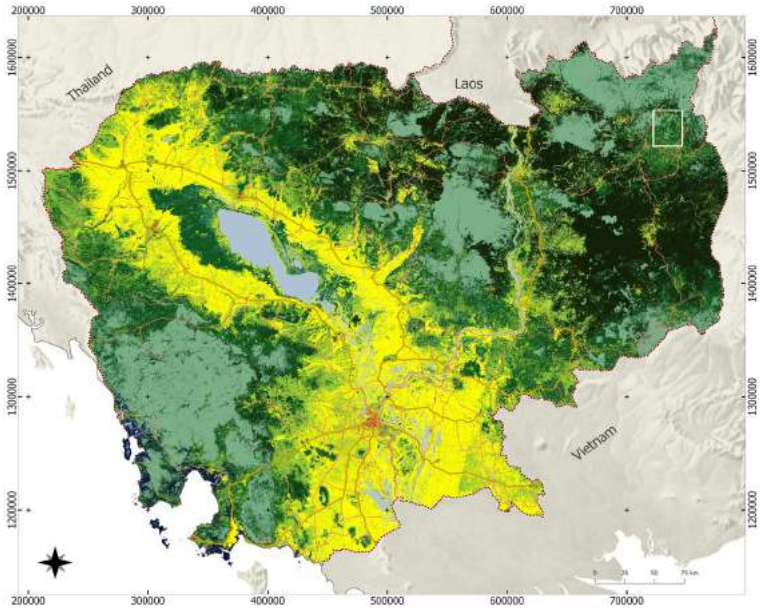
According to the maps of land cover of 2012 and 2015 produced by Open Development Cambodia, the cropland keeps increasing throughout the research area (both in concession area and the villages) especially over former mixed evergreen and deciduous forest. And, the former cropland of rubber plantation in 2012 has become forest on the map in 2015[2].

[2] However, the map of 2015 cannot differentiate mature rubber trees of concession companies located in the area from the forest. On the top of this map, it is noticed that cropland in 2012 has become mixed evergreen and deciduous forest in 2015. It is not possible that there is still forest inside the concession land after 5 years of rubber plantation. These should be rubber trees at the age of 4 or 5.

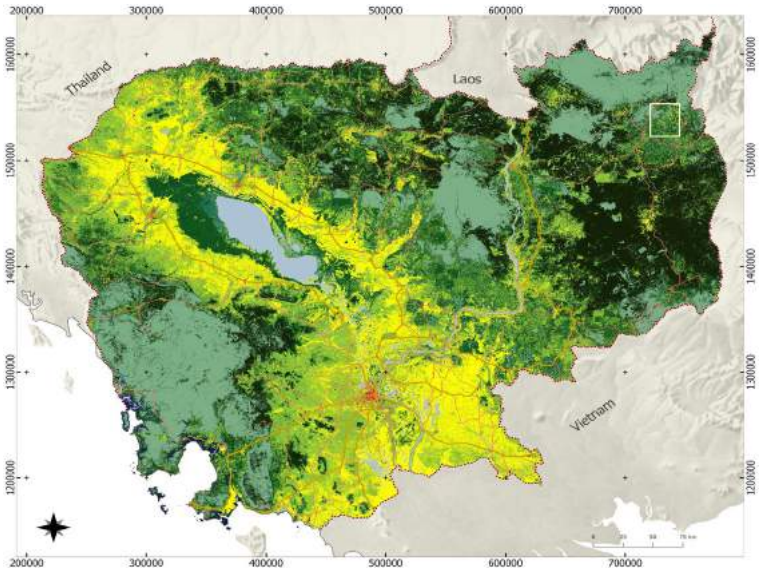
Figure 8: Land cover from Open Development Cambodia

2012

Area view



2015



Source: Open Development Cambodia, 2018

And, the rubber plantation of concession companies and the orchards of cassava and cashew nut of villagers are shown as one type of cropland on the map. To solve this issue, the research will use different images with higher resolution that enables us to analyze land cover and land use change at different year. Field GPS-tracking data will be used to identify the crops and verify them with the maps. And, they are used to overlay with each other to detects changes and differences on one common map.

"Compared to cashew nut, predominant as cash crop in indigenous areas a decade ago, cassava, beans or peanuts are more profitable and allow significant monetary gains" (Park et al., 2015). "Their attitude toward monetary income has changed. Commercial crops represent a renewable source of cash and are seen as an important way to catch up with societal and economic changes. And, many families to have shifted to cultivating cash crops such as cashews and cassava" (Gryseels, 2017). However, price of cassava has dropped from 700 to 200 riels (0.14 to 0.041 euro) kilogram that make indigenous people insecure about their source of non-subsistent livelihoods.

For fresh cassava, prices have dropped more than threefold from 300 riels (0.062 euro) per kilogram in 2008 to 90 riels (0.018 euro) per kilogram in 2009 (Thet et al., 2009). For dried cassava, the price drops from 600 riels (0.12 euro) in 2014 to 500 riel (0.10 euro) in one kilogram in 2015 (Ratha, 2015). This year (2017), the price of dried cassava in northeastern Ratanakiri province is down to 410 riels (0.08 euro) while wet cassava is down to an average of 162 riels (0.03 euro) per kilogram due to low demand in local and international markets (Chea, 2017).

The fluctuating price of cassava has made them grow less cassava. For non-subsistent livelihoods, villagers plant both cassava and cashew-nut. And, they have focused more on cashew-nut when its price keeps increasing for the last few years (Cheng, 2017). The price of cassava jumped sharply this year as many farmers who were fed up with low profits for several years in a row changed crops, thus decreasing the market's supply and raising the price. This year, fresh and dried cassavas cost up to 250 riels (0.05 euro) and 715 riels (0.15 euro) per kilogram respectively (Cheng, 2018). These activities incite them to continue farmland expansion throughout the villages.

With the remaining degraded forest and limited land for farmland expansion, indigenous people's livelihood is called into question. And, this research will focus on resilience of the two groups by finding out their buffer capacity, self-organization, and capacity for learning. And, theoretical reviews for and conceptual framework of the research are shown below.

Neighboring countries including Thailand, Vietnam, and Lao have longer experience with land concessions problems. And, this research will review their experiences for the case studies in Cambodia. It illustrates the impacts of land concession and an exposure of indigenous people's communities to the resources trends by pick up the analogies from them to present the resilience in their socio-ecological system respectively.

2.2 Lao:

2.2.1 EIA process:

The Decree 112 dated 2010 on Environmental Impact Assessment has the objective to ensure that all public and private investment projects, both domestic and foreign, which create or may create adverse

environmental and social impacts, are designed with the correct appropriate environmental and social impact prevention, mitigation measures, or environmental management and monitoring plans (EMMP) as well as social management and monitoring plans (SMMP). The aim is to effectively prevent, minimize and resolve adverse environmental and social impacts derived from investment projects (LIWG, 2012).

According to this Decree, Ministry of Natural Resources and Environment (MONRE) is responsible for reviewing and approving initial environmental examination / terms of reference / final full EIA reports / environmental management and monitoring plans. The Environmental and Social Impact Assessment (ESIA) Department within MONRE is responsible for overseeing the implementation of the EIA process. MONRE is responsible for issuing environmental quality standards in cooperation with the line ministries, and for issuing general EIA guidelines specifying procedures and standards to evaluate and mitigate environmental impacts caused by development projects (Wayakone et al., 2013). MONRE has to inform their approval on EIA reports to Ministry of Planning and Investment (MPI). And, MPI issues a concession license to the investor after the project agreement (concession agreement) is made.

2.2.1 Development issues:

There are several similarities between Cambodia and Lao. The Lao government has made some attempts to curb the chaotic growth of land concessions but to little avail. The market demand for rubber in China had encouraged investments from Chinese and Vietnamese companies in rubber plantations in Lao[3]. The Chinese investments are in the north of the country and the Vietnamese in the south (Lang, 2006). Commercial plantations, especially rubber financed by Chinese and Vietnamese companies, began to be established on a significant scale about 15 years ago (2002), and have been increasing ever since. Guidelines for the selection of land for concessions are not fully developed, and monitoring mechanisms are too weak to ensure a meaningful evaluation of the positive and negative impacts of concessions. Based on a recent (partial1) inventory of land concession agreements, conducted by the Ministry of Natural Resources and Environment, approximately 1,1 million (M) hectares of land have been conceded (LIWG, 2012). In 2007, the government did not allow concessions larger than 100 ha. In 2011, the government limited total land for rubber plantation at 300,000 ha. Given the lack of transparency in Lao' concession governance, the current policy on allocations is unclear. Either way, none of these bans have done anything to address the problems facing communities who have already lost their land and forest to rubber (Global Witness, 2013).

Land concessions began to accelerate during the early to mid-2000s as investors connected to global flows of capital and world commodity markets rapidly acquired large tracts of land in the country (Kenny-lazar, 2005). Especially after 2003-2004, there was a rapid increase in demand for economic land concessions in Lao. Monoculture plantations can be found across the country, particularly in the southern

[3] The explaination made by Sounthone Ketphanh, Deputy Director of the Lao Forest Research Centre during a workshop on "Rubber Development in Lao" held in May 2006 in Vientiane.

provinces of Xekong, Attapeu, and Champasak (Baird, 2011). In Xekong, two village leaders explained to Global Witness how HAGL attempted to purchase land from villagers for US$250 per hectare in 2005 but after people refused, local authorities gave the company 400ha anyway (Global Witness, 2013). This area included the farmland and forest on which people's livelihoods depended; some are now facing food shortages and 25 households were forced to clear new fields within the community's own protected forest area.

The legal framework governing land leases and concessions contains numerous provisions that require potentially affected communities to be consulted prior to the implementation of the project. Legislation also provides for resettlement and compensation packages for affected communities to ensure that their livelihoods are not undermined (FIDH, 2015). The reality on the ground, however, is a chaotic and opaque 'free-for-all' due to lack of political will and weak rule of law, legal ambiguity and little clarity of responsibilities between varying levels of government administration (Global Witness, 2013. Consequently, 13% of all villages in the Lao PDR have at least one concession within their village boundaries (Wellmann, 2012).

Ownership, tenure and use rights to land are often poorly defined in Lao. According to the constitution of Lao, all land is the property of the state (Campbell et al., 2012). Many of the concession deals are done by higher levels of government without specific demarcations of territory, and it is then left to lower levels of government to "find" available land. In practice, most of these concessions occupy land and forest areas that are in fact important for the livelihoods of smallholders, hence the characterisation of the concession process as land grabbing (Hirsch et al., 2015). Increasingly, the government of Lao has recognized land concessions as a problematic mode of investment (Kenny-Lazar, 2005).

Despite the law allowing only 'degraded' forest to be allocated as concessions, across the country intact forest is giving way to industrial-scale plantations at an unprecedented rate. Evidence of intensive logging was discovered; large cleared areas for storing logs, logging roads criss-crossing the area, and denuded forest landscapes (EIA, 2011). In both Cambodia and Lao, land concessions have been allocated within national parks and are recognised as the main driver of deforestation (Global Witness, 2013). In July 2004, the Viet – Lao Rubber Joint Stock Company (Viet – Lao Company), a member of VRG, was granted a 50-year lease of 10,000ha to cultivate rubber in Bachieng District, Champasak Province (Baird, 2009). Almost half of these impacted villages lost all but 10% of their agricultural land, four lost everything (Obein, 2007). Significant areas of communal land and forest were also cleared by the company, removing vital resources such as food sources, timber, and non-timber forest products, on which women, in particular, relied (Global Witness, 2013).

The rapid growth of rubber plantations causes large-scale loss of forest resources[4] (Lang, 2006). In Lao, Vietnamese Dac Lac Rubber Company has replaced forests and villagers' land with rubber plantations. The company paid compensation where it cleared cash crops, but provided no compensation where it cleared farmers' upland rice fields. Before the company established its rubber plantations, much of the land was a mixture of rice fields, fallows and forest. The company simply declared it "degraded forest" and cleared the land (Lang, 2006).

Another research from CIDSE-Lao found that prior to land concessions all the communities relied on surrounding natural resource for their living. This included both wet and dry land rice cultivation, collection of non-timber forest products (plant and animal) for consumption and sale, small scale handicraft production, animal raising and selling of labour. Large areas of the concessions included forest area that were previously used for hunting, NTFP collecting and agriculture. The loss of these areas has meant a decrease in these resources which has meant decreased food security and in some cases income (CIDSE, 2009). After the plantation, the villagers reported that natural resources for their daily livelihood practices had decreased (CIDSE, 2009). During his trip in 2015, German geographer Hans Gebhardt has witnessed the concession projects along the road to Attapeu being organized the Vietnamese companies.

2.3 Vietnam:

2.3.1 EIA process:

Projects which uses land of nature reserves, national parks or projects which change the purpose of use of forest area or areas with less than two rice crops per year are subjected to Environmental Impact Assessment according to Vietnamese Law (GVN, 2011). At provincial level, Vietnam has nationwide approved 5.623 EIA reports with average 33 EIA reports for one province per year (Nghiem, 2015). The investors need to hire independent consultant companies to prepare and submit EIA report to Provincial People's Committee (PPC). For forestland conversion, the project owners have to choose professional consulting firms to carry out surveys on land availability, site conditions, and forest stock. And, they prepare and submit documents of harvest design and salvage of forest products to the Provincial People's Committee (PPC) for approval. PPC, with consultations with Provincial Department of Agriculture and Rural Development and Provincial Department of Natural Resources and Environment, has right to approve EIA report. After the projects have been approved, DARD will issue a harvesting license for forest products to forest owners (MARD, 2008). The conversion of forest for rubber plantations is done without proper scientific advice, public consultation and top-down decision.

[4] Acknowledgement made by Sounthone Ketphanh, Deputy Director of the Lao Forest Research Centre During a workshop on "Rubber Development in Lao" held in May 2006 in Vientiane

2.3.2 Development issues:

The Decree 327 provides a mix of technical guidelines, financial incentives and subsidies, and legal provisions that apply to barren land development projects[5]. And, it contains three scenarios of barren land use and development. Target groups and strategies can be briefly described in the following way: The resettlement strategy: Poor farmers from lowlands resettle in the Vietnamese highlands to utilize the highlands' untapped resources. The sedentarization strategy: Migratory shifting cultivators move to permanent settlements and adopt fixed cultivation practices on previously unused land. The community development strategy: Sedentary highland cultivators, both Kinh, and ethnic minorities, intensify agricultural production (Sikor, 1995). The resettlement strategy can be expected to succeed on fertile barren land in regions with relatively low population densities. It will therefore be most successful in the regions where in-migration meets favorable conditions and does not cause negative impacts on the livelihoods of original inhabitants (Sikor, 1995).

However, with the large-scale migrations of Kinh after the war, much of the Highlander land was taken over by cooperatives, particularly fertile valley bottoms which were suitable for wet rice cultivation, and in the highland forests, land left fallow by the Highlanders was often claimed by Kinh settlers. The Vietnamese government also initiated its programme of Fixed Cultivation and Settlement, which forced Highlanders out of their old villagers and into Kinh-style settlements. Now living in small brick houses, constructed on the ground, arranged along a road, with fenced farming plots adjacent to the houses, many Bahnar people living in the new Government villages near Kontum lament the loss of their traditional village life where the extended family under one roof. Clearly, the aim of this programme is to assimilate the Highlander into mainstream Vietnamese society (Lang, 1996).

In the Central Highlands, there has been fierce competition between state-owned rubber companies and private companies over land resources for rubber plantations. Eahleo Company of Vietnam Rubber Corporation, located in Eahleo district of Dak Lak province, is managing about 6,000 ha of rubber plantations in the district. Most of these plantations were established before 2005 and are now producing raw latex. In recent years, the Company has sought to expand its plantation area. However, implementation has been difficult as the Company is unable to compete for land resources with private companies from outside the district due to higher transaction cost, bureaucratic, and lobby mechanism. In the district where the Company's headquarters are located, 15 companies have been allocated land for rubber plantations, almost all of them private companies established since 2008. As a result, Eahleo Rubber Company has had to move into other provinces, or even to other countries such as the Lao PDR and Cambodia in search of land resources for rubber plantations (Phuc et al., 2014). Another Vietnamese company, VRG also began operating abroad due to a shortage of available land in Vietnam (Global

[5] Decree 327 A program for covering the barren hills was initiated and issued by the Council of Ministers in September 1992. Guidelines were issued by the Ministry of Finance for provision of credit on April 7, 1993; for allocation of land by the General Department of Land Management 8, 1993, and on actual implementation by the Ministry of Forestry on June 9, 1993.

Witness, 2013). In 2011, the Prime Minister approved VRG's five-year business plan, which earmarked an additional 140,000ha for rubber, mainly in Cambodia and Lao, which would expand the company's holdings in the Mekong to 500,000ha in total (Thuy, 2012). This has made Vietnam become the world's leading exporter of natural rubber latex. By the end of 2012, the country's rubber plantation area accounted for 910,500 ha. In some locations, conflicts have emerged among household members, between different communities, and between households that have contributed land to rubber companies (Phuc et al., 2014).

The socio-cultural concerns of local communities are not taken into account while technical guidance is mentioned in the process of forestland conversion (MARD, 2008; 2009). Households within the project sites are encouraged to lease their lands or contribute capital through the values of their land user rights to rubber companies and laborers of working age employed to work for these companies (Nguyễn, 2009). The conversion of community forests to rubber plantations does not only narrow traditional community space but also deprives household rights to forest resources

People Committee had long bitter history with highlanders since Vietnam war while The U.S. Mission to Saigon sponsored the training of the highlanders in unconventional warfare by American Special Forces (Onion, 2013). The traditional lands of the Central Highland had been taken by the Vietnamese and the Central Highland demonstrators. Most of the NTFP have either been destroyed as a result of urban developments, or are managed by the state, and the indigenous people have lost their access to this resource (Thái, 2016).

As lowlanders or ethnic minorities from other parts of Vietnam began to encroach on their land, or as state plantations displaced them, such practices became untenable (The Phnom Penh Post, 2002). In February 2001, a mass protest took place in Pleiku and Daklak provinces that were among the largest since the reunification of Vietnam in 1975. Several thousand members of indigenous minorities from the country's Central Highlands held a series of peaceful demonstrations calling for independence and return of ancestral lands (Human Rights Watch, 2002). The Hanoi government responded by sending huge numbers of police and military forces into the Central Highlands and expelled foreigners and news media (Nay, 2010). The unrest in the Central Highlands represented the convergence of multiple grievances among the highlanders: religious repression, ethnic persecution, among the highest poverty and illiteracy rates in Vietnam, and most importantly, the struggle over increasingly scarce land (The Phnom Penh Post, 2002).

Slash-and-burn farming began to die out during the 1960s because of the war and other outside influences. After the war, the Vietnamese government began to lay claim to some of the lands for the resettlement of mainstream Vietnamese. Swidden farming has now all but come to an end in the Central Highlands. Increasing population density has required other farming methods, and the Highlanders have lost control of ancestral lands. Large-scale government-controlled farming schemes, with coffee as the

major crop, have been implemented in the area. Tribal villagers survive with small garden plots, growing cash crops such as coffee when the market is favorable. Many seek jobs in the growing villages and towns. However, traditional discrimination against the Highlanders restricts employment for most (Hays, 2008b). Over the past ten years, local authorities have acquired vast swathes of agriculturalland for commercial development, sometimes forcing farmers to sell or buying fromindebted peasants at prices far below market value. Farmers' loss of livelihood, inadequate payment for land, and confiscation of property by local authorities has fueled intense anger by indigenous highlanders, particularly in the last decade

Moving lowland settlers into the highlands or highland cultivators to new areas in the highlands may thus generate and aggravate land-use conflicts between natives and settlers. Experience from resettlement efforts has shown the detrimental consequences of land-use conflicts for people's livelihood and resource base (Sikor, 1995). The highlanders' resentment over the loss of land has been compounded by the fact that they are finding themselves losing out to the new migrants in education, employment, and other economic opportunities. The livelihoods of indigenous people of the Central Highlands in general still rely on land to grow the crops. And, the lack of the modern agricultural techniques will not allow them to cultivate crops on this small plot of land efficiently (Thái, 2016).

Today, most highlanders eke out a living by farming rice and perhaps a small home garden of coffee and peppers on less than a hectare of land, making ends meet by trading in the market or working as laborers for the growing population of ethnic Vietnamese in the region (The Phnom Penh Post, 2002). Young indigenous people were expected to be less influenced by traditional social structures and be more active than their forefathers in utilizing assets besides natural resources. For instance, the indigenous villagers in Lac Duong district have shifted to intensive crops of vegetables and fruit (Thái, 2016). The way the Vietnamese government treats their indigenous people in Central Highland is totally different from Cambodia and Lao. It goes beyond livelihood strategies, but Vietnamization.

2.4 Thailand:

2.4.1 EIA process:

Thailand has had EIA legislation and government capacity to manage it since the 1970s. In the other Mekong region countries, EIA is a newer policy topic (Wells-Dang et al., 2016). The 2007 Constitution and the Guidelines prepared by MONRE (Ministry of Natural Resources and Environment) provide that a project is required to hold public participation at least twice. This will occur at the start of the preparation of the EIA report for the public to review the TOR of the project and the scope of the study, and during the preparation of the draft EIA report including the proposed prevention and mitigation measures. In the case of a project requiring Environmental and Health Impact Assessment (another type of EIA report), it requires four public meetings (Baird et al., 2015).

The project owners must hire a consulting firm who is recognized by ONEP (Office of Natural Resources and Environmental Policy and Planning) of MONRE to prepare EIA report ((Baird et al., 2015). The EIA report must be submitted to ONEP to be reviewed and for recommendations to be made. ONEP provides comments and recommendations on to EIA reports and. They can withhold permission if the EIA report is not correct or incomplete. The ONEP is in charge of EIA, coordinating with permitting agencies and the Secretariat of ERC. The EIA then is handed to an Expert Review Committee for approval before being returned to the permitting agency that grants the license for the project to be implemented.

2.4.2 Development issues:

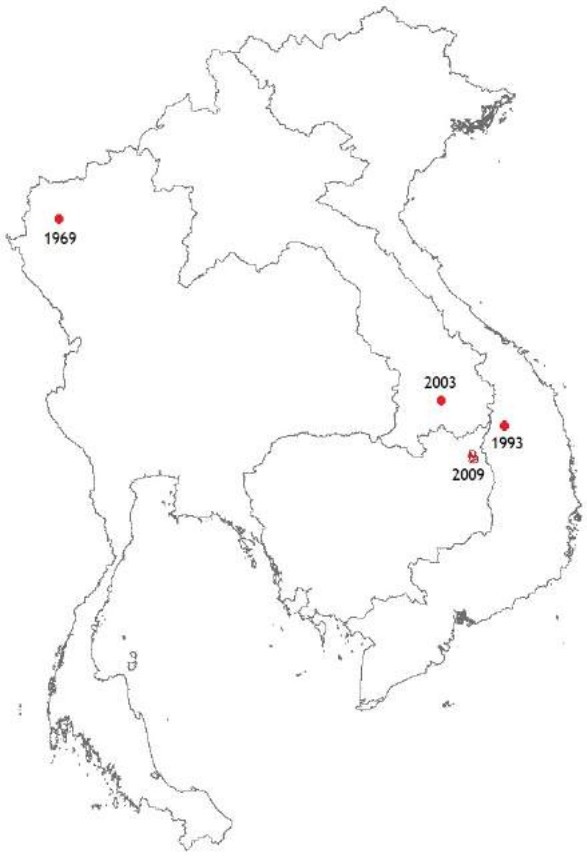
The term "hill tribes" designates ethnic minorities, most of whom live in the remote highland areas of the northern and southwestern parts the country (Win et al.,2005). Northern Thailand's mountains are the home of the Karen, Hmong, Lahu and other ethnically distinct hill tribes. The Royal Thai Government has decided that hilltribe farmers, who traditionally practice slash-and-burn (shifting) agriculture, are responsible for destroying the nation's forests. It has, therefore, adopted a policy to resettle these farmers in the lowlands. The relocations are made at three stages- 1960-1961, 1969, and 1986 (Chupinit, 1988).

Hill tribe people are among the most disadvantaged groups of the country, due largely to a lack of infrastructure, limited access to Thai citizenship and delayed land settlement (partly because of their traditional way of living in small communities and migrating frequently). Hill tribe people face a higher degree of poverty than other groups in Thailand. The majority are engaged in agriculture as their main economic activity, and household-based handicraft production and wage employment as secondary sources of income. They practise three principal forms of land use, i.e. pioneer swidden agriculture, land rotation and wet (paddy) rice. The former group tends to practise an ecologically informed mode of shifting cultivation based on, wherever possible, rice production (Fujioka, 2002). In the past, highland communities had often been associated with problems such as shifting cultivation, watershed forest destruction and opium cultivation. Government assistance to hill tribe people therefore mainly focused on such areas as forest destruction, narcotics, and national security. Land settlement and granting of national identity were also priority issues (Fujioka, 2002).

The evacuation of more than 900 hilltribe families from national parks in Kamphaeng Phet Province to protect watershed areas became deplorable when government officers turned into forest destroyers and built timber mills on a large scale. In a speech at Chiang Mai University in 1969, His Majesty said that he intended to help hill tribe people grow useful crops that would give higher income than growing opium, so that they would switch from opium cultivation to other crops. The project would also support the government’s policy of banning opium cultivation and trade. He pointed out that the traditional farming method of cutting down and burning the forest conducted by hill tribe villagers would lead to forest destruction and deterioration of soil quality. That was how the Royal Project was launched. His

Serene Highness Prince Bhisatej Rajani was assigned by His Majesty to carry out his initiative for the establishment of the project. Originally, the project was called the Royal-sponsored Hilltribe Project. Later, it was changed to the Royal Hilltribe Development Project and then the Royal Northern Project. Now, it is called the Royal Project. The Royal Project was awarded the Ramon Magsaysay Award for International Understanding in 1988. In the same year, it also received the Thai Export Award 1988 for its outstanding activities to promote Thai exports of fresh vegetables and fruit and canned fruit. From it humble start, the Royal Project has expanded significantly. Royal Project farmers now grow more than 300 crops, thanks to their training in the methods of growing new crops. The Royal Project helps them collect, distribute, and sell highland produce, while improving their quality of life through education, health care, and environmental preservation (Hays, 2008a). Another potential source of income for the Karens, is the option to **join the Royal Project**. And, the most positive effects came from medical plants because these are the only products which can reach the income of drugs. They can work on organic farms supported by the government that help local communities exclusively with marketing. Farmers earn 50% from the sales, and half of this money they use for buying seedlings for the next planting season (Greslikova, 2016).

Figure 9: Regional resettlement



Source: Own research, 2017

The situation of indigenous livelihoods living in Cambodia, Lao, and Vietnam are quite similar while the case of Thailand is dated back to 1960s. Thailand has never been in war even during World War II. This can be a reason that there was an agrarian change, in the Northern part of the country, earlier than other countries. And, Vietnam was seen as the first country in Indochina which started to develop indigenous-inhabited area before the other two countries. The situation of Thailand and Vietnam is opposite each other. Thai government tries to displace them out of the forest following Royal Policy. In 1993, Vietnamese government kept them at the same place. But, parts of their land were taken for new immigrants Kinh and private companies following by Prime Minister policy. Indigenous people living in Cambodia and Lao face similar problem at early 2000. Most of them could not continue shifting cultivation due to the scarcity of land. The governments had the same policy to boost local economy by introducing economic land concession in the area. The resources have been granted to foreign investors to implement large scale agriculture.

Chapter 3: The conceptual framework

3.1 Research concepts:

The conceptual framework of this PhD consists of a mixture of different approaches of development geography. It combines concepts of vulnerability, resilience and livelihood concepts and actor research to an integrative theoretical approach with focus on sustainable development ideas.

Benefiting from vulnerability context of DFID, we now can integrate it with its livelihood framework where the exposure of indigenous people to resource trends as a connection. In livelihood framework, there are the transforming structures covering different expertise from local to central government and the processes which covers policies, law, culture, and institution. And, these structures and processes defines livelihood strategies that influence livelihood outcome afterward. Unfortunately, Sustainable Livelihood Framework does not provide a clue to how the used structures and process produce better or worse livelihood outcome. For deeper investigation into livelihood outcome, the research will analyze all relevant actors whose practices can influence the trust, norm, regulation, institution, network structure, knowledge transfer, and feedback mechanism. And, the relationship between the structure and the actor was used as ground to develop actor-oriented model such as theory practice (Bourdieu, 1977) and Structuration theory (Giddens, 1984). The actors' practices illustrate actions and strategies from the viewpoint of relationship between actor and social structure (Wiesmann et al., 2011).

"The livelihood research gives an understanding of vulnerability which includes the dimension of human capacity to anticipate, resist, cope, adapt or recover from the impact of a hazard. As we shall see, this human capacity is also at the center of an actor-focused conceptualization of resilience" (Obrist et al., 2010). *Absorptive*, *adaptive*, and *transformative* capacity are analyzed to understand what exactly 'strengthening resilience' means (Béné et al., 2012). Social resilience shall be defined in general terms as social actor's capacities to protect themselves from and to overcome all kinds of adversities, their capacities to adjust themselves to actually pressing challenges of their everyday lives, and their potentialities to creatively develop sets of institutions that foster sustainable societal robustness and persistence towards crises and catastrophies (Keck, 2012).

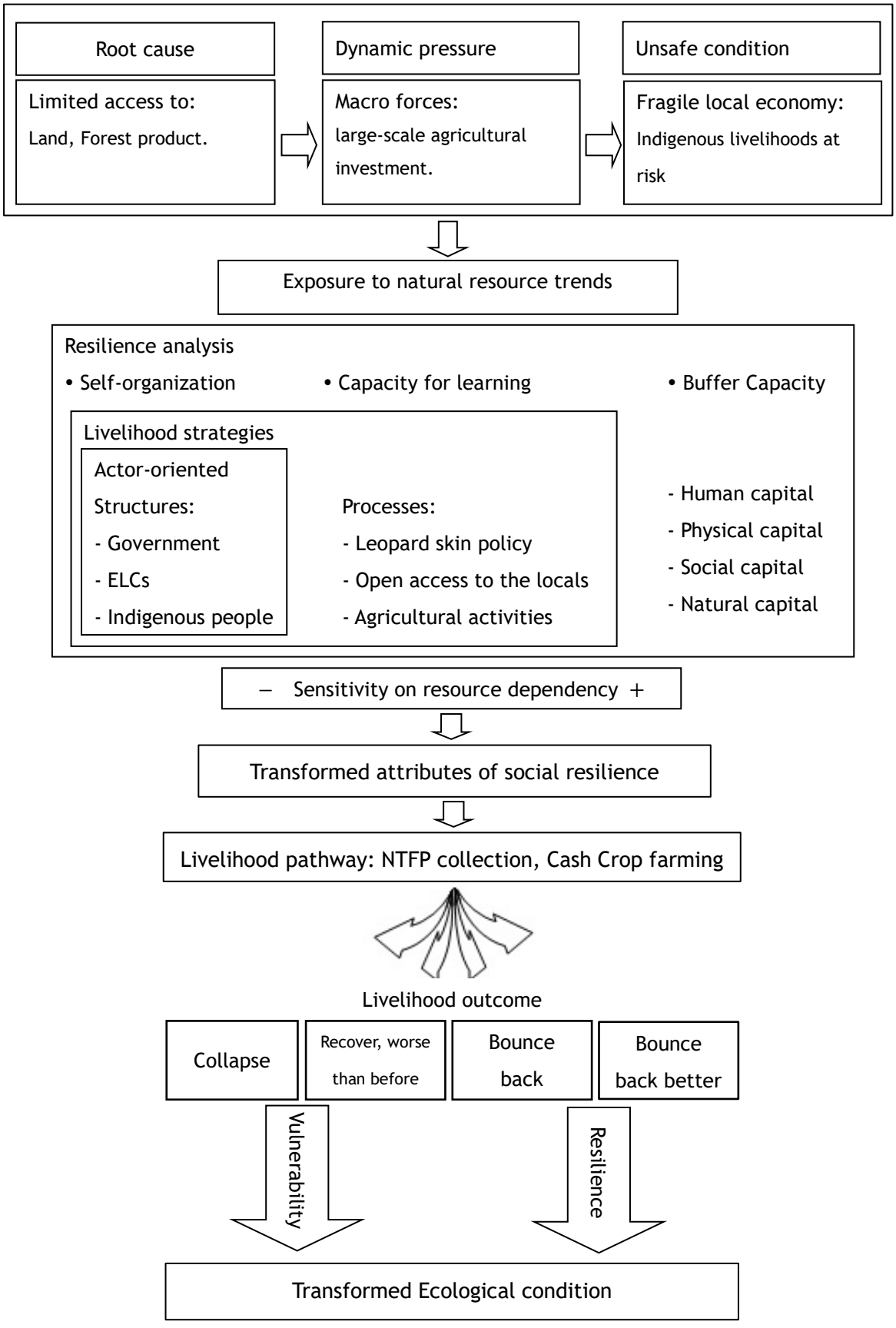
Here, the combination of resilience with sustainable livelihood framework could cover the concepts which parallel the problem resulting from development. It examines the causes and their effects and vice versa as the result from actor-oriented model does not provide the full answer to the question of resilience such as social, natural, physical, and human capitals. The research need to combine actor-oriented model with the conceptual and analytical framework for characterizing livelihood resilience. In resilience analysis, there are structures and processes which are elements of self-organization (Ifejika

Speranza et al., 2014). In this way, the resilience analysis and the actor-oriented model can be linked by their structures and processes.

Again, the vulnerability which was mentioned in the early review is not only measured by exposure to hazards (resource trends for this research) but also resides in the sensitivity and resilience of the system experiencing such hazards ((Turner et al., 2003). Sensitivity refers to the characteristic of how the internal system reacts to external phenomena (Thái, 2018). Then, the result of resilience analysis can reveal indigenous people's sensitivity on resource dependency based on their new transformed attributes of social-ecological resilience after having exposed to resource trends.

The use of livelihood framework in this research has given more space to examine its connection with other concepts. To some extent, it helps to fullfill the missing important determinants of life assurance in the concept found by Hans-Gorg Bohle, such as the question of the emergence of livelihood portfolios, the conditions of access to or control of living assets and the ability of actors to portfolios in the context of societal and ecological transformation processes to adapt more or less successfully to new conditions (Bohle, 2007). Finally, the research uses livelihood trajectory approach from Susannah Sallu to spell out the characteristics of livelihood strategies that contribute to increased resilience or vulnerability. The detailed description of each concept and the synthesis framework are shown in next page.

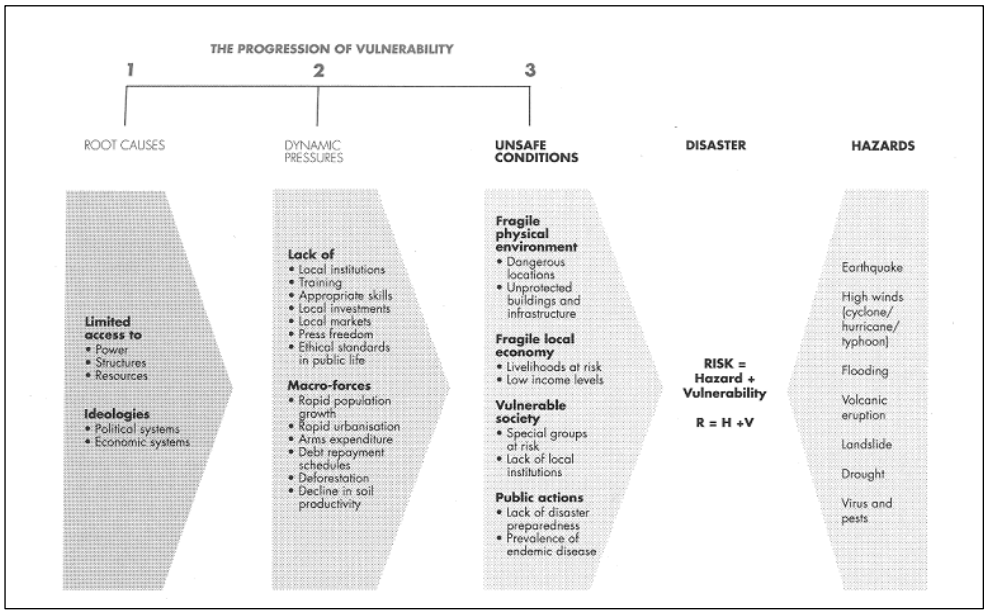
Figure 10: Conceptual Framework



3.2 The progression of vulnerability:

"Made up of the three elements systematically breaks down assets thus dramatically weakening people's resilience to hazards. First beginning with Root Causes then proceeding to Dynamic Pressures that ultimately entrenches vulnerable people into Unsafe Conditions. Root Causes are underlying processes that are embedded within a society and economy based on power and reinforced by resources and structures. In the PAR, root causes are identified as the limited access to power, resources and structures and secondly the ideologies, political and economic systems. Power is a root cause that determines the level of vulnerability as groups associated with a lower scale of power have less supportive systems in place and is also reinforced by a lack of resources and structures" (De Zoysa , 2013).

Figure 11: Pressure and release



Source: Wisner et al., 2003

The explanation of vulnerability has three sets of links that connect the disaster to processes that are located at decreasing levels of specificity from the people impacted upon by a disaster. The most distant of these are *root causes* which are an interrelated set of widespread and general processes within a society and the world economy. They are 'distant' in one, two or all of the following senses: spatially distant (arising in a distant centre of economic or political power), temporally distant (in past history), and finally, distant in the sense of being so profoundly bound up with cultural assumptions, ideology, beliefs and social relations in the actual lived existence of the people concerned that they are 'invisible' and 'taken for granted' (Wisner et al., 2003). The last one is named socially distant as it is based on norms that are embedded within social systems. People who are marginalized in this category can be minority groups based on ethnicity, religions or culture (De Zoysa , 2013). The villagers who live in research area are indigenous people who have different culture and speak different languages. Their

attempts to get the forestland back failed regardless many times they had tried. Their voice for justice was unheard. The authority took no action to solve the problem. Gradually, their forestland was cleared in preparation for rubber plantation of private companies. This permanent loss of resources made them face and deal with new hardship.

The PAR model understands a disaster as the intersection between socio-economic pressure and physical exposure. It happens when there is intersection of two opposing forces- those processes generating vulnerability on one side, and the natural hazard event (or sometimes a slowly unfolding natural process) on the other (Wisner et al., 2003). In this way, it directs attention to the conditions that make exposure unsafe, leading to vulnerability and to the causes creating these conditions. Even there is no natural hazard mentioned in the conceptual framework, the indigenous people has already been exposing to the resource trends caused large-scale agriculture development.

Used primarily to address social groups facing disaster events, the model emphasizes distinctions in vulnerability by different exposure units such as social class and ethnicity. Principal root causes include "economic, demographic and political processes", which affect the allocation and distribution of resources between different groups of people. The model also suggests that the extreme natural event itself is often functionally and spatially separate from the conditions that produce vulnerability. And, it concludes that vulnerability to natural hazards is rooted in social processes and bundles of causes that ultimately have little to do with the natural hazards themselves (Bohle, 2007). In this research, the limited access to resources is treated as the root cause. Large investment project is considered as dynamic pressure that indigenous people are exposed to. And, Indigenous livelihoods at risk is the unsafe condition. Dynamic Pressures translate economic and political processes in local circumstances. Unsafe conditions are the specific forms in which vulnerability is expressed in time and space, such as those induced by the physical environment, local economy or social relations (Blaikie et al., 1994). Due to the dynamic pressures of large-scale agricultural investment, the villagers had lost their access to the forests. And, it has imperiled their subsistent livelihoods at last.

"In SL framework, the *Vulnerability Context* frames the external environment in which people exist. People's livelihoods and the wider availability of assets are fundamentally affected by critical **trends** as well as by **shocks** and **seasonality** – over which they have limited or no control. The factors that make up the *Vulnerability Context* are important because they have a direct impact upon people's asset status and the options that are open to them in pursuit of beneficial livelihood outcomes. **Shocks** can destroy assets directly (in the case of floods, storms, civil conflict, etc.). They can also force people to abandon their home areas and dispose of assets (such as land) prematurely as part of coping strategies. Recent events have highlighted the impact that international economic shocks, including rapid changes in exchange rates and terms of trade, can have on the very poor.

Table 1: Factors of Vulnerability Context

Trends	Shocks	Seasonality
• Population trends • Resource trends (including conflict) • National/international economic trends • Trends in governance (including politics) • Technological trends	• Human health shocks • Natural shocks • Economic shocks • Conflict • Crop/livestock health shocks	• Of prices • Of production • Of health • Of employment opportunities

Source: DFID 1999

Trends may (or may not) be more benign, though they are more predictable. They have a particularly important influence on rates of return (economic or otherwise) to chosen livelihood strategies. **Seasonal shifts** in prices, employment opportunities and food availability are one of the greatest and most enduring sources of hardship for poor people in developing countries" (DFID, 1999).

3.3 Vulnerability:

Vulnerability is the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation or stress (Turner et al., 2003). "Vulnerability, is highly differentiated; some people are much more vulnerable than others. Put bluntly, in many climates rich people tend to take the higher land leaving to the poor and working-class land more vulnerable to flooding and environmental pestilence. In every phase and aspect of a disaster – causes, vulnerability, preparedness, results and response, and reconstruction – the contours of disaster and the difference between who lives and who dies is to a greater or lesser extent a social calculus" (Smith, 2006). The vulnerability for indigenous people living in research area emerged when the large-scale agricultural development had started to degrade their subsistent resources.

Chambers (1989) defined vulnerability as the exposure to contingencies and stress, and difficulty coping with them. Vulnerability has thus two sides: an external side of risks, *shocks and stress* to which an individual or household is subject; and an internal side which is defenselessness, meaning a lack of *means* to cope without damaging loss. The shift from one livelihood activity to another shows their old practices could not be used to cope with the loss.

3.3.1 Exposure:

Exposure is the nature and degree to which a system experiences environmental or socio-political stress (Adger, 2006). In general, Exposure is the contact between a system and a perturbation or stress at certain degree, duration, and/or extent (Kasperson et al., 2005). Vulnerability is a function of the system's sensitivity and capacity of response, and the transformation suffered by the system is a function of its vulnerability, the properties of the perturbation, and the exposure of the system to the

perturbation. From this perspective, a system (i.e., a city, a human community, an ecosystem) may be very vulnerable to a certain perturbation, but persist without problems insofar as it is not exposed to it (Gallopín, 2006). The system could deal with mechanism that allow adjustments to reduce harm through experience.

The concrete characterization of vulnerability (i.e., indices, maps, etc.) needs to take into account the full set of possible combinations of situations, and must be changed if the distribution of exposure changes (for instance, when alternative climate scenarios are examined) (Gallopín, 2006). In this research, several maps of land use change are produced to see how the rubber plantation affects former forestland and farmland of the villagers.

3.3.2 Sensitivity:

Sensitivity is the degree to which a system is modified or affected by perturbations (Adger, 2006). "The concepts of adaptation, adaptive capacity, vulnerability, resilience, exposure and sensitivity are interrelated and have wide application to global change science. Moreover, exposure and sensitivity are almost inseparable properties of a system (or community) and are dependent on the interaction between the characteristics of the system and on the attributes of the climate stimulus" (Smit et al., 2006).

"Sensitivity and exposure are inherently linked as characterizing exposure without characterizing sensitivity (and vice versa) provides little insight into the relative vulnerabilities of two systems. The relative effect of exposure on a system is dependent on the relative sensitivities. sensitivity is portrayed as the degree to which a system will respond to an external disturbing force. It includes the ability to resist change and the ability to return to a previous condition after a stress has been removed. Here, exposure refers to the characteristics of forces that could stress the system such as magnitude and frequency" (Luers, 2005). In discussions of climate change, sensitivity is defined is the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli (McCarthy et al., 2001).

Sensitivity to resource dependency: Resource dependency relates to communities and individuals whose social order, livelihood and stability are a direct function of their resource production and localized economy (Machlis et al., 1990). There are elements by which the consequences of dependency can be observed: income stability, and social stability and migration. Indigenous people in Andoung Meas were not about to leave their village, but to stayed there and changed their livelihood activities. Indeed, there is a sensitivity to resource dependency. The villagers had lost their sense of commonality after implementing these newly emerging practices.

3.4 Resilience analysis:

Combining sustainable livelihood framework with resilience thinking can improve the understanding of livelihood dynamics of the communities maintain and enhance their livelihoods in the face of change, including stresses and shocks (Scoones, 2009; Sallu et al., 2010). Resilience offers a lens with which to explore stresses and shocks and to understand livelihood dynamics. It is future oriented and is used to characterize a system's ability to deal with change that also allows us to assess its capacity (Marschke and Berkes, 2006). After having exposed to resource trends, the indigenous people started to use different livelihood strategies. They expand their farmland by encroaching their farmland. And, they also involve in logging in their community forests. These practices are mainly incited by the quick generation of monetary income. It throws social and ecological resilience into question in the long run.

The concept of resilience:

Resilience is currently defined in the literature as the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks (Walker et al., 2004). Another meaning of resilience, it was defined as the ability of human communities to withstand external shocks to their social infrastructure, such as environmental variability or social, economic and political upheaval (Adger, 2000). Commonly, all definitions cover the capacity to absorb disturbance, or the buffer capacity that allows persistence. It is similar to the concept of robustness. it was used to mean the maintenance of some desired system characteristics despite fluctuations in the behavior of its component parts or its environment (Carlson et al., 2002). When the livelihood activities of indigenous people were disrupted by the forestland clearance, their communities started to lose a sense of commonality. Their social cohesion deteriorates through their self-serving attitudes. Gradually, their new emerge livelihood practices started to degrade surrounding environment.

But resilience is not only about being persistent or robust to disturbance. It is also about the opportunities that disturbance opens up in terms of recombination of evolved structures and processes, renewal of the system and emergence of new trajectories (Folke , 2006). In this sense, resilience provides adaptive capacity that allow for continuous development, like a dynamic adaptive interplay between sustaining and developing with change (Smit et al., 2006). The extent and speed of these changes exceeding the capacity of local communities to adapt their productive systems destabilize the socio-ecological system and place them in imminent danger of collapse. Collapse is described as the breakdown of parts of social-ecological systems. It is often the culmination of a drawn-out process of increasing vulnerability (Bollig et al., 2017). Thus, Resilience as a system property is not just a determinant of fluctuations beyond balanced states but rather decisive for the persistence of the system or its capacity for absorption in cases of disturbances (Lorenz, 2010). Too much of either will ultimately lead to collapse. It does not imply that resilience is always a good thing. It may prove very difficult to transform a resilient system from the current state into a more desirable one (Folke, 2006). The loss of

resilience makes the system more fragile in the sense that can easily be tipped into a contrasting state by stochastic events. Such stochastic fluctuations may often be driven externally; however, they can also result from internal system dynamics (Scheffer et al., 2001).

Table 2: resilience concepts

Resilience concepts	Characteristics	Focus on	Context
Engineering resilience	Return time, efficiency	Recovery, constancy	Vicinity of a stable equilibrium
Ecological/ecosystem resilience social resilience	Buffer capacity, withstand shock, maintain function	Persistence, robustness	Multiple equilibria, stability landscapes
Social–ecological resilience	Interplay disturbance and reorganization, sustaining and developing	Adaptive capacity transformability, learning, innovation	Integrated system feedback, cross-scale dynamic interactions

Source: *C. Folke / Global Environmental Change 16 (2006) 253–267*

The link between ecological and social resilience:

There is a relationship between ecological and social resilience when the community depend on ecosystems for their livelihoods (Adger, 2000; Milner-Gulland, 2012; Fisher et al., 2014). This leaves us with the question of how resilient they are when one of them is not. To answer this question, the research continues to examine certain elements of buffer capacity, self-organization, and capacity for learning. The analysis is done on common pool resource management which is considered as incentives for sustainable use. And, certain livelihood activities causing land use changes are also observed. To verify the changes and its resilience, land covers are periodically examined from early stage of development. This could make analysis expansive, but relevant as it attempts to pick up the appropriate component linking social and ecological resilience for this case.

Institution which is the element of self-organization will be explored to see how successful the communities manage the common resource. It can be broadly examined by dealing with linkages to functional diversity, key structuring processes, and resilience (capacity to survive disturbance) in ecosystems (Folke et al., 2007).

The loss of most part of common pool resource to ELCs has raised concerns over the resilience of institutions. “Institutions are vital in the process of identifying and responding to threats to survival. And, the mechanisms of predicting outcomes, of organizing response, of preparing for possible danger, and of accommodating to stress or hardship, are constitutive of the discussion on environmental change (O’Riordan *et al.*, 1998). This refers to the role of social institutions in coping with disturbance. Certainly, the institutional environment largely determines the system of support and its efficiency in the context of social system (Esparcia, 2016). The growing demands for public intervention and management of environmental risks may also be an indication that an institution approach is appropriate to understand pivotal decisions and perceptions of environmental vulnerability at the level of

organizations (Cantor et al., 1994). Thus, the resilience of institutions is based on their historical evolution and their inclusivity or exclusivity, and hence how effective they are in oiling the wheels of society (Adger, 2000). The social capital of communities certainly determines the existence of integrating features of social institution such as trust, norms, and networks (Putnam et al., 1994; Pelling, 1998).

"In determining the parallels between social and ecological resilience, potential indicators for the concept are discussed below, focusing on the links between social stability (of populations within social systems) and resource dependency. Stresses and variability associated with resource dependency are manifest in instability and increased variance in income and risk of failure of particular sources. Social instability is manifest through various social indicators such as the impacts of population displacement. Resource dependency, in this sense, demonstrates the coevolutionary nature of the social and natural systems being examined, with social and economic systems themselves being more or less 'resilient' to external physical as well as social stresses" (Adger, 2000). This research illustrates the motives behind both non-migration and potential economic activities which make indigenous people stay in the village and the resilience of the communities in face of resource trends.

The dependency of individuals within a resource system does not necessarily depend on reliance on a single crop or fish stock, but in some circumstances on dependence on an integrated ecosystem (Adger, 2000). In this paper, we will look at domino effects from economic land concession when indigenous people lost their traditional livelihood activities (NTFP collection, hunting, land sharing) and started to overuse the last common property (community forest). Their resource dependency is observed through land cover change since the arrival of ELCs. Indigenous people can be dependent to a greater or lesser degree on forest and land for their livelihood from subsistence to profit. After the government allowed the ELCs to operate for over 50 years in area, the resilience of indigenous people to the unsafe condition may therefore be enhanced by more than the regenerating capacity of ecosystem. The 21727 hectares (4 ELCs) of forest land have been cleared.

For forest-based communities in southeast Asia, commercial logging and other market activities can reduce the resilience of such communities (King, 1996). It particularly happened when rapid market integration is exacerbated by low levels of social capital and infrastructure (Adger, 2000). And, the direct dependence of communities on ecosystems affects social resilience and ability to cope with shocks, particularly in the context of food security and coping with hazards (Adger, 2000). This means that disturbance in market system or environmental system can ruin resilience. "Resilience therefore depends on the diversity of the ecosystem as well as the institutional rules which govern the social systems. Many resource-dependent communities, particularly in the developing world, are partially buffered from market variability by their persistent subsistence activities. The resilience of such communities can therefore be affected in both positive and negative ways by market integration" (Adger

2000). This research will also conduct two case studies to check buffer capacity between a group of with-subsistence agriculture and a group of non-subsistence agriculture when they both are facing resource trends of remaining forest and market failure of cash crop. It illustrates how disturbance of resource trends or market system gradually affects the resilience of communities. This will also give us a clue to answer whether the distribution of high financial returns from commercial resource has caused changes in the social organization for managing the community forest: the overuse and inappropriate use of remaining common resource as certain groups are squeezed out.

According to Adger (2000), "institutional structures are a central component linking social and ecological resilience as it includes property rights, govern the use of natural resources creating incentives for sustainable or unsustainable use". His study in Vietnam shows that Market liberalization and the privatization of mangroves reduce ecosystem as well as social resilience. Aquaculture relies on a narrow range of commercial species prone to pests. In addition, conversion of mangroves to aquaculture ponds actually increases the risk of inundation and coastal flooding. This means that its higher returns for a smaller number of users occur with less regularity and higher variance. "In effect those entrepreneurs engaged in aquaculture act with implicit high discounting of the future: they often abandon their ponds after less than a decade". He concludes that the interaction of the management of the coastal resources with the social system forms a direct coevolving link between ecological and social resilience. The conversion to agriculture and aquaculture in this case increases income inequality within the population, thereby reducing the likelihood of co-operative action within a heterogeneous community (Adger, 2000). Adger found the impacts on biodiversity and ecosystems from weak social organization after some users have abandoned the aquaculture ponds. In the research area, a deformed social organization has started to appear after villagers become more possessive and self-serving minded by encroaching environmental degradation-prone area for their own farm expansion.

This research calls into question the ecological resilience of the remaining forest from rubber plantations, as impoverished indigenous communities do not seek high yields from natural resources. However, study case of Adger was conducted after the abandonment or the final stage of aquaculture, this research is now taken placed in the stage of investment project implementation while all rubber trees can produce latex. The ecological resilience is still being disrupted by land preparation of ELCs. From what was found in literature review above, most part of former common resource are granted to private investors for 50 years. This happens in between project design and project closure of large-scale agricultural investment.

Project Design- According to the master plan and EIA reports (source), the companies cut and cleared thousands of hectares of existing tropical forest to make way for new rubber plantation. The impacts from this early stage of investment project on ecosystems are erosion and water pollution. It regularly

happens when most plantations are located in highland area with hills and mountains during rainy. The rain could bring down sediments from plantation field on sloped hills to the nearby streams.

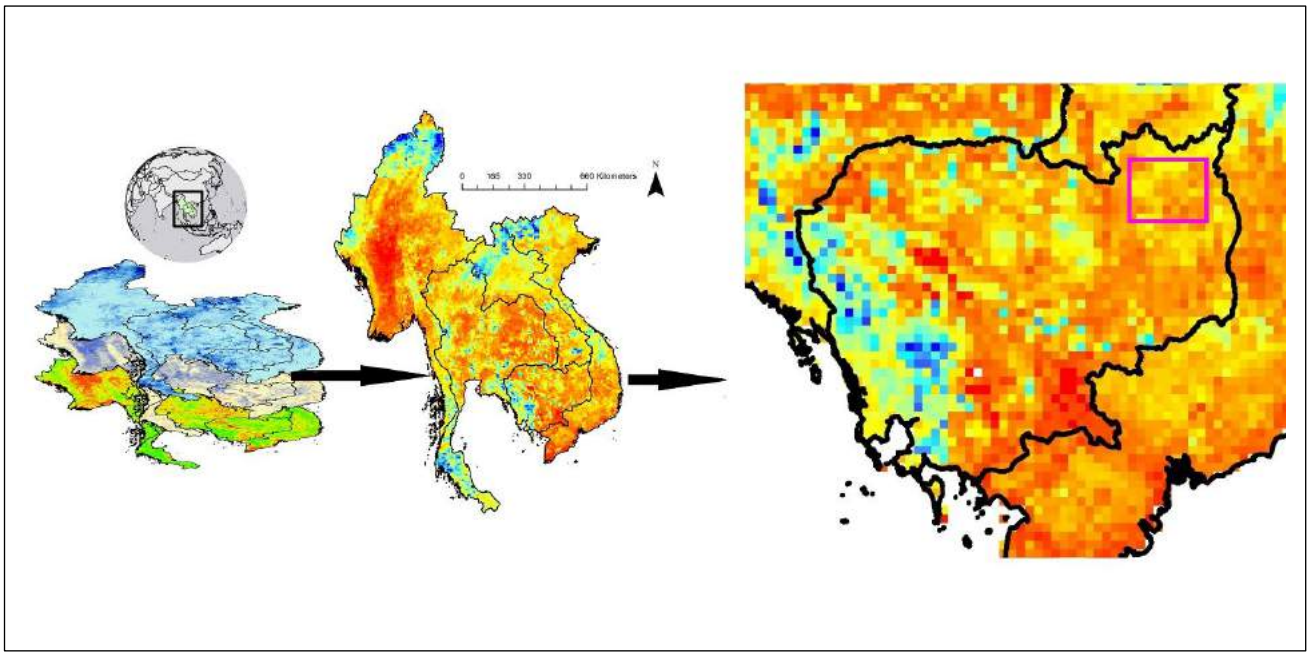
Project implementation- "The companies use fertilizers (types of fertilizer) to enrich the soil's nutrients for productive rubber plantation, and spray herbicides from the time of seedling to harvest until the project closure. Again, this will be a concern for water quality, fisheries resources, and human health. They spread fertilizer and earth every year, and then we get rashes when we shower and diarrhea when we drink it," Mr. Nim said of water from nearby streams. Nowadays, there is no time during the year when the water is clean enough to use (Down, 2016).

Project closure- After 50 years of their operation, soil quality needs to be restored on these abandoned rubber plantations. Can these abandoned unproductive rubber trees and secondary succession maintain and restore indigenous ecosystem on time? It could double hardship for villagers who have already encounter drought almost every year at the end of dry season. As an evidence, the severe drought had choked the northeast for weeks before many residents of Ratanakiri province run dry, according to villagers, local officials and organizations working in the province. Some families bought water from anyone with the means to pump and carry it from wells and streams that haven't dried up, with some trucking in water from more than 10 km away and selling it at five to 10 times the normal price. This reliance on natural water sources is about 50 percent higher than the national average, which Unicef places at 46 percent. A largely rural province, Ratanakiri is particularly vulnerable to the impact of drought, with almost 70 percent of the population relying on streams, according to Heang Thira, who directs the clean water project for CARE, an organization that works on rural development in the province (Down, 2016).

In Data in action of USGS 2016, the Scaled Drought Condition Index (SDCI) which is recreated by precipitation, land surface temperature, and the Normalized Difference Vegetation Index also illustrates severe drought in the region of northeastern part of Cambodia. Precipitation's data is taken from the Tropical Rainfall Measuring Mission (TRMM) and Global Precipitation Measurement (GPM).

And, land surface temperature and Normalized Difference Vegetation Index (NDVI) is taken data from Terra and Aqua MODIS. The SDCI is an example of an index that can be used to measure agricultural drought (NASA LP DAAC, 2016).

Figure 12: Scale drought condition index 2016



Source: NASA DEVELOP National Program Summer 2016 Term, Data in action (NASA LP DAAC, 2016).

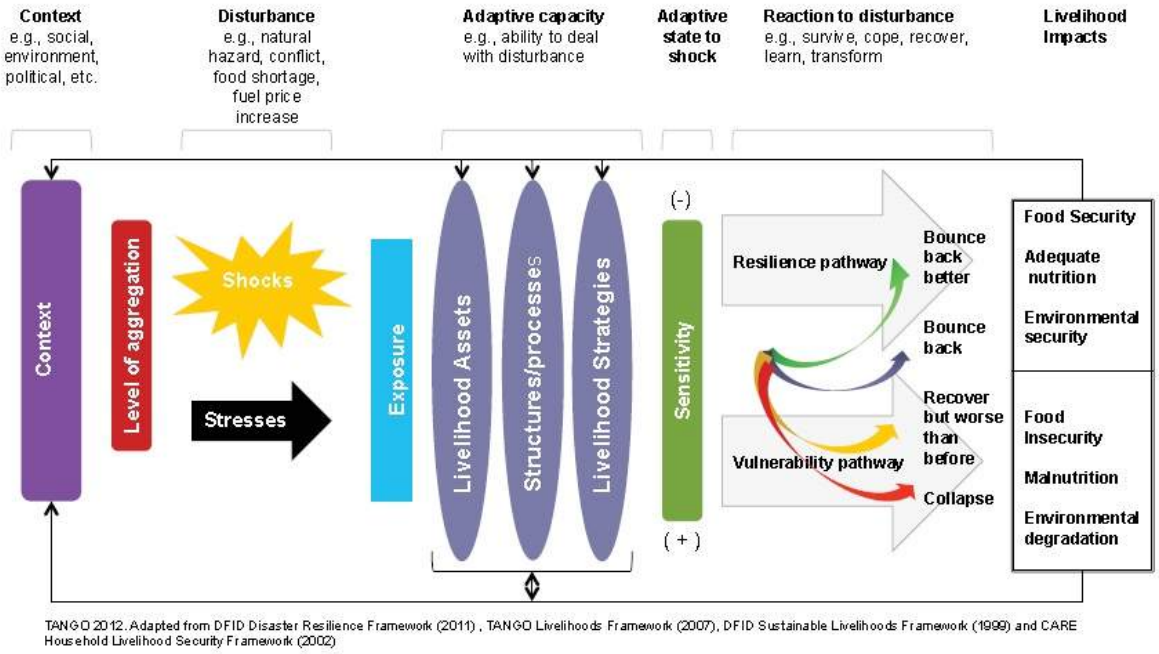
The research will also collect and use existing data 2014 of Vegetation Index and Phenology (VIP) of USGS to illustrate ecological resilience, and to verify with the data collected at the field, especially in community forest and farm land. And, we will analyze and find out the interaction between social and ecological resilience in indigenous community during and after the investment project implementation.

Uses of resilience in Sustainable Livelihood Framework:

Existing resilience models can be categorized generally into two groups: Models that attempt to capture and describe a system-wide approach to resilience (e.g., DFID, Technical Assistance to Non-Governmental Organizations [TANGO], Practical Action, Fraser, etc.); and Models that attempt to define and measure the characteristics of resilience at a community level (e.g., Food and Agriculture Organization of the United Nations [FAO], Oxfam, Tulane University, etc.) (UNDP, 2014).

In this research, resilience assessment is done by combining its elements such as self-organization and capacity for learning with livelihood strategies of sustainable livelihood framework. This model enables us to collect data related to structures, processes, and roles of actors from all groups using different sources of livelihoods- both subsistent and non-subsistent ones.

Table 3: The TANGO Resilience Assessment Framework



Source: Frankenberger et al., 2012

Resilience has another main element called buffer capacity. And, various sources of livelihoods, natural capital, and social capital from buffer capacity are observed and analyzed to understand villagers' reaction to the resource trends caused by Economic Land Concessions. Then, it explores again how the emerging livelihood practices done indigenous people cause local ecological changes. The ecological changes are verified, during on-site observation, with different maps of land cover type generated at different years.

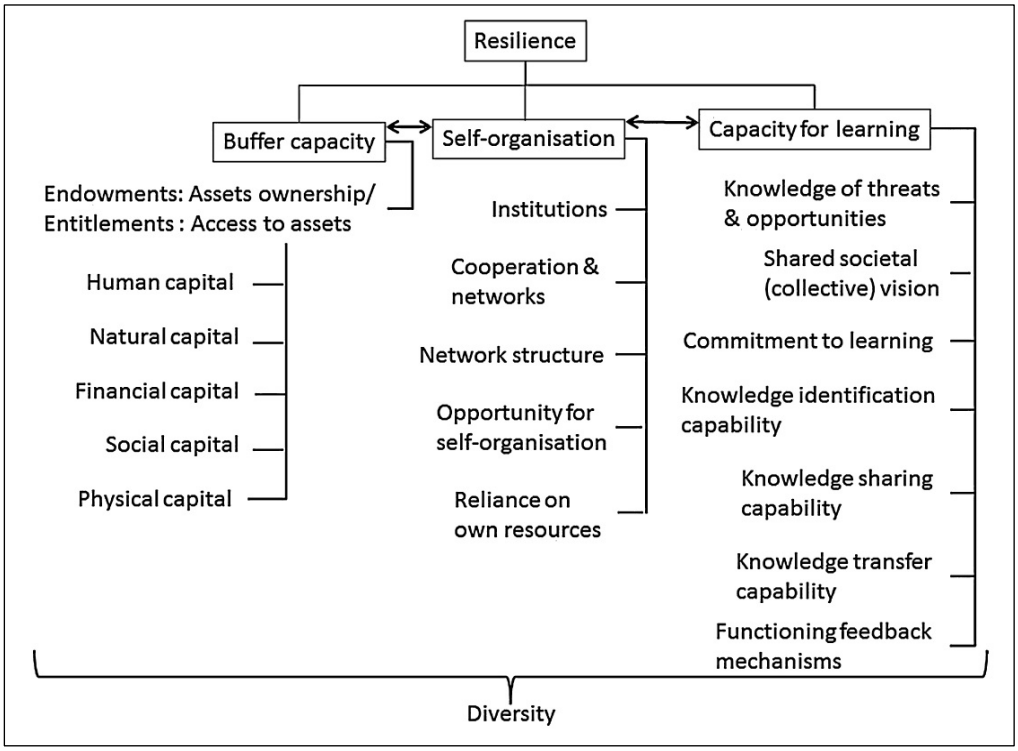
The characteristics of livelihood resilience:

Three major attributes of resilience, which can further be decomposed into various proxy indicators, are usually identified namely buffer capacity, self-organization and capacity for learning (Ifejika Sparenza et al., 2014). Resilience has defining characteristics: the amount of change the system can undergo while maintaining its functions and structures, the degree of self-organization, and the capacity for learning and adaptation (Milestad et al., 2008).

Buffer capacity characterizes the ability of SES to stay in the domain of attraction is related to slowly changing variables, or slowly changing disturbance regimes, which control the boundaries of the domain of attraction or the frequency of events that could push the system across the boundaries. Self-organization is related to the extent to which reorganization is endogenous rather than forced by external drivers. Self-organization is enhanced by coevolved ecosystem components and the presence of social networks that facilitate innovative problem solving. And, the adaptive capacity of an SES is related to the existence of mechanisms for the evolution of novelty or learning (Carpenter et al., 2001).

Resilience is maintained when buffer capacity exists and is not declining, self-organization exists and is promoted, and learning occurs (Ifejika Sparenza et al., 2014).

Figure 13: A conceptual and analytical framework for characterizing livelihood resilience.



Source: Ifejika Speranza et al., 2014.

Capacities in resilience:

To define social resilience, authors have proposed that three different types of capacities are necessary for understanding the notion of social resilience in its full meaning. These are labelled coping capacities, adaptive capacities and transformative capacities (Keck et al., 2013). Cultural status, perception, redundancies, flexibility, social networks, and cognitive identity-formation are the elements of participative, adaptive, and coping capacities of resilience (Voss, 2008). Within the social resilience approach, importance has been attached to three components that are shaped by the preeminent role of the symbolic dimension of social systems: the adaptive capacity, the coping capacity, and recently the participative capacity. (Lorenz, 2010).

3.4.1 Buffer capacity:

Buffer capacity has been interpreted as the amount of change a system can undergo (and implicitly, therefore, the amount of extrinsic force the system can sustain and still remain within the same domain of attraction that is, retain the same controls on structure and function (Carpenter et al., 2001). In Socio-ecological systems, buffer capacity represents the ability to adapt to changing relationships between society and ecosystems in ways that sustain ecosystem services (Gunderson et al., 2010). Put

simply, having buffer capacity means having the capacity to cushion change, and possibly to use the emerging opportunities to achieve better livelihood outcomes such as reducing poverty (Ifejika Sparenza, 2013; Ifejika Sparenza et al., 2014). Capacity indicators measure more dynamic factors including the ability of households to expand and contract their capital in response to shocks, stresses or changes, and rely on skills and linkages to adapt in a positive way (UNDP, 2014).

3.4.2 Self-organization:

Self-organization of farming systems is defined as the ability of a group of farms to form flexible networks as well as the ability to be involved with the social, economic and institutional environment on other scales than the local (Milestad, 2003). An emerging common feature is that endogenous interactions and processes are the core for self-organization (Di Marzo Serugendo et al., 2004). And, social resilience can also be studied based on these interactions between enabling factors and capacities operating at different levels of society (Obrist et al., 2010). The attributes include: Institutions, Cooperation and networks, Network structure, and Reliance on resources (Ifejika Speranza et al., 2014).

Self-organization is easy to observe when common property resource is picked for study. The central question in this study is how a group of principals who are in an interdependent situation can organize and govern themselves to obtain continuing joint benefits when all face temptations to free-ride, shirk, or otherwise act opportunistically, Parallel questions have to do with the combinations of variables that will (1) increase the initial likelihood of self-organization, (2) enhance the capabilities of individuals to continue self-organized efforts over time, or (3) exceed the capacity of self-organization to solve CPR problems without external assistance of some form (Ostrom, 1990). However, common property resource can be destroyed if there are no effective institutional rules rules and norm of behavior among members (Ostrom, 1990). Institutions are defined as rules that are permanently reproduced by means of social interaction, that comprise regulative, normative and cultural-cognitive elements, and that enable, constrain and give meaning to social life (Keck, 2012). Existing norms and rules can indicate self-organisation in a SES. They can enhance or limit actors' adaptive capacities and are crucial for building resilience. Questions include how and to what extent institutions foster or hinder livelihoods and how much an actor's livelihood practices contribute to institution building and help to cope with and adapt to stress and shocks (Ifejika Speranza, 2013).

Lack of cooperation among farmers can in turn lead to lack of trust (or *vice versa*), which is a poor basis for self- organization. It means also that cooperation and networks can be good bases for self-organization when the interactions between actors in the SES result in the creation of own rules, norms and values (institutions), building trust and decreasing dependence on external actors for information, innovation and capital (Ifejika Speranza, 2010). Social capital is the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition. In other words, this links to membership in a

group-which provides each of its members with the backing of the collectivity-owned capital, a 'credential' which entitles them to credit, in the various senses of the word (Bourdieu, 2002). By social capital we mean the quantity and quality of associational life and the related social norms and it can be measured using proxies such as the number and types of groups in which an actor is a member, the degree of participation in groups and networks, trust, reciprocity and social cohesion (Narayan et al., 1999). Trust, norms and networks which define social capital that facilitate social co-ordination and co-operation for mutual benefit as it is conceived as a relative measure of the quantity (individually within households, or collectively between households) and quality (inclusiveness, transparency and accountability of decision-making) of social linkages associated with a defined social group facing a specific developmental pressure (Pelling, 1998). Without such trust, there is little likelihood that resources and sustainable rates of offtake could be maintained in the long-term, nor that individuals would restrict their own potential to capture all the benefits of free-riding in favor of the collective good (Pretty et al., 2004).

Development is based on people's own resources which include material, socio-cultural and spiritual dimensions. strengthening the resource base of the local population means to enhance their ability to integrate selected external elements into local practices and to broaden the options available to the people. This refers to resources that are mainly but not exclusively locally available, local knowledge, culture and leadership, along with openness to integrating external knowledge and practices (COMPAS, 2007). Similar to COMPAS, *Reliance resource* reduces dependency on external inputs and saves time for prompt action at the farm-level. It needs to be noted here that depending on how the SES is defined, subsidies are external to the SES but can have both positive and negative effects on farm resilience (Ifejika Speranza, 2010). The sense of commonality, the integrity of community of the community forest management committee had started to fade away while they try to squeeze out the last benefit of common pool resources. And, the cooperation among stakeholders including state agencies and NGOs is idle.

3.4.3 Capacity for learning:

Learning is the process of acquiring knowledge, skills and/or values that causes a change of behavior, attitudes or self-image. Learning can take place through copying behavior, study, introspection, reasoning, experience or teaching. And, learning also results from interaction among individuals, between social groups. Resilient communities gain adaptive management by learning experiences and incorporating them into current action and thus has memory within socio-ecological system. (COMPAS 2007). Learning is not just acquiring knowledge and skills but also translating the knowledge into action (Argyris et al., 1978). Learning is defined as the development of insights, knowledge, and associations between past actions, the effectiveness of those actions, and future actions (Fiol et al., 1985).

In this vain, learning encompasses two meanings: (1) the acquisition of skill or knowhow, which implies the physical ability to produce some action, and (2) the acquisition of know-why, which implies the ability to articulate a conceptual understanding of an experience (Kim, 1993). As the concern here is with capturing learning and the capacity to learn, we do not dwell on these typologies but note that learning is evidenced when behaviours change because of acquired knowledge (Argyris et al., 1978). Learning is a process that unfolds over time and link it with knowledge acquisition and improved performance while it creates, acquires, and transfers knowledge. It also modifies the behavior (livelihood activities) to reflect new knowledge and insights for better performance. (Garvin, 1993). The livelihood activities practiced by young generation in the community define their learning capacity, and the success of knowledge transfer. Indigenous youths gradually involve less in their traditional livelihood activities and more in short livelihood activities such as cash crop farming and logging. Their practices result in environmental degradation.

3.5 Livelihood dynamics:

"Livelihoods pattern is trajected through time by describing and explaining the direction and pattern of individuals and groups of people in supporting their living. Those larger-scale and longer-term changes affecting people's livelihoods (e.g. population growth, agricultural technical change, environmental degradation) constitute the conditions under which livelihoods are constructed. Government policies may affect these indirectly or directly; they too have to be considered, so that changing livelihoods can be understood in context" (Bagchi et al., 1998). Here, the approval of agro-industrial projects and the directive 001 of the government need to be re-examined for their influences on indigenous livelihood pattern as it provides further explaination over livelihood changes.

"Similarly, the concept of pathway is used to observe regularities or patterns in livelihood among particular social groups and to use trajectories for individual actors' life paths. And, to give additional information on how livelihood activities give rise to the regularities of pathways, we propose to employ the methodology of livelihood trajectories, which provides an appropriate methodology for examining individual strategic behavior embedded both in a historical repertoire and in social differentiation" (De Haan et al., 2005). The fluctuation of assets directly and indirectly translates from livelihood strategies, from the formal and informal institutional setting and the shocks and stresses that indigenous people face. The focus on assets is therefore a way to analyze livelihood dynamics (Ulrich et al., 2012). Their background in agriculture and NTFP collection made the farmland and forestland the critical sources of livelihoods. At the time the indigenous people became more possessive of their own properties, their livelihood dynamics had altered over the years. They will be observed at different dates to identify livelihood dynamic and to analyze resilience. Having identified what livelihood resilience constitutes and the complexity of indigenous people' livelihoods, the following steps can explain livelihood dynamics and future possible trajectories:

- Conducting historical (longitudinal) analysis of livelihoods
- Identifying and characterizing possible livelihood trajectories in the face of exposure to shocks and stresses
- Analyzing recovery pathways and implications for maintaining or enhancing livelihood resilience

3.6 The Actor and the link of social and ecological resilience:

In the context of dynamic social-ecological systems, livelihood trajectory approach is used to explore the shocks and stresses that affect livelihoods and to elucidate the characteristics of livelihood strategies that contribute to increased resilience or vulnerability (Sallu et al., 2010). Whether viewing resilience as the ability to support the buffering capacities of vulnerable livelihood systems, to strengthen the adaptive capacities of people and their institutions, or to generate innovation and learning that allow for resilient transformations, the focus must be on social actors and their agency (Bohle et al., 2009). it is crucial to look for the major drivers of change, both social and/or ecological, and the major actors at work, both social and/or ecological as well especially when it is needed to find out which actor and which relationship seem to be the most influential. During phases of collapse, their connectivity dissolve and networks become sparse. And, the institutions and organizations lose their binding value and actors look for new affiliations, identities and normative orientations. New species establish themselves innovative strategies of resource use are developed and new modes of regulation emerge (Bollig et al., 2017). And, the analyses of their connectivity and centrality and the types and degrees of relations between actors in a livelihoods system can also help explain how network structure facilitates resilienc (Janssen et al., 2006).

The human's activities such as large -scale agriculture development or rapid and unmanageable farmland expansion can result ecological changes. And, it causes social changes as a whole later on because of its new deformed attributes. This coevolutionary perspective emphasizes the increase in individual task specialization and the increase in the institutional complexity, a form of social organization of maintaining feedback mechanisms between specialized actors within the social system and between the social system and the ecosystem. they establish myths and forms of social organization to rationalize and encourage the intervention by individuals and thereby to maintain the favorable environmental response (Norgaard, 1994).

Here, the actor-oriented analysis is used to explore social change and development in the communities (Long, 2001). This research presents the exploration of these themes by examining the management of last common property regime (community forest) and its social actors who are locked up into a series of intertwined battles over resources after most part of the villages' land has been granted to investors. It will figure out how the concessions reduce ecosystem as well as social resilience by reviewing the historical land use change on map and observing on-field social resilience. Social resilience can be determined by the physical environment. This loss or gain of resilience are associated with negative or

positive impacts on livelihoods and, in the context of the institutions of common property management, collective institutional resilience is also undermined. A reliance on the resource involved within the livelihood system and a relatively homogeneous distribution of benefits within the user group are important for successful common property management (Ostrom, 1990). Thus, resilient common property management is enhanced through the users co-operating on the basis of relatively equitable share of the benefits of use and the critical role of the resource in their livelihood stability (Adger, 2000). And, the link between social and ecological resilience happens because there is dependency of the communities on the nature and vice versa.

Chapter 4: Research procedures

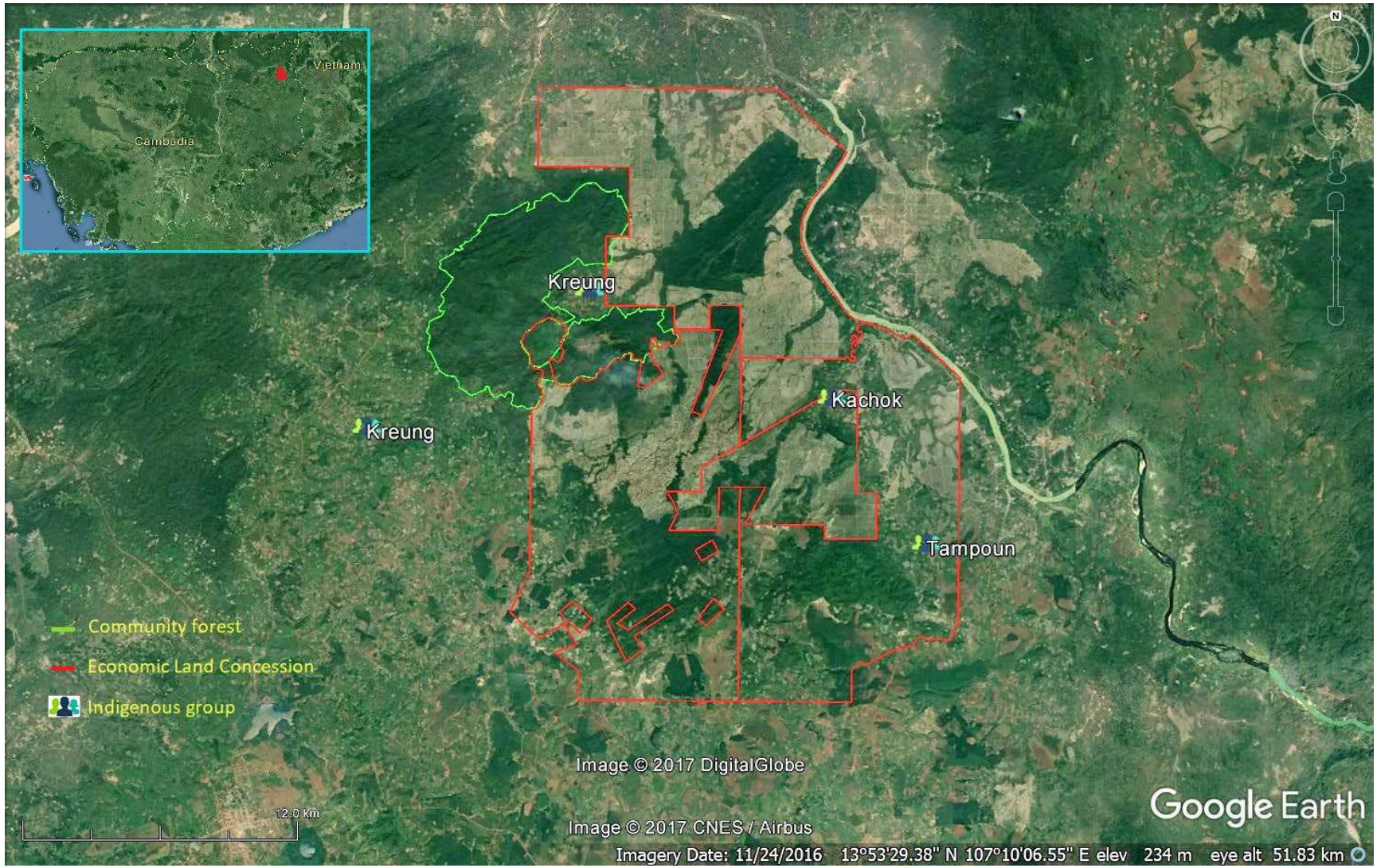
4.1 Site selection:

Three villages are selected to represent most of the major area affected by four economic land concessions. The red lines on the map are the borders of these companies- Krong Buk on the top, Heng Brother in the middle, CRD on the left, and Veasna Investment on the right (Fig.14). The area was granted to the companies by Ministry of Environment through Environmental Impact Assessments in late 2009 and early 2010. Since their arrivals, the forests have gradually been cleared to make way for large-scale rubber plantations. These forests had served as subsistent resources for local villagers for generations.

The villages affected by the large-scale rubber plantations are Mass, Malik, and Kanat which are inhabited by different ethnic groups who have their own language and traditions. After the presence of the ELC's, villagers have encountered difficulties in making a living. Some of them have done less subsistence livelihood activities as the resources have been degraded. Indigenous livelihood strategies have also altered over the years. However, the villagers possess different capacities to buffer the impacts. To see more differences in their livelihood dynamics and resilience, the villages inside and outside the concession area have been chosen for the studies. Mass is an isolated village lying between the concession area and community forest. The Kreung (the villagers of Mass) own a community forest, marked with a green border on map, that covers 4,334 hectares. Malik owns a community forest which now produces a small amount of NTFP. The village is closer to the main road than other villages in the research area. They have more chance to be contacted by businessmen. In Kanat, villagers collect NTFP from two different forests located close to the rubber plantation. However, their forests are the most degraded among the others in the area. Currently, villagers are excessively growing cash crops to support their living. And some of their farmland is prepared across the environmental degradation-prone area.

The information of their livelihood pathways, strategies, self-organisation, and buffer capacities can tell us what the villagers have and do not have in common after having been exposed to the resource trends caused by ELC's. An in-depth analysis will be made to find out why and how these elements have evolved into their new forms. The research also provides inputs to improve the current situation based on these deformed elements.

Figure 14: Research area (satellite view)

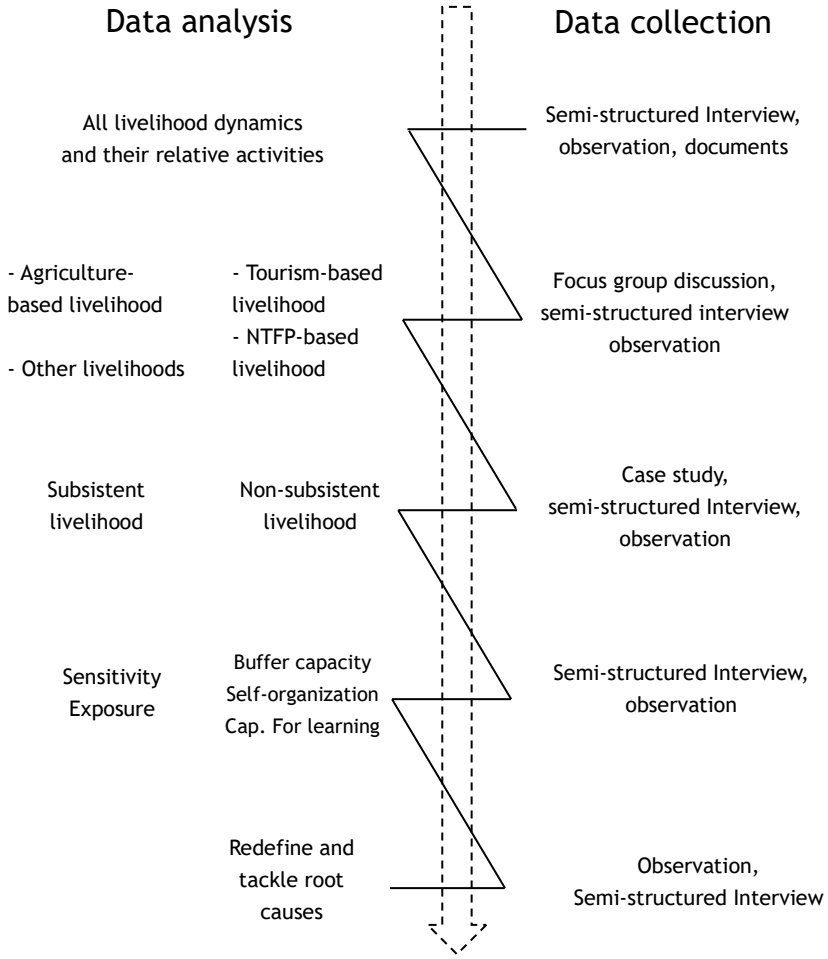


Source: data derived from LICADHO Cambodia, Open Development Cambodia and site visits.

4.2 Structure of data collection and analysis:

There are many methodologically-oriented books dealing with quantitative and qualitative methods. Very often, household surveys, observations and narrative interviews with key persons are used. In this research, the collection and analysis of data are conducted in a step-by-step process bunching up different methods of social sciences. Mainly, qualitative interviews are combined with remote sensing, documents and other information.

Figure 15: Data collection and analysis in zig-zag approach



Source: own design based on zig-zag approach of Creswell (Creswell, 2015)

The interviews are organised in a zig-zag approach to get the data of livelihood dynamics and resilience. It is based on several visits "to the field" to collect interview data to saturate the categories (or find information that continues to add to them until no more can be found) (Creswell, 2007). This allows all methods (questionnaire, semi-structured interview, focus group discussion, observation, and document) to be combined into one system of zig-zag. And, the data collected from the preceding method is also

used to verify and to guide the following one to make them more consistent given there are different groups to be interviewed and different places to be observed. The root causes of transformed attributes of resilience are redefined and analysed at the end of the process.

The Kachok, Tampoun, and Kreung ethnic groups who respectively live in Kanat, Malik, and Mass represent most of the interview respondents as they represent villagers affected by forestland conversion in the areas. The data collection is divided into five different steps starting from semi-structured interviews with chiefs of the village and community forest to gain an overall understanding of livelihood dynamics to specific case studies on the elements of resilience, vulnerability, and their root causes. Then, twenty households have been randomly selected for interviews for livelihood activities. Some of them are further selected as family case studies and asked to form a group discussion on subsistence and non-subsistence livelihood, and resilient livelihoods. Between three and five people participated in each of the focus group discussions. Field observation is also conducted in village centres, community forests and plantations where the economic land concessions are located to collect and verify data with previous collected ones.

The results from the first observation are used to guide and adjust the questionnaire, topics for group discussion, and other survey tools. Finally, one family who tended to depend more on NTFP and another one who got involved more in cash crop farming are chosen for family case studies. More than a home visit and discussion, the researcher spend more time to observe their activities at the farmland and in the forest from dawn to sunset. And, a total of 05 months had been spent in Kanat, Malik, and Mass, rubber plantations of the four ELCs, villager's farms, and community forests. Data obtained through participant observation serves as a check against participants' subjective reporting of what they believe and do. It is also used to create and improve the questions for the interviews and focus groups.

4.3 Data collection:

Data is divided into two types- livelihood dynamics and elements of resilience. The process of data collection starts with those of livelihood dynamics obtained from semi-structured Interviews, observation, and documents. The collected data is used for verification with other types of data such as satellite imagery derived from GPS location tracking and forest records. Certain data on elements of resilience can be also obtained during the survey of livelihood dynamics (household survey) as it covers some elements of human, physical, and social capitals of buffer capacity.

4.3.1 All livelihood dynamics:

The semi-structured interviews are conducted with chiefs of the villages and chiefs of community forests. It firstly attempts to collect general information which leads to the data of livelihood dynamics. The records of villages (land uses, jobs, migration… etc.) and community forests (the availability of wood, source of subsistent livelihoods… etc.) which were respectively collected during the early field

visit are used as a guidance on data collection during individual household interviews. The data from these authorities could give the overall information of livelihood dynamics in their own localities. Then, the researcher observes and identifies livelihood activities that are preferably practiced by villagers in the field.

4.3.2 Livelihood activities:

During a household survey, I let the villagers list down all the livelihood activities that they do daily to support their living. The activities are ranked by the level of supportiveness from both subsistence and non-subsistence perspectives in different years. In addition, both monetary and non-monetary income, generated by each livelihood activity can be used to classify the level of resource dependency. To quickly recall the main livelihood activities of previous years, specific local events are used to represent the year such as “the arrival of ELC” for 2009, “young rubber tree” for 2013, and “mature rubber tree” for 2015. The questionnaire also helps to seek information related to literacy level, reason for livelihood change, labour income, expenditure, dependency ratio, and number of non-working members (Details in annex). They were also asked to form a group discussion on how, when, and why they changed their livelihood strategies. Semi-structured questions are asked during the discussion to dig out more details of the situation.

4.3.3 Subsistence and non-subsistence:

From the answers of the most supportive income sources, respondents are separately asked through semi-structured questionnaires on subsistence (NTFP collection) or non-subsistence livelihoods (cash crop farming). These two cases are particularly formed for in-depth examination and further analysis of resilience (Details in annex).

Again, the respondents from these two groups are asked to recall the reasons behind the changes of their main livelihood activities from 2009 to present, and how the recovery path to maintain livelihoods after the presence of ELCs was created. During the discussion, the researcher needs to observe and identify the interesting given facts to provoke further debate on them.

4.3.4 Resilient livelihoods:

To understand and collect data for the elements of resilience-buffer capacity, self-organisation, and capacity for learning, those who participate in subsistence livelihoods and non-subsistence livelihoods are asked to continue the discussion on related issues of resilience. The discussion is then followed by semi-structured questions if needs be.

To ensure the quality of the data and follow the zig-zag approach, previous collected sources are used to inform the researcher what to do with the next data collection. All data collected from one step to another are double-checked with each other. Certain data shown below has already been collected

during the study of livelihood dynamics. Additional data remains to be taken during group discussions ((Details in annex). As natural capital is one element of buffer capacity, the research mainly uses two maps- soil type and land cover type to see the condition of the resource. Maps of Land Cover Type in 2009, 2013, 2015 are produced from Landsat to generate data for land use changes, and to verify with data collected in the field. During the field trip, observations are conducted at plantation fields and community forests to verify land cover types.

4.3.5 Redefinition of root causes:

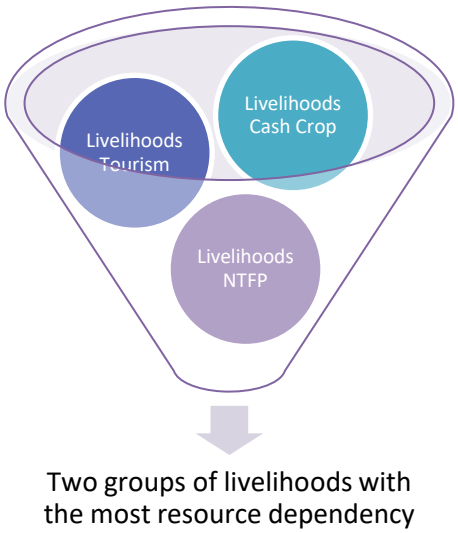
The data from resilience analysis lets us know the strengths, weakness, opportunities, and threats of each of the livelihood activities practiced by villagers. The unsustainable livelihood activities can be observed on the condition of ecological resources such as forests, stream banks, foothills, and slope areas. This may also link to the issues of self-organisation, cooperation, and knowledge transfer in resilience. It also opens the floor for the discussion on livelihood strategies implemented by concerned actors, especially on their unsustainable practices that lead to self-destruction. The researcher keeps using semi-structured questions to ask the respondents to provide more details of their unsustainable livelihood activities at the last stage of the structure of data collection. Therefore, several recommendations could be made to tackle these root causes from both practical and theoretical viewpoints.

4.4 Data analysis:

4.4.1 Livelihood dynamics:

From the result of the general survey on livelihood dynamics, two groups of subsistence and non-subsistence livelihoods are selected for further analysis on their resilience. In indigenous livelihoods, there is a strong connection between subsistence and non-subsistence as they do not dependent wholly on cash-crops or NTFP alone. Originally, indigenous people had totally depended on a subsistence economy provided from the forest land around their villages. But, the large-scale forestland conversion has thrown the existence of subsistence livelihoods into question. However, I must check whether one or both livelihoods are resilience for them. Making an analysis of resilience for single livelihoods will make us miss the most important part of interrelated elements among the main two livelihoods to sustain indigenous living.

Figure 16: Livelihood dynamics.



Source: Own research, 2018.

To see the differences in more detail, the analysis for livelihood dynamics is done by combining two types of collected data.

Historical data.

- Changes in main livelihoods since 2009 until present (questionnaire, semi-structured interview, group discussion, and observation)
- Comparison of land cover type maps (2009, 2013, &2015)
- Comparison of tree cover percentage maps (2009&2015)

Specific dated data.

- All livelihood activities at present (questionnaire, semi-structured interview, group discussion, and observation).
- Land cover map 2015. Tree cover percentage map 2015.

From this result, these two groups will separately join discussions on how they maintain their livelihood resilience. Then, I finally let the two groups join in one common discussion on how the two livelihood activities of the most resource dependency compete with each other to sustain the overall indigenous livelihoods.

4.4.2 Resilience analysis:

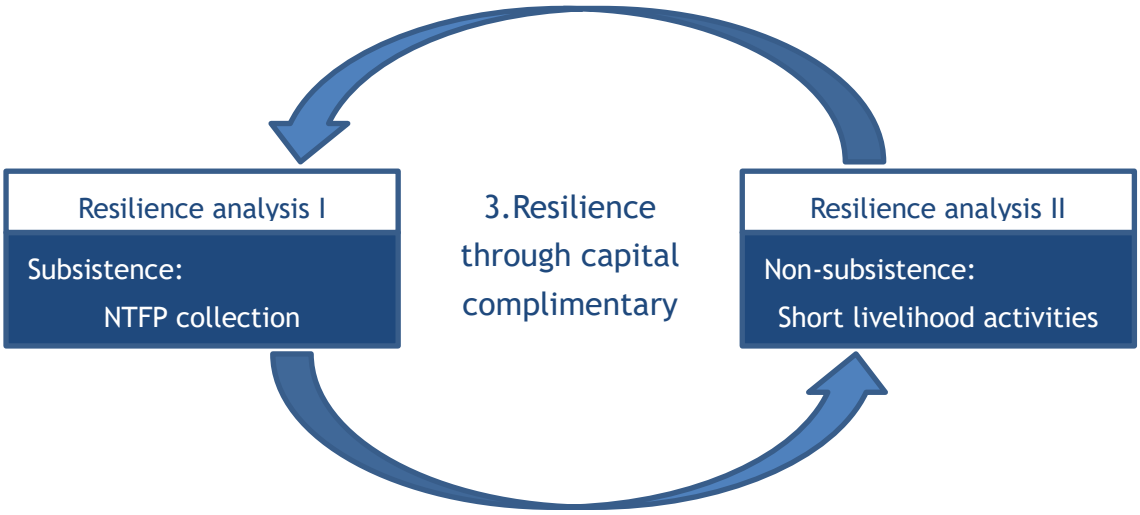
The resilience analysis is done based on the collected data of each attributes of buffer capacity, self-organisation, and capacity for learning. The research also attempts to analyse the human capital,

physical capital, social capital, natural capital, institution, cooperation and networks, network structure, reliance on own resources, knowledge of threats and opportunities, shared vision, knowledge identification capacity, knowledge transfer, and feedback mechanisms of the communities who are collecting NTFP and practicing short livelihood activities in the three villages.

4.4.3 Interrelationship in livelihood resilience:

Finally, the research will look at the strength and weakness of each resilience of the two livelihood activities, and find out the elements which are interrelated to make indigenous livelihoods sustainable.

Figure 17: livelihood resilience



Source: Own research, 2018.

There are two main livelihood activities- subsistence and non-subsistence in the overall framework of resilience. The research will analyse and illustrate how these two activities are connected to sustain indigenous living by checking certain elements of its resilience.

4.4.4 Resilience in comparative analysis:

Three different ethnicities including Kachoks from Kanat, Tampoun from Malik, and Kreungs from Mass, are selected for comparative analysis of resilience. This analysis also aims to find out how the sense of commonality in each community has changed in order to survive, why the livelihood activities are chosen, how the environmental condition degrades due to emerging livelihood practices, and whether they are sustainable or not.

Table 4: Resilience in comparative analysis

Village	KANAT	MALIK	MASS
Ethnicity	Kachok	Tampoun	Kreung
	Livelihood dynamics	Livelihood dynamics	Livelihood dynamics
	Resilient livelihoods	Resilient livelihoods	Resilient livelihoods
		Resilience in win-lose situation	

Chapter 5: Making a living under Post-ELC conditions

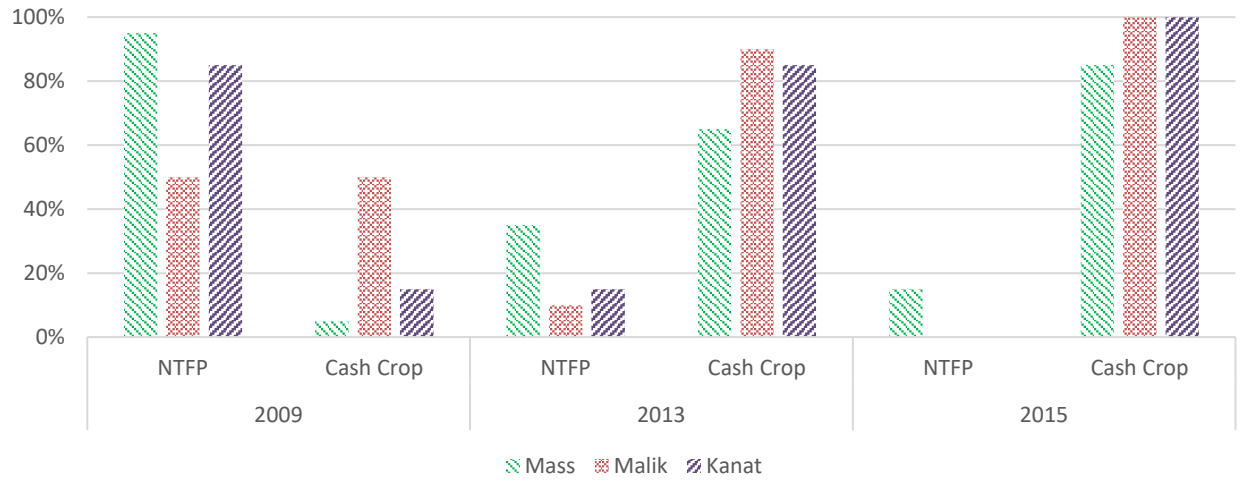
5.1 The reaction to changed land-use situation:

The research areas are inhabited by three different ethnic groups living in three different villages. The Mass is located outside the concession area and close to Yak Poy community forest, is inhabited by ethnic group called Kreung (fig.19). And, it has higher elevation than the other two villages in research area. Kanat and Malik which are located inside the concession area are inhabited by Kachok and Tamoun respectively. Even these ethnic groups are not numerous in each village, they have unique identities and languages.

Their forestland has been granted by the government to concession companies to develop large-scale agriculture. Before the land concession has been granted, the three villages had abundant and lush natural resources. The villagers rarely spent on living necessities. They could easily fulfill the basic needs by consuming the countless subsistence resources, from the nearby forests, such as wild fruits and vegetables.

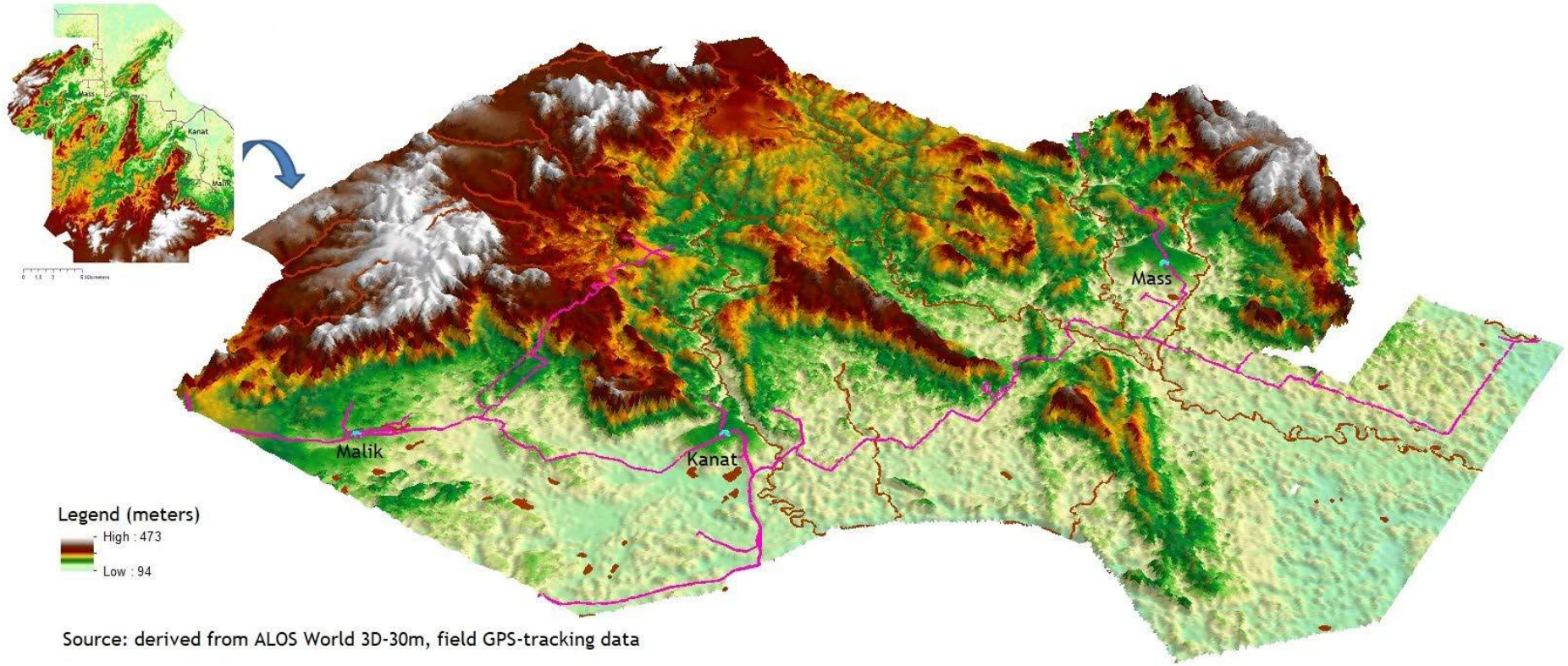
After the loss of natural resources which were usually and easily found near their village has pushed them to look for other alternatives to survive. Some livelihood activities are showing up while some others are disappearing. More and more villagers have started to grow cash crop on the remaining land. And, it gradually became their major source of income that enables them to afford living necessities. Wild vegetables are hardly to be found and collected as villagers spend longer time searching for them at many places in the forest. The two lowland villages have already run out of valuable forests while the highland Mass still benefits from this resource for the next two years.

Figure 18: Sources of livelihoods



Source: Own research, 2017

Figure 19: Villages on 3D elevation



5.1.1 KANAT village:

Kanat is located at farthest distance from Banlung (administration center of Ratanakiri) comparing to other two villages in research area (68 Km). Fortunately, villagers can travel to town on concrete road, red soil dirt road. This could boost local transportation both seasons. However, the road connecting the center of the village to the dirt road is a card track which usually flooded during rainy. This makes the transportation less busy but time-consuming during rainy. The village is inhabited by Kachok minorities which are the second largest group among other indigenous people in research area and smallest one in Ratanakiri. Kanat is located inside and at northeastern part of concession area of Heng Brother which covers 2361 hectares of land.

Photo 1: Center of Kanat village

Source: Own research, 2017
(13°54'22.55"N, 107°13'31.04"E)

"We cultivate cashew nut and cassava for income. And, we grow rice on a small plot of land near the village. Before coming back home in the evening, we collect some wild vegetable for cooking", villagers mentioned during group discussion. During forestland conversion, villagers lost most of their shifting cultivation area to concession companies. What has left for them is area at their backyard and community forests. There are 176 families in the village. In 2012, they have received private land title over their former collective land. And, all of them grow cash crops-cassava and cashew nut on the land to generate monetary income. A small number of families said that they have planted cassava and cashew-nut before the presence of concession companies as they saw and followed other indigenous groups who planted them. There was the demand from middlemen who came to the village to buy their cash crops. And, middlemen were necessary to organize the trade. Villagers

Photo 2: Kachok minority harvesting lowland rice

Source: Own research, 2017
(13°55'13.76"N, 107°14'14.87"E)

have expanded their land to plant the crops around the village while the resources and the size from forest decreased. Their harvests bought from villagers are normally exported to Vietnam as there are efficient starch processing factories. However, the average cassava yield in Vietnam is 17.2 tons/ha (Viet et al., 2013). It is higher than those produced by indigenous people on the same size of land in the research area. And, there are many large-scale cassava plantations almost throughout Vietnam (Kim et al., 2000). They also cultivate lowland rice for their own consumption along the road leading to the village. And, less than half of the villagers do vegetable gardening.

Since 2009, the concession companies-Heng brother, Veasna, Krong Buk, and CRD have taken parts of their farm land and forest land for large scale agro-industrial development. Currently, these areas have been gradually planted with rubber trees. After the concessions were granted, Kachok minorities still have one forest called Ton Blon. And, they share another forest called Yak Min with other villages (Chouy, Chan, and Mass). But, this has already degraded. And, there is no woods left for them to cut. With limited wild vegetables found in the forest, villagers occasionally buy meat and fish from traveling salesmen who come to the village by motorcycle. Before the presence of concession companies, they could collect plenty of wild vegetable, catch fish in the streams, hunt the animals, and make bamboo and rattan baskets. And, they could barter with outsiders for what they did not have. They can eat rice with boiled vegetables to save their expense on basic needs. Villagers also use their income to acquire living necessities. *"When I go to market in the town, I usually buy medicine and clothes back home. But, I do not go there often because it is so far. We do not have much money." Mr. Sol Dom said.*

Photo 3: Traveling saleman selling his groceries

Source: Own research, 2017

5.1.2 MALIK village:

Photo 4: Center of Malik village

Source: Own research, 2017 (13°50'57.34"N, 107°15'47.88"E)

Malik is located at the shortest distance to town comparing to the other two villages (52 Km). And, the road connecting the village to the town is almost dominated by asphalt concrete road and red soil dirt road. And, there is only a short dirt cart track 3.8 Km connecting the center of the village to the red soil dirt road. The village can be easily reached in both dry and rainy. Malik is inhabited by Tampoun minorities. It is the most populated village, with 238 families, among the other three villages. All of them grow cash crop and collect NTFP. Like other indigenous people, Tampoun minorities have their own dialect. They live in both town and forest. Their village is located inside one economic concession company called Veasna which covers 5080 hectares of land. However, the village was only slightly affected by economic land concession. *Villagers successfully got back their land from the company after protesting and refusing to leave their land", Mr. Rormam Myorng, Chief of the village mentioned.*

Photo 5: Banner of Malik community forest

Source: Own research, 2017

Here, the villagers own Phnom Raing (or Malik) community forest which is smaller than Yak Poy. This community forest covers 924 hectares of land in the southern part of Veasna's concession area. The community forest was first supported by European commission and DPA. Currently, the forest does not provide any significant resources such as wood for housing or wild animal for meat. But, there are small amounts of bamboo, rattan, mushroom and wild vegetables. Their basic needs differed from the past. Now, they buy foods from traveling salesmen or nearby local market. The decrease of NTFP was caused by forest land encroachment and logging. Villagers need to buy woods from other community forests to build their house.

Photo 6: Old cashew nut farm along cart track

Source: Own research, 2017 (13°50'13.41"N, 107°16'20.85"E)

Their affordability on living necessities is higher than other minorities'. Being close to the main road, Tampoun minorities benefits a lot from harvest transactions. This makes villagers in Malik have better source of livelihoods than villagers in Kanat and Mass have. *Villagers plant and sell cassava and cashew-nut along both sides of the cart track. "The first year of harvest are up to 10 tons per hectare on the same plot of land. And, the amount remains the similar for the first a few years if they blow the red soil and prepare rows for planting cassava. The crop yield drops to three or four tons per hectare plot in the sixth or seventh year, villagers said during group discussion."* With easy access from the main road, there are more chances for them to sell their harvest to many buyers who come to the village by truck. Villagers also own new croplands on foothills of community forest and riparian bank as they try to increase productivity even they have legally already given individual land titles. Certain families started to use concrete to build some parts of their houses such kitchens and restrooms as there are no more wood available in the community forest. Tampoun minorities are wealthier in the context of property they own such vehicles, the size of their house, building materials, and other utilities.

The majority of them planted cassava and cashew-nut before the presence of economic land concession company in the area. They cultivate lowland rice for their own consumption. The rice fields are seen along the cart track in the north of the village (13°52'22.86"N, 107°15'2.13"E). Vegetable gardening is secondary task done by some families from 100 to 400 square meters of land.

Photo 7: Center of Mass village

Source: Own research, 2017 (13°56'53.58"N, 107° 7'39.29"E)

5.1.3 MASS village:

The village is inhabited by Kreung minorities. At the provincial level, they are the third majority of indigenous people. This village lies between the concession area at the east and community forest at the south and west. Besides asphalt concrete road, red soil dirt road, the dirt cart track 1.15 Km leading to the village is quite narrow. More than half of the road is red soil dirt road. And, villagers need to travel 13.90 Km on dirt road across rubber plantation of Krong Buk to reach the main road. The dirt cart track is small, muddy. Some rain-fed streams flow across the track when there is too much rainfall at the high elevation area.

Photo 8: Stream dividing Mass and Kress

Source: Own research, 2017 (13°54'47.46"N, 107° 5'52.04"E)

Even the distance between town and Mass is shorter than the distance between town and Kanat (57.5 Km), the travel to the village takes longer time. There are many rocky slopes, streams, and sudden change in direction along the road. The soil cart track to the center of the village with cashew nut and cassava farm at both sides is just enough for one-way traffic at a time.

The center of the village is quite close to from Yak Poy community forest (1.5 Km). And, this is the least populated village in the research area with 75 families. And, all of them grow cash crop and collect NTFP. The village is surrounded by economic land concession and community forest (13°56'54.67"N, 107° 7'39.50"E). During the arrival of economic land concessions, they lost their eastern farmland to Krong Buk and CRD. The croplands of cashew nut and cassava belonging to villagers lies from the border of economic land concession to the foothill community forest. Some parts of Yak Poy which is close to the village have been cleared and burned for farming in the upcoming

rainy in the middle of May. Many piles of cassava trees have already been kept in the burnt area even during this dry season. Yak Poy still provides the villagers with wild vegetable, bamboo, rattan, and many others of NTFP. It is said that NTFP represents 20 percent of their source of livelihoods. The existing cashew nut and cassava farms are also seen in the area. *And, …this forest will run out of wood for house in the next two years…. Logging is being done every day for different purposes. Some woods are cut for making house, some for selling to other villagers..., Mr. Toung Penh, chief of the village said.* Kachok minorities also buy woods from this village as there are no more big trees in Ton Blon and Yak Min. With poor infrastructure and isolated from populated area, logging easily happens throughout the southeastern part of Yak Poy. The forestland encroachment and logging has made the remaining evergreen of community forest near the village gradually fade out. Several confiscated logged woods are kept in the village for sale for the revenue.

Photo 9: Illegal logging done by Kachok in Yak Poy

Source: Own research, 2017

Photo 10: Forestland cleared for farming

Source: Own research, 2017 (13°55'55.69"N, 107° 6'42.47"E)

Living on high elevation area, Kreungs cannot grow lowland rice like Kachok and Tampoun minorities. Each family owns upland rice farm. And, they plant it mixed with cashew nut. Some years with long lasting dry season and lack of rainfall, the rainfed upland rice cannot survive. The villagers totally depend on rainfall to grow their crops. When they face food shortage, villagers buy rice from the market. Villagers also do vegetable gardening planting pumpkins, cucumbers, melons, corn, banana in a small plot of land between 100 to 400 square meters. The price of cash crops sold at this village is cheaper than those

from the other three villages because the buyers drive from a long distance and on bad condition cart track to the village. And, foods sold by traveling salesmen are double the price of the ones sold at local market.

5.2 Land-use change:

The livelihood dynamic and pattern are collected from 2009 to 2015. The period is more accurate for the research, especially, during environmental change. Most ELCs came to clear the forestland in 2009. they divided the area into many sub-regions. And, they planted rubber trees at the same time. From 2009 to 2015, the company planted new rubber trees every year according to their master plans. Until 2015, some rubber trees have already grown up. And, they look like a field of young forest from satellite image (fig. 20)[6].

For this research, two different years of tree cover are selected for studies and comparison. It can describe how forestland conversion, land encroachment, and logging have been degrading the environment over a time span. Some areas have dramatically degraded from the highest to the lowest percentage especially in CRD[7]. To spot the differences, the planation fields are re-checked and georeferenced.

Young crops and recent cleared forestland are found throughout the research area[8]. Besides these types of vegetations, it is observed that the forest degrading, the rubber trees and the cashew nut trees maturing[9]. For this part, the research attempts to show only deforestation in the area. Then, several maps of land cover type are produced to differentiate them[10].

[6] The blue band 1 with spatial resolution is 30 meters of Landsat 7 which is useful for distinguishing soil from vegetation, and deciduous from coniferous vegetation is selected for tree cover comparison between year 2009 of arrival of ELCs and year 2015 of project implementation (USGS, 2009b; USGS, 2015a).

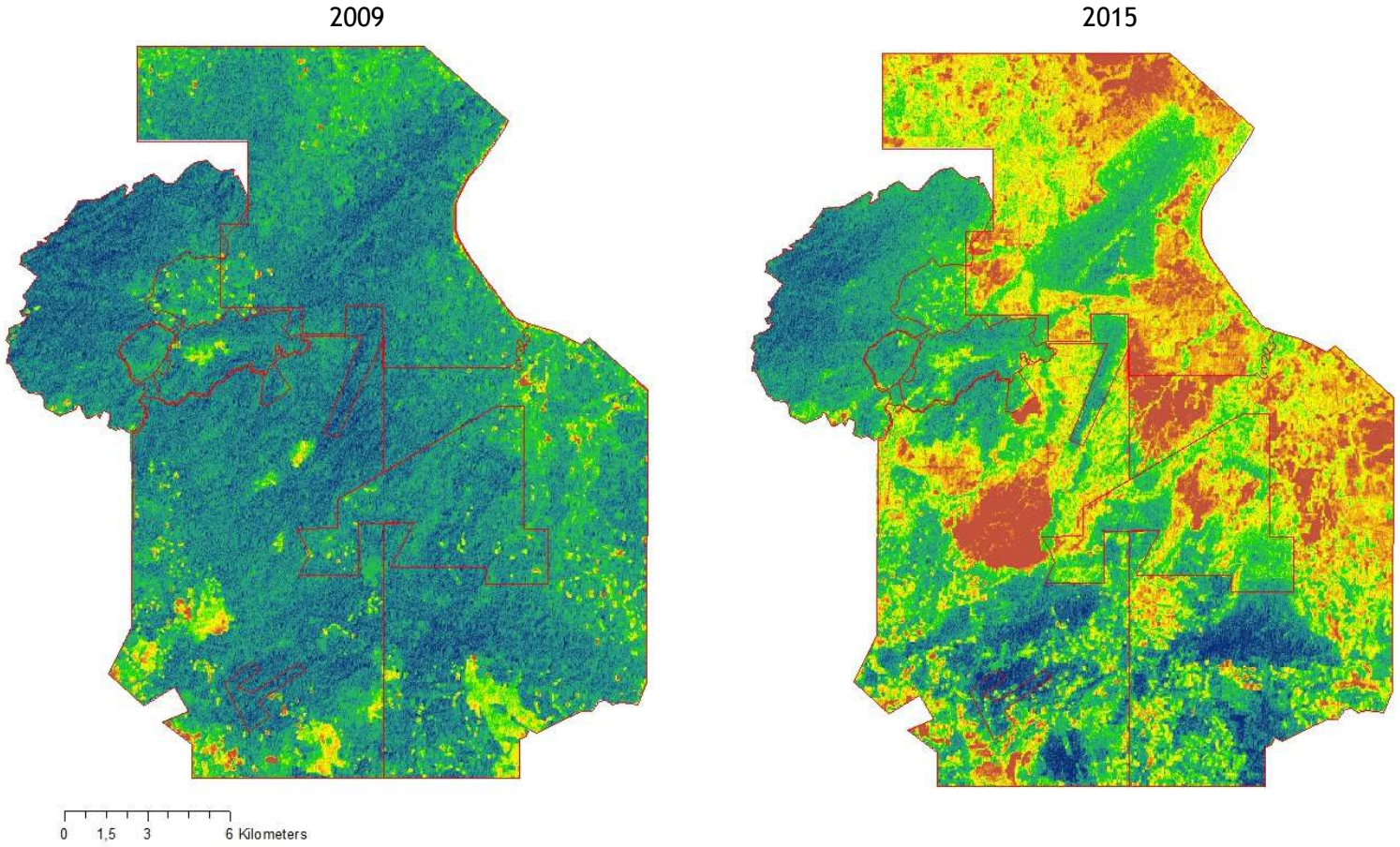
[7] The highest tree cover percentage is 200. And, the lowest one is 0.

[8] The area is located in between yellow and dark red area

[9] With light green area

[10] By using Land cover type 1 of International Geosphere Biosphere Program *MCD12Q1, LP DAAC, USGS (resolution: 500 meters)*, 11 land cover types are selected and focused for studies. The area is covered with evergreen broadleaf forest, deciduous broadleaf forest, mixed forest, closed shrublands, woody savannas, savannas, grasslands, permanent wetlands, croplands, urban and built-up, and cropland/natural vegetation mosaic.

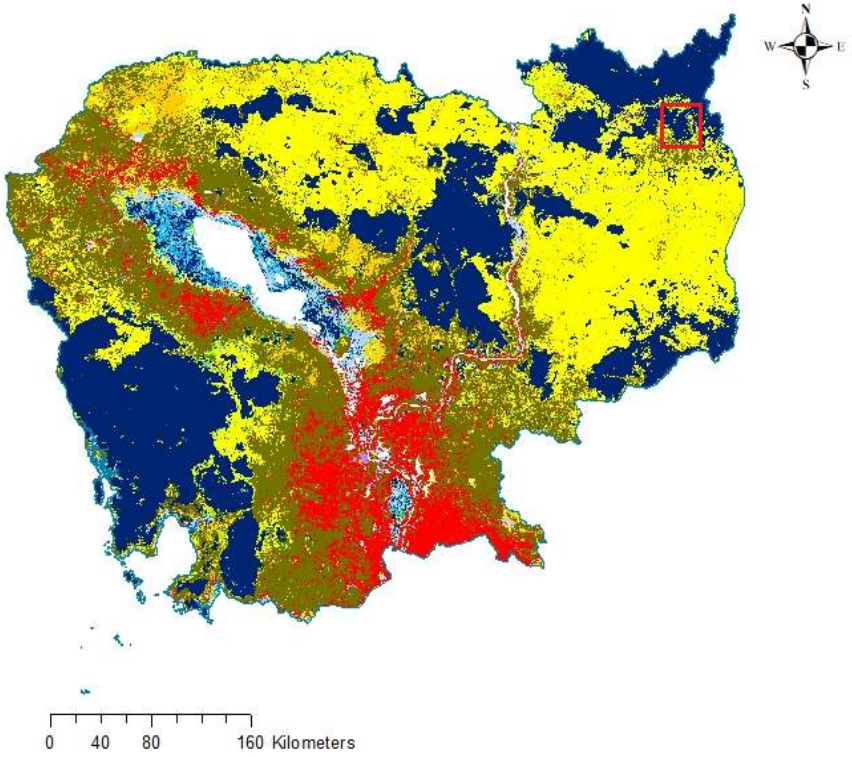
Figure 20: Deforestation



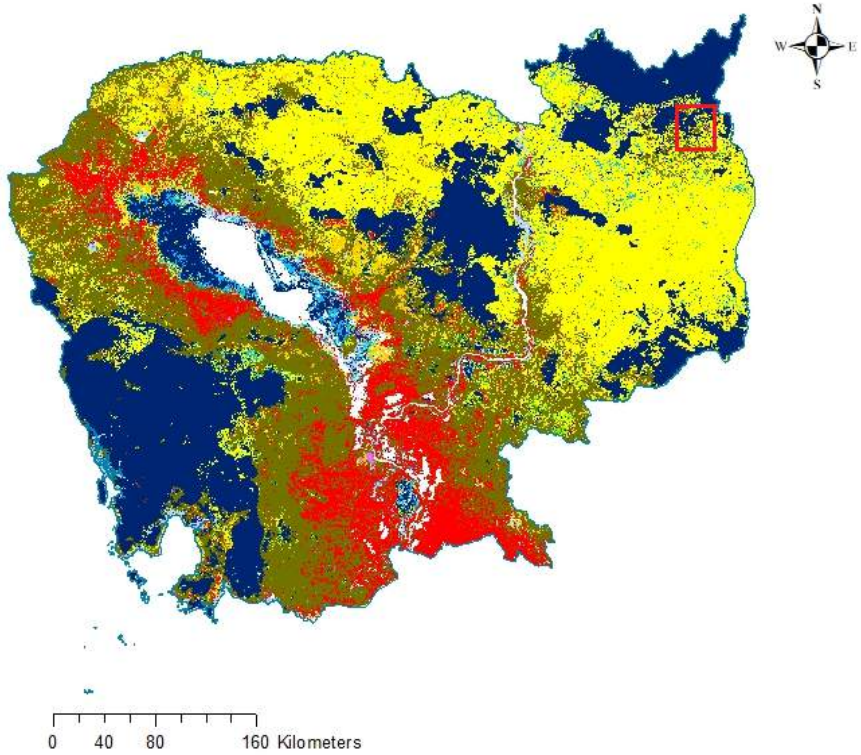
Source: Band 1, Landsat 7 Enhanced Thematic Mapper Plus (ETM+) 2009, 2015, USGS.

Figure 21: Land cover view of Cambodia

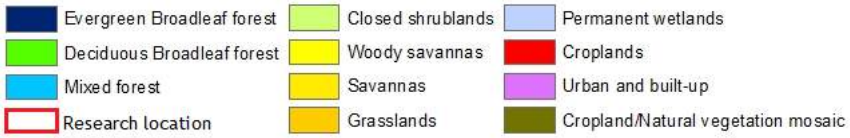
2009



2013



Legend:

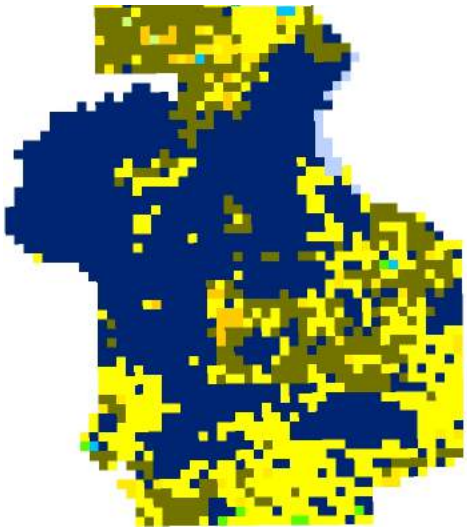


Source: Land cover type 1(IGBP), MCD12Q1, LP DAAC, USGS (resolution: 500 meters).

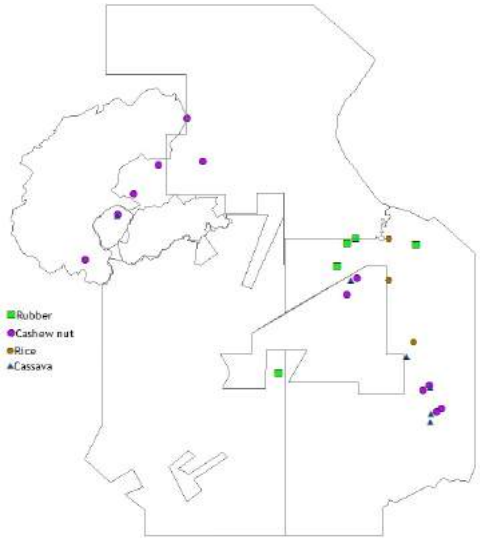
Figure 22: Land cover conversion

Landsat 8 (2013)

MCD12Q1 2013



Field GPS-tracking data



Land cover type 2013

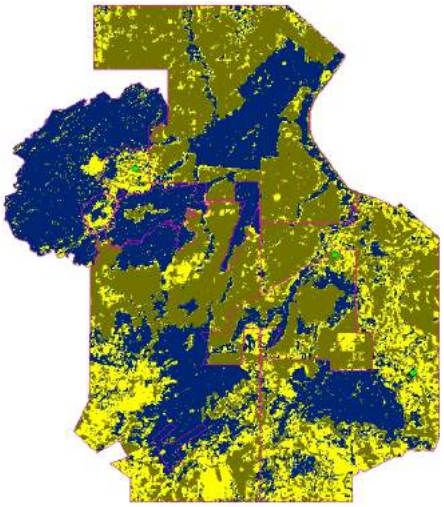
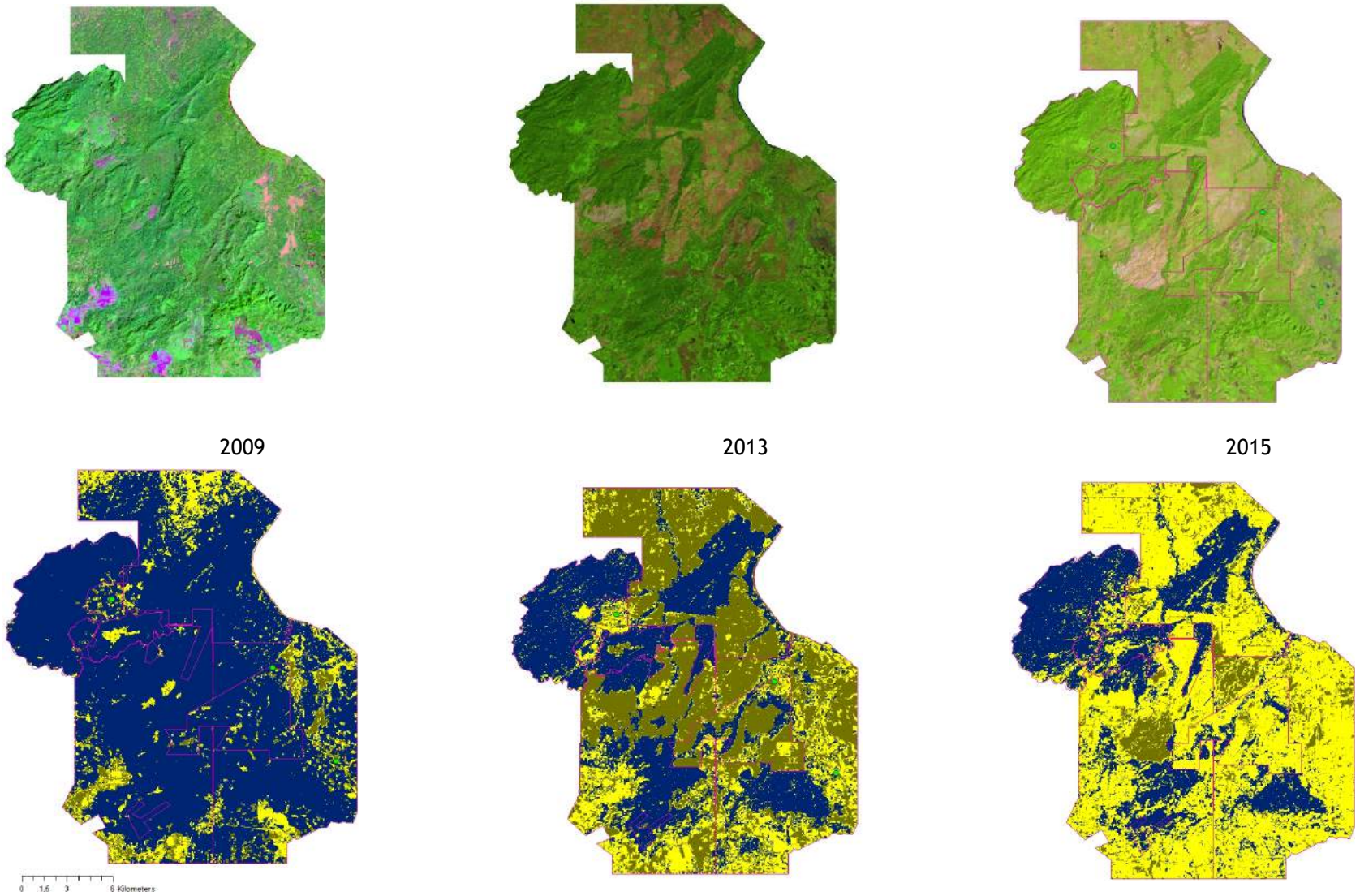


Figure 23: Land use change



Source: derived from NASA LP DAAC's MCD12Q1 (2009, 2013), Landsat 4-5 (2009), Landsat 8(2013, 2015), google earth's satellite image (2017)

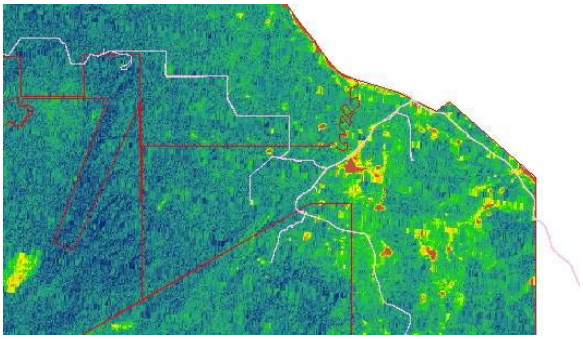
The overlaying images of Landsat, MCD12Q1, and field GPS-tracking data show that woody savanna keeps gradually increasing throughout the area[11]. Oppositely, the former immense forest land has lost most of its evergreen part to cropland and woody savannas since the beginning of ELC. And, the indigenous people are seen to encroach community forest for farmland expansion. This comparison is generated from the overlaying images of 2009, 2013, and 2015. To give a better view of land use change in each locality, the above images of land use change are cropped out and zoomed in on each village. And, they are depicted with collected data from both remote sensing and the field.

5.2.1 Kanat village

Kachok own one forest and share another forest with other minorities. Ton Blon (13°55'56.72"N, 107°10'57.65"E) is located inside Krong Buk. And, Yak Min (13°58'30.60"N, 107°11'13.88"E) is outside and close to the border of Krong Buk. Forestland conversion of concession companies made the tree cover percentage dramatically decrease. It has changed from dark blue to yellow and dark red. And, this area is now becoming rubber plantation.

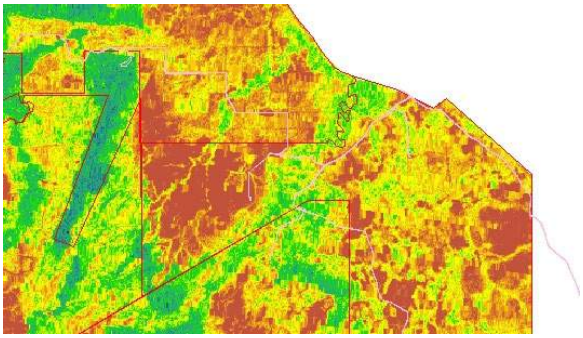
Figure 24: deforestation in Kanat

2009



Even Ton Blon was cut out from concession area, illegal logging and forestland encroachment for cropland expansion happened throughout its vicinity. These short livelihood activities made forest change from dark blue area of it to light green. From 2009 to 2015, the cropland of Kachok has been expanded from the center of village to the border of rubber plantation of Heng Brother at the south, Veasna at the east and west, and Krung Buk at the north.

2015

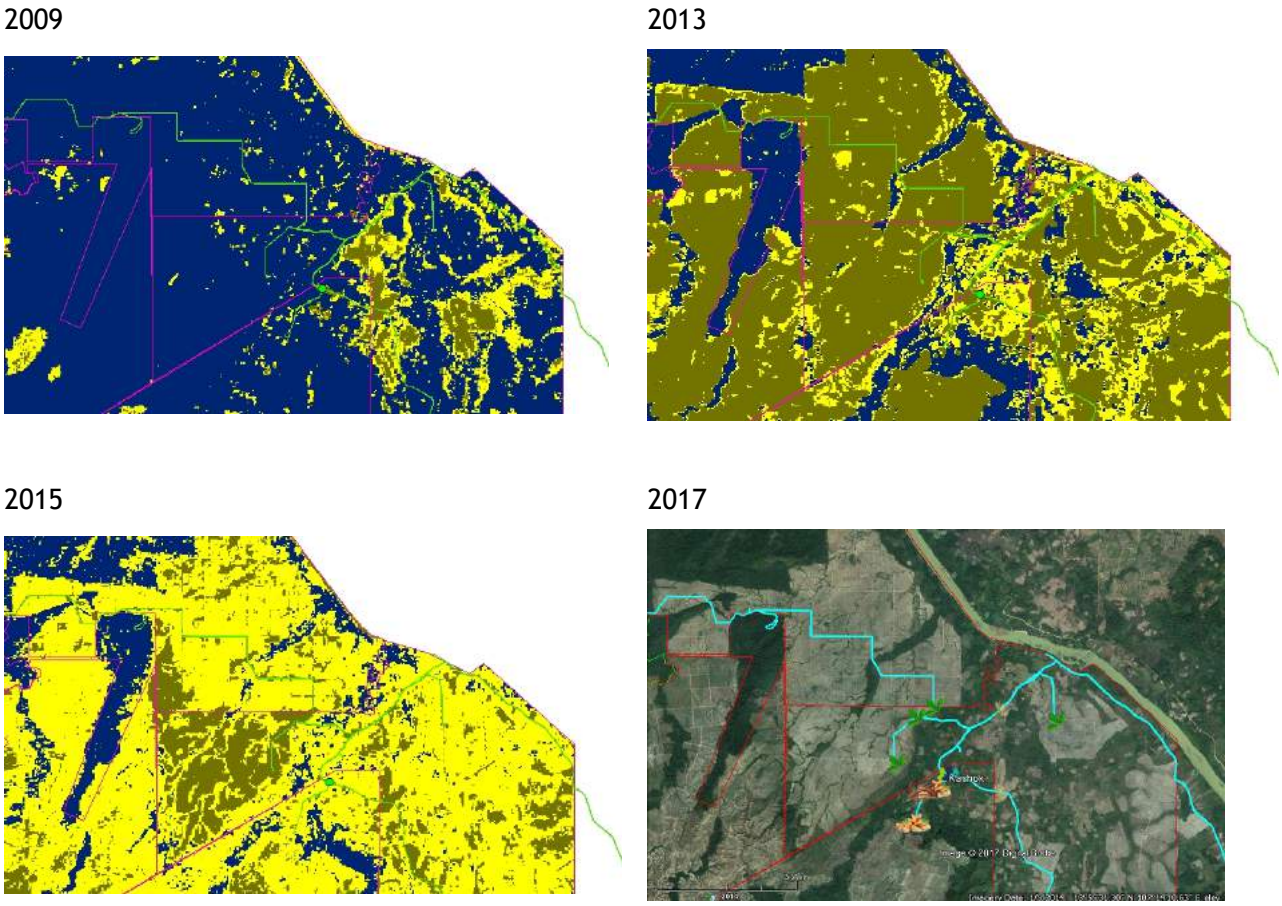


Kachok has overused their forests. Right now, the Ton Blon and Yak Min have run out of woods. And, if they need woods to build house, they have to build it from other forest communities. The trees left from logging are small, young and unmatured. Tree cover percentage in the area ranges from medium to the lowest. This change explains the decrease of subsistent livelihoods.

[11] *To keep land cover type which are derived from Landsat 4-5 (2009) Landsat 8 (2013, 2015) with the same mosaic colors as MCD12Q1 at 1:150 000 scale (1cm= 2km), field GPS-tracking data and MCD12Q1 have been used to verify and classify satellite image based on its evergreen broadleaf forest, woody savannas, and cropland.*

Surrounded by rubber plantation field of CRD, Krong Buk, CRD, and Veasna, Kachok cannot expand their farm land in the area anymore. Last year, fifteen families from Kanat once encroached forest land near Ton Blonc community forest. And, this activity was halted by the local authority. Prohibited areas such foothills of the forest and riparian bank have become the target for indigenous people to expand their cropland. These unsustainable practices have made the whole area lose its tree cover percentage.

Figure 25: Land use change in Kanat



The center of Kanat is located inside Heng Brother's concession area. In 2009, the village is surrounded with evergreen broadleaf forest as the largest land cover type following by woody savannas and cropland. The villagers plant both rice and cash crop. However, the village has lost most part of their forestland to concession companies.

In 2013, the young rubber plantations are found in CRD, Veasna, Heng Brother, and Krong Buk. There are more woody savannas and cropland than evergreen broadleaf forest inside the area. These can be notified along each straight turquoise tracking line in the checkerboard pattern-like plantation field. The companies have cleared the forest and prepared plantation field. These can be seen clearly as loss of evergreen broad forest and the checkerboard pattern-like roads which are close to the village and

the sacred forest.

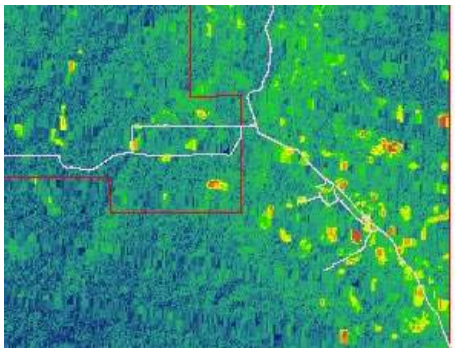
These land cover type also get larger in the village. The forest once looks like cropland especially when villagers cleared the new forest and enlarge their land into evergreen broadleaf forest. In 2015, indigenous people's croplands of cashew nut once appeared to be woody savannas when the trees are growing big and old. People annually prepared this kind of land to plant the new crop in the upcoming rainy. And, the croplands which remains the same after several years are cassava field. Mature rubber trees of concession companies also appear to be woody savannas. These two types of land are commonly found at the village center to rubber plantation of economic land conesssions. Being close to the local market Andoung Meas (13°52'8.31"N, 107°17'45.50"E), and having middlemen come to the village, Kachok have more advantage to sell their harvests. However, villagers are not well prepared for this opportunity. This land-lost community do not have enough land for cultivation after their swidden plots have taken by Economic Land Concessions.

5.2.2 Malik village

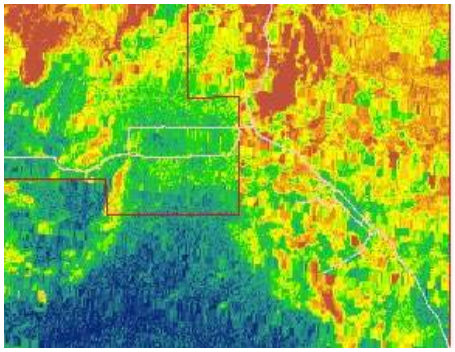
The villagers have cleared more land at both side of Malik's main road for planting cashew nut and cassava. This is centralized and large expansion comparing to other villages. Tampoun minorities cleared more land for rice cultivation along the way to Kanat which made this area become dark orange and yellow. in 2009, the tree cover percentage at the center of the village was already below medium. If comparing to Kana and Mass at that time, Malik had the lowest percentage. And, this describes and links to their early involvement in cash crop shown land cover type.

Figure 26: Deforestation in Malik

2009



2015



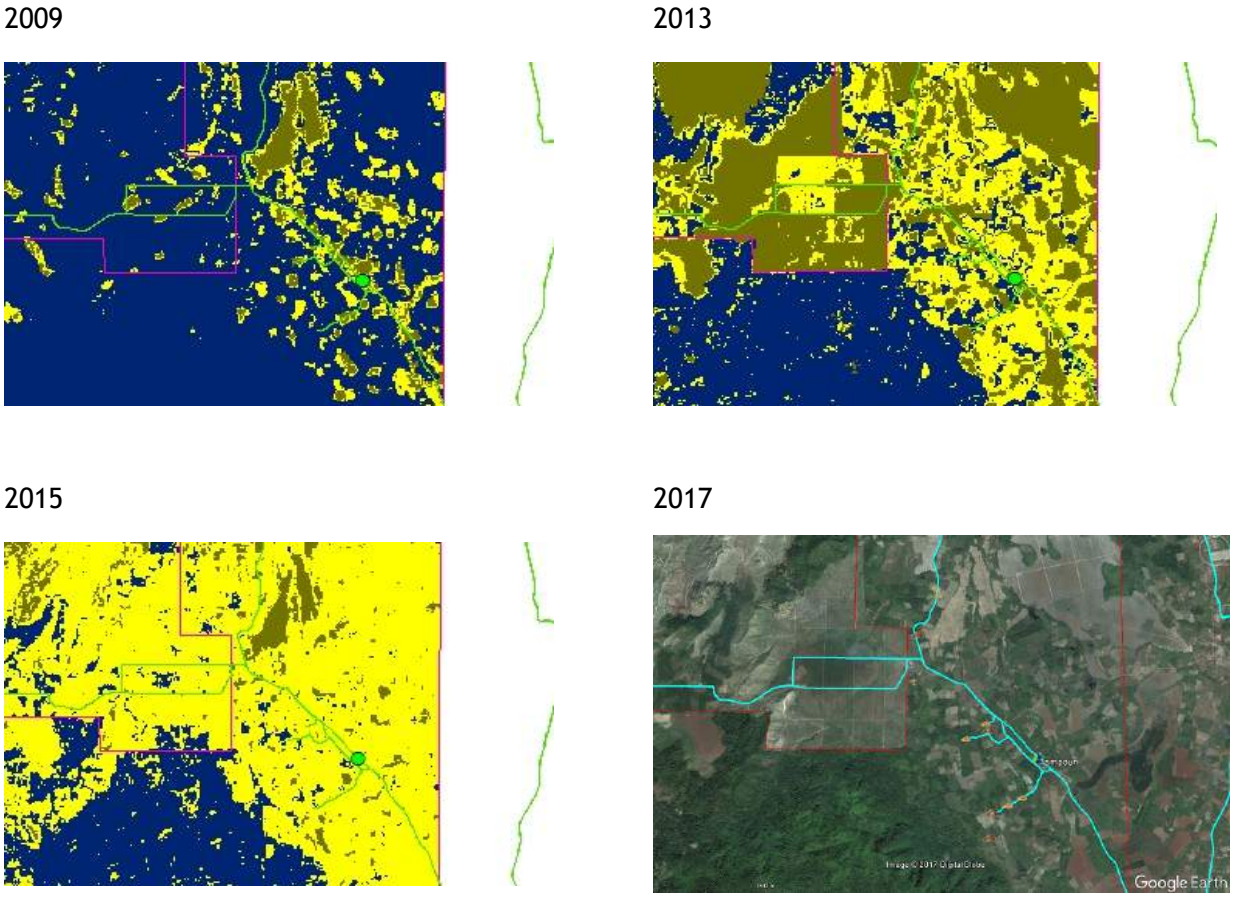
In 2015, both concession areas look light green and dark red caused by forest clearance. It has become woody savannas and cropland/natural vegetation mosaic. This is because the rubber trees in this area are reaching 2 or 3 years old now.

Until 2017, Veasna has not been preparing rubber plantation in lower part of their concession area in Malik village. This makes Tampoun own more land than Kachok do. And, they can grow more cash crops. The minorities have expanded their cash cropland on both side of the road. The evergreen broadleaf forest has

become deciduous forest and farm land of cashew nut and cassava. Villagers have expanded their cropland along the foothills and in the vicinity of Malik.

Malik forest now provides wild vegetable for villagers with limited amount. They spend more time to find NTFP. Moreover, the forest has already run out of woods for housing for the villagers. The absence of this kind of wood has downgraded their evergreen broad leaf forest. And, they start to buy wood from community forest. Some parts of villager's house are planned to be built by using brick and cement which is not common for village located near the forest in Ratanakiri. Many new houses are being built as villagers get the high return from selling their cash crop. Their affordability on living necessities and degradation of local environment is win-lose outcome.

Figure 27: Land use change in Malik



Malik is located inside the concession area of Veasna. Almost the villagers have not lost their farmlands as the government granted the land to the company. Since 2009, land cover has not changed much, except in the concession area. The villagers plant more cashew nut than cassava from the village center to the rubber plantation of Veasna. They cultivate their lowland rice which is seen as cropland at the right-hand side on the way back to Kanat.

The woody savannas present the old cashew nut trees in the village and old rubber trees in concession area. The evergreen broadleaf forest has been dramatically lost and became woody savannas and croplands in lower part of Heng brother (left) and the upper part of Veasna (right).

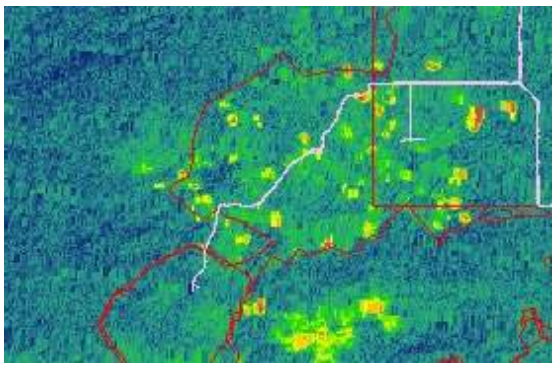
Tampoun minorities enlarged their cashew nut and cassava farm close to borders of each land concession. The high production of cassava and cashew nut attract buyers to permanently install their stores in the village and near the farmland. One plot of land can be used for plantation from one to five years without using chemical fertilizers. They just burn all the old and less productive trees of cash crops. And, when the rainy starts, they prepare the same plot for the new crop plantation.

In 2013, the two companies have cleared the forest and prepared the land for plantation. Young rubber trees, appeared to be cropland on land cover map, are planted on checkerboard pattern-like field in Heng Brother. And, old cashew nut trees and young crops of Tampoun minorities are seen throughout the village from its center to the eastern border of Veasna. In 2015, both concession area and the village are full of old rubber plantation and cashew nut farm leaving some small spaces for cassava plantations.

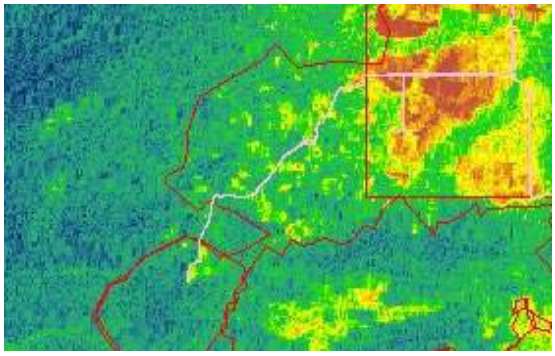
5.2.3 Mass village

Figure 28: Deforestation in Mass

2009



2015



In 2009, Mass had the highest tree cover percentage among other villages in the area. Previously, it was difficult to come and go out of the village. Kreung minorities had to walk through the thick forest for hours to reach other villages. However, the forestland conversion in concession area has made tree cover percentage in the eastern of the village fall below medium. And, the area is now filled with rubber tree. And, its land cover changes from forest to cropland.

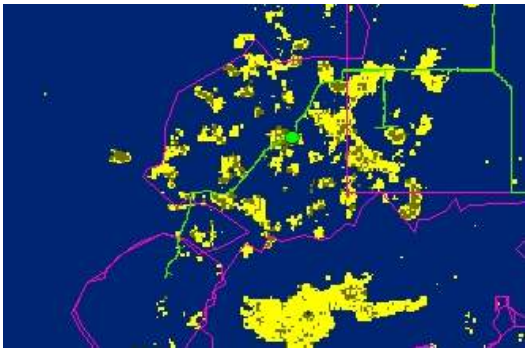
Kreungs live close to the Yak Poy community forest. After taking their crop and before coming back home in the evening, they go to collect NTFP from this forest. Yak Poy is also the last forest for loggers in the area after the others have run out of woods. It is expected that the forest will make it run out of wood for housing in 2019. Tree cover percentage does not change much at its center even logging happens every day. But, the dark green located along its border has changed to light green.

The expansion of cropland on prohibited areas are found on foothills of the forest and slope area. They encroach these areas for planting cassava and cashew-nut. And, these new farmlands can be seen on both sides of turquoise tracking line from the village center to Yak Poy community forest. There are still several plots of forest being burned down and ready for plantation in upcoming rainy.

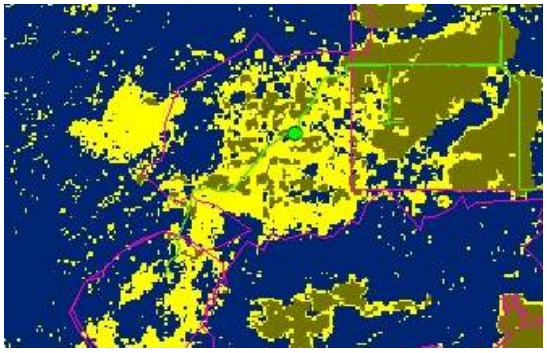
The high return of valuable woods has incited many villagers, especially youths to get involved in illegal logging. This is the easy and fast livelihood activity which enables them to generate monetary income and to afford living necessities. Then, the tree cover in Yak Poy will not be able to keep its high percentage in the next few years. And, villagers might encroach their existing common pool resource heavily to increase their productivity of cash crop after earning nothing from logging. This has already happened in Malik and Kanat.

Figure 29: Land use change in Mass

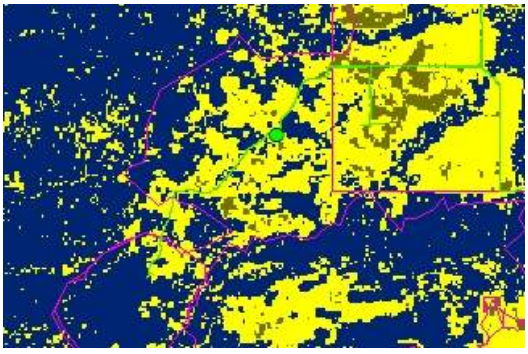
2009



2013



2015



2017

Yak Poy community forest is shared by five villages. All ethnicities living in these villages are Kreung. Mass is one among the other five villages who manage and use Yak Poy community forest.

The expansion of cropland in this village is quite difficult. The village is surrounded by community forest, and economic land concession. There are three main types of land uses- evergreen broadleaf forest,

woody savannas, and cropland. From 2009 to 2013, there was an expansion of cropland from the center of the village to border of Yak Poy and the border of Krong Buk.

In 2017, there are already croplands of cashew nut and cassava inside Yak Poy. Some areas have been recently burned down. The villagers said that they follow what villagers in Kress (nearby village) have planted on their land. After having seen other villagers in Kress generating income from selling cash crops such cashew and cassava, villagers in Mass also started to plant the crops to acquire living necessities.

Photo 11: Young cashew nut farm near Yak Poy

Source: Own research, 2017 (13°58'34.08"N, 107° 8'40.55"E)

The road access to the village is small and bad condition. However, there are still businessmen come to this village to buy their harvest. Kreungs cannot sell their crop at the same price as other minorities do. The price of the crop is normally cheaper than those of nearby villages due to the distance and condition of the road. Besides selling their cash crop, villagers also collect wild vegetables in Yak Poy community forest. And, there are indigenous people's land sold to outsider along the track to farmland in Yak Poy community forest. All families in Mass grow and consume only upland rice. Some places, they plant upland rice mixed with cashew nut.

Chapter 6: The Social Transformation Among Indigenous Communities

After the destruction of the forestland, villagers had to adapt at the new situation with their limited capacities. Their sense of commonality in resource protection is spoiled as everyone compete for what is left from the resources. This has led to the degradation of existing resources making their reactions to land use change unsustainable. Some attributes of resilience in the communities were transformed from its original state[12]. The details of them are illustrated below.

6.1 Kachok minorities:

6.1.1 Buffer Capacity:

Human capital:

Kanat has one primary school. And, only a few students from this village can continue their studies at junior high school which is located in Andoung Meas. The rates of drop-out and repetition are high as they get involved in family farming activities. They pursue their studies with the supports such as transport means from the families. Less than half of total villagers can read Khmer as they had previously participated in literacy class.

Photo 12: Kachok woman with her children

Source: Own research, 2017

Those who pass primary school exam have to travel 13 km to Andoung Meas junior high school (13°52'13.27"N, 107°17'30.02"E). Normally, they drive motorbike to reach school. There are only 12 students in grade 6 (last school year of primary education). For those who missed a chance to access education at young age, they still can participate literacy class provided by Plan International. And, most of them are youths in the village. The possibility to get higher degree with modern knowledge is quite rare for the community. Some children are seen to help their families to grow crops and collect cassava and cashew nut. Most indigenous youths are self-employed in the vicinity of the village to survive during the shock (the loss of forestland). *"I do not want to work as wage laborer in town because I do not know how to live there well. And, we do not get used to the traffic. there are*

[12] The information is generated from collected data of observation, questionnaires, semi-structured interview, and document. To verify the data with locations, geo-referencing is also used during the research throughout the area.

too many roads. And, we need to spend more to live there," villagers said during group discussion. To work in the outside world is risky and unexplored for them. Kachok minorities do not get involved in labor market. Even there are many rubber plantations around the village, none of them works for the concession companies. Having only traditional knowledge, without modern one, has not enabled them to go beyond village boundary and looking for the new job in the modern job market. They manage to thrive in one place by practicing short-livelihoods activities.

Physical capital:

Pigs and buffalos are raised free-range in the village. Indigenous people raise them for sale and for their own consumption in special events. At the early rainy season, villagers prepare their small plot of land to plant variety of vegetables such as cucumber, pumpkin, and melon for their own consumption. They sometimes prepare food with it or wild vegetable collected from the forest or other groceries.

Photo 13: Pumpkin near upland rice

Source: Own research, 2017 (13°55'13.76"N, 107°14'14.87"E)

Once or twice a month, Kachok minorities buy food-vegetables fish pork and beef from traveling salesmen. The prices of these items are more expensive than the local market. They eat hardly enough meat. In the past, the foods are previously found in the forest and stream by hunting, collecting, and fishing. They also go to Andoung Meas market which is located 13.5 Km from the village center when they need to buy medicines and clothes.

Villagers own farmland of cash crops such cashew nut and cassava. They annually collect and sell their harvest to the middleman to generate quick monetary income. The harvests are between nine and ten tons of cassava per hectare plot for the first year. And, the amount remains the similar for the first a few years if they plow the red soil and prepare rows for planting cassava. The crop yield drops to four or three tons per hectare plot in the sixth or seventh year. The monetary income is normally spent on modern living necessities from prepaid card to gasoline and basic needs from foods to clothes. Kachok minorities cultivate lowland rice on flooded rice paddies during rainy. These paddies are located along the cart track to the village. And, they also plant highland rice with other crops near the foothills.

Before the presence of land concessions, almost all the areas around their village are forest. Logging

has been done so fast in the area made the sacred forests-Ton Blon and Yak Min which are located in the concession area run out of woods for making houses anymore. They have never been registered and approved from Ministry of Agriculture, Forestry, and Fisheries as community forest which should be protected. The tall shade trees which are suitable for making house have been cut throughout the forest. Wildlife habitat has been destroyed due unstoppable encroachment and logging. Normally, villagers collect wild vegetables into Kapha (indigenous backpack basket) from the forest and near the village while they come back home in the evening. Not like before, the amount of mushroom and other wild vegetables has decreased due to change of its environmental conditions. They can easily find it during rainy season. Meanwhile, these NTFP keeps decreasing caused by forest encroachment at the foothills.

To some extent, the current farmland enables Kachok minorities to generate monetary income to afford living necessities. But, the growing trend in materialism makes villagers need more physical capital. The community has started to depend more on short livelihood activities. And, this lead to overexploit the remaining resources especially inside community forest and environmental degradation prone area.

Social capital:

There are 176 families in Kanat. Besides growing cash crop, all villagers own and use two forests. However, there is a group of villagers managing the forests. The group consists of the chief of village, tribal leader, and four villagers. Until now, there is no valuable wood from this forest for villagers to cut. But, they need to preserve the existing forest to be suitable shelter and ecological system for other NTFPs to grow. So, the villagers can collect them for daily consumption.

Photo 14: Kachok man making basket

Source: Own research, 2017

When villagers see illegal logging done by other villagers or outsiders, they will inform this activity to the forest management group. And, the group will go and arrest these people. Each member of group uses their own means to help to protect the forest. There is no common property that they can use together to operate their activities. After the arrest, these loggers are warned not to commit it again. The chainsaws and woods are kept in the village. And, these items are for sale later. The revenue from selling confiscated items is kept for the operation of forest management. But, their resource protection is ineffective as the evergreen parts of the forest has faded out.

The logging continues in Ton Blon and Yak Min even smaller trees are being cut. The forest has already run out of big woods. Right now, the villagers buy woods from other community forests such Yak Poy of Kreung minorities if they need to build house. Forestland encroachment and logging were done by the villagers themselves. *"They often have arguments over the border of new encroachment area", chief of the village said. During field observation, I (researcher) have also heard a villager talking with Mr. Sol Dom, the assistant to chief of village on the phone over boundary dispute of farmland that he had with his neighbor.* Each family try to get maximum benefit from common pool resource and other natural resources.

Moreover, villagers have lost trust among each other especially the abuse of private property. And, the norms of sustainable resource management are also violated. This has broken the network of institutionalized relationships of NTFP users who should provide each other with the support of the collectivity-owned capital (Bourdieu, 2002). The long-term goal of natural resource management cannot be achieved. The forests and other prohibited areas could not be protected and maintained since forestland conversion, as everyone expanded their own potential to benefit from the common pool resources.

Natural capital:

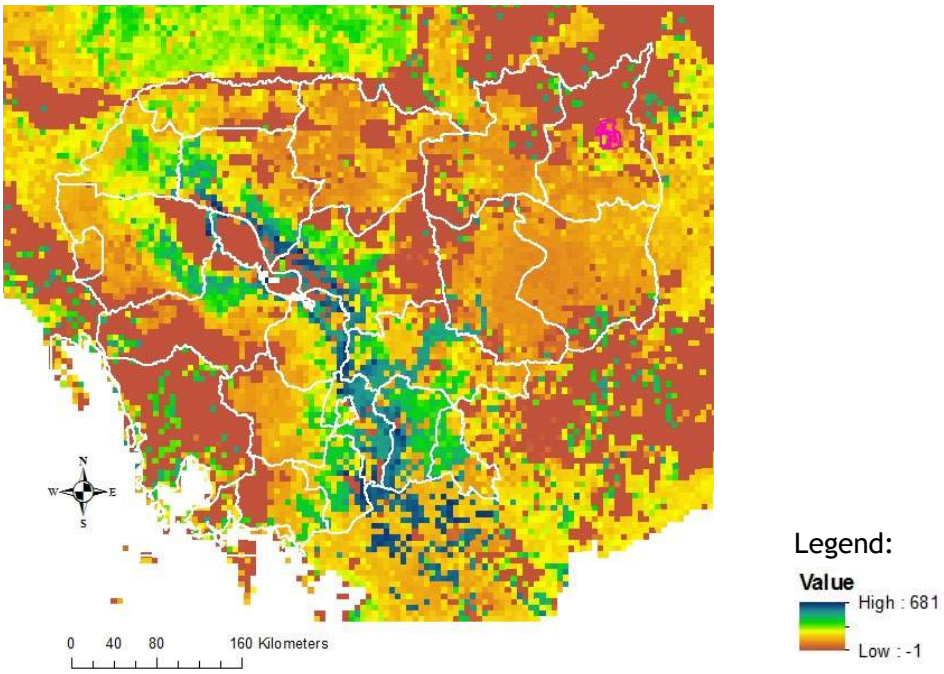
The big trees in community forest of Yak Poy are not healthy with low vegetable index[13]. However, the former green and logging areas have been replaced by rubber trees of economic land concessions[14]. In 2014, the rubber trees in this area are 3 to 4 years old. Comparing to the leaves of the trees in community forest, the rubber trees of economic land concessions, and cashew nut trees of villagers are in between the average and the lowest VIP[15]. The companies have just cleared the forestland in their concession area around Kanat. And, the resources have shrunk to bare earth with the lowest vegetation index. For cassava, they keep annually practicing slash and burn on their old cassava farms, especially the end of dry season.

[13] The evergreen broadleaf forest of Yak Poy appears to be low vegetable index with more visible red. The VIP Vegetation Index (VI) product was developed to provide consistent measurements of the Normalized Difference Vegetation Index (NDVI) and modified Enhanced Vegetation Index (EVI2) spanning more than 30 years of data from multiple sensors (Didan, 2016). Vegetation indices such as NDVI and EVI2 are useful for assessing the biophysical properties of the land surface and are used to characterize vegetation phenology. Phenology tracks the seasonal life cycle of vegetation and provides information on the biotic response to environmental changes.

[14] The area is in dark orange and yellow.

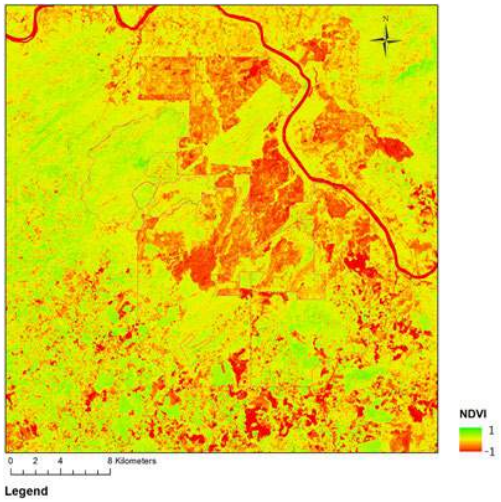
[15] The leaves absorb less near infrared and emit more visible red

Figure 30: Cambodia's Vegetation Index and Phenology 2014



Source: Vegetation Index and Phenology(VIP) Phenology NDVI (Resolution: 5600 meters), LP DAAC, USGS, 2014.

Figure 31: Normalized Difference Vegetation Index in Andoung Meas district



Source: Source: Derived from Band 5 and Band 4 of Landsat 8 (Resolution: 30 meters)[16], USGS, 2018.

[16] NDVI is also calculated from the visible and near-infrared light reflected by vegetation. Healthy vegetation absorbs most of the visible light that hits it, and reflects a large portion of the near-infrared light. Unhealthy or sparse vegetation reflects more visible light and less near-infrared light. The result of calculated NDVI ranges from minus one to plus one. However, no green leaves give a value close to zero. A zero means no vegetation and close to +1 (0.8 - 0.9) indicates the highest possible density of

Photo 15: Recent burned farmland

Source: Own research, 2017 (13°53'38.12"N, 107°12'58.85"E)

The villagers burn down the cashew nut trees when they become old and less productive. This makes many small dots of visible red in the light green area of the vicinity of the village. All villagers do not use fertilizer for growing their plants while it is said that the land is still fertile. In 2016, drought at the end of long dry season that has destroyed Villager's rice.

Besides planting highland rice near the foothills area or with other crops, they also plant cultivate lowland rice on flooded rice paddies during rainy. These paddies are located along the cart track to the village. Villagers did not have any means to get water to save their rice from being dried out. And, they bought rice from the local market to fill this shortage of food supply. The two wells in the village ran out of water. And, the authority used trucks to transport water to the villages for daily consumption.

Photo 16: Authorities distributed water to villagers

Source: Dem, 2016

green leaves (Rouse et al., 1974). The above result is produced from near-infrared Band 5 and red Ban 4 of Landsat 8 by using formula "NDVI=(NIR-Red)/(NIR+Red)".

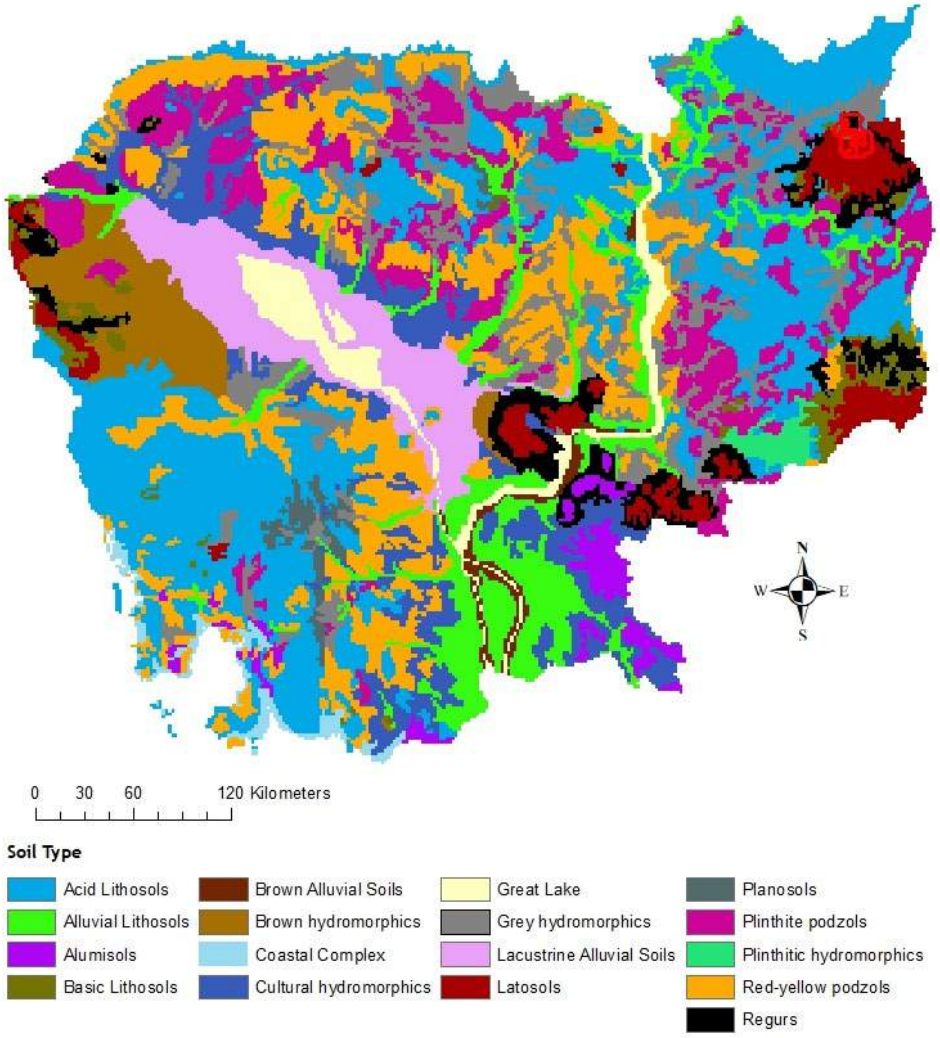
Swidden plots are planted at the beginning of the rainy season and the same plot may be used for a period ranging from one to six years, depending on the quality of the soil. The plots are then left fallow in order to regain their fertility before being cultivated again. Villagers subsequently shift their farming sites to other fields that have regained their fertility or have never been cut at all. The system of setting aside forest fallows rejuvenates soil fertility without use of chemical fertilizers. However, the soil type in the northern part of the villager is acid lithosols which has low fertility potential (Crocker, 1962). This makes the land-loss villagers encroach the fertile red soil which has not been taken along the riparian zone and sacred forest. There are more streams in Kanat than in other two villages. And, some of them are rainfed. Land clearance on riparian bank for cropland expansion has potential impacts on the environment as erosion and surface runoff can happen during rainy.

Photo 17: Hand water pump

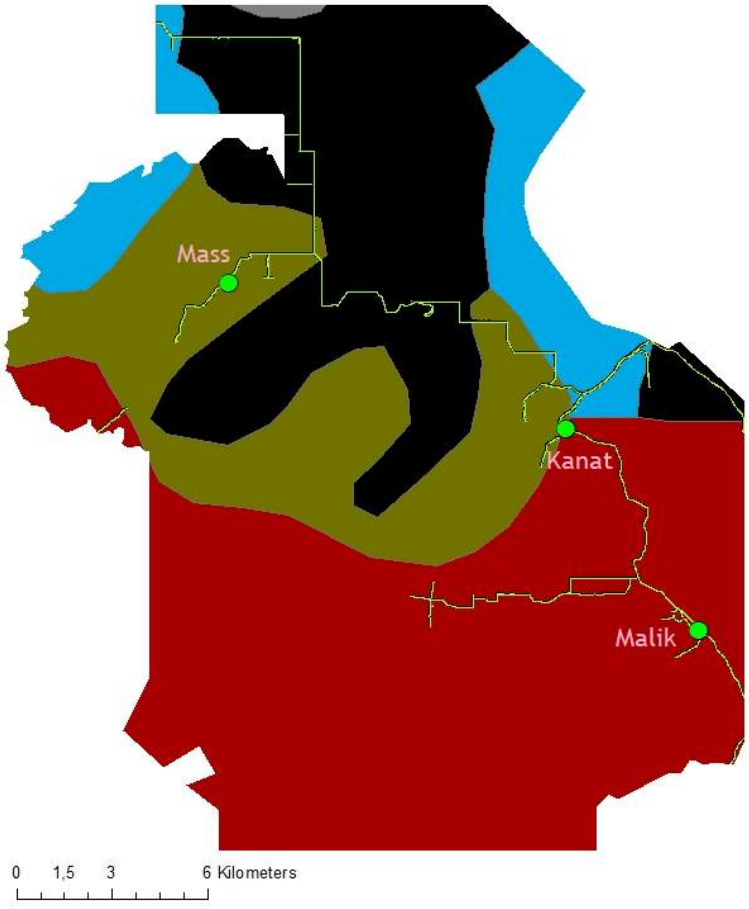
Source: Own research, 2017

Figure 32: Soil types of Cambodia and research area

Cambodia's View



Andoung Meas district's View



Source: Crocker, 1962

6.1.2 Self-organization:

Institution:

Even there are forests for villagers to use, they do not have formal or official community forest recognized by Forestry Administration. The villagers have managed this forest by themselves. And, their management is ineffective as logging and forest land encroachment happened in Ton Blon. Until now, there is no support from any NGO or authority to protect and manage the forest. Illegal logging happened throughout the forest. And, it has already run out woods for constructing houses.

Photo 18: Illegal logging in Ton Blon

Source: Own research, 2017

Now, the expansion of cash crop farmlands at foothills of Ton Blon is on the rise. Kanat is second largest village, after Malik in research area, with 176 families. The villagers were adversely affected by huge loss of subsistent resources to concession companies. In order to continue to afford basic needs, most of them have generated monetary income from short livelihood activities including cash crop farming and logging. Being surrounded by economic land concessions, only expansion of cropland toward foothills of forest and on riparian bank is less conflicting. Even so, villagers still have some argument among each other over the border of their cropland, especially new encroachment areas. Villagers lost trust among each other. Any form of property ownership can become competitive.

The collective institutions producing unsustainable practices have become persistent. Villagers have become self-serving minded and possessive of their own properties. As their own forest has ran out of woods, some villagers take the risk of logging them in Yak Poy community forest. Quick generation of monetary income drives them to do self-destruction by depleting common pool resources. The norm of sustainable resource management is deteriorated by short livelihood activities.

Cooperation and networks:

Villagers can cooperate with their forest committee by not encroaching forestland or by reporting illegal activities to the committee. Then, the committee will take action or warn the people about it. However, there are still a number of families clearing and burning down the forest for cash crops plantation at

the foothills of common forest. To generate monetary income, families of this land-lost community get involved more in short livelihood activities in prohibited area.
It shows a weak cooperation between villagers and their forest committee in resource protection. The cooperation is weakened by self-serving attitude. Everyone tries to get maximum benefits from short livelihood activities, even committee members. As evidence, villagers have finally cut unmatured woods in Ton Blon after all valuable woods vanished. And, there is no serious punishment from the committee on this group for having done unauthorized logging. They have broken their leading role in resource protection.

Network structure:
In term of forest management, the network size is just among the villagers themselves. Officially, Kanat have not made any community forest agreement with Forestry Administration. It means that there is no technical support from Forestry administration in sustainable resource management. But, villagers did attempt to make their forest become common pool resource recognized the authority. This is their second failure in seeking assistance from the government since they could not find any help to stop forestland conversion. The situation turned violent as security guard from Heng Brother fired shots to warn them during this land conflict.

There was an NGO called Highlanders Association helped villagers to sue the company and to protect their land. In 2011, the villagers asked congressman from opposition party to halt economic land concession from clearing their land (Phorn, 2011). At least, they can get back their cropland due to Directive 001. However, it also ended their claims over land loss.

According to forest law, Ton Blon forest should be protected as it is spiritual forest. And, Forestry Administration need assist villagers to protect them for cultural and traditional reason. However, non-realistic network structure in resource protection has left their forest which is surrounded by concession companies unsafe. And, it has become the most degraded forest in the area afterward. This common resource was quickly squeezed out in uncontrollable way. And, villagers started to log woods in the forest of other minorities.

Reliance on own resources:
The village has lost most their fertile land such as basic lithosols in the west and latosols in the south to the concession Veasna and Heng Brother while they own more acid lithosols in the north (fig.32). The expansion of cropland to the fertile land is limited as the village surrounded by economic land concession. Villagers have encroached the prohibited area such as the foothill of community forest and riparian bank.

The current livelihood strategies cannot assure the community of long-term benefits as it causes environmental problem in the future. The vanished forest of Ton Blon is one example for the loggers in

livelihood failure. Those who got involved in logging in their own forest started to log woods illegally in the forest of other minorities. Yak Poy community forest which is 15 Km away from Kanat has become the target for Kachok youths to log woods. The income from these livelihood activities enables them to afford basic needs such as food, medicine, and clothes for short time only. And, this is more than what the common pool resource can provide. Consequently, these activities have caused environmental problem. And, the increase of new croplands on prohibited area is a sign of unsustainable livelihoods transition.

6.1.3 Capacity for learning:

Knowledge of threats and opportunities:

By following one after another, Kachok minorities have expanded their cropland into the foothills of the forest and on riparian bank. The income from short livelihood activities has enabled them to afford basic needs and other living necessities. At least, villagers can buy meat and groceries two or three times a month. Being surrounded by concession companies, villagers cannot increase their productivity by enlarging their farmland toward companies' plantation. Instead, the encroachment within the prohibited area usually happens when they want to grow more crops. The areas such spiritual forest and riparian bank have been cut out before the forestland was granted to concession companies.

Ton Blon was severely affected for the second time as it has run out of woods. And, villagers know that the previous logging activities have posed threat to the environment of the forest. The decrease of NTFP in Ton Blon has proved it to them. These activities cannot provide them with long-term benefits. The sense of frustration and powerlessness among villagers was overwhelming due to the sudden and enormous resource loss to ELCs. Everyone sees short livelihood activities as the opportunities to recover rather than a threat to the common pool resource management.

Shared vision:

One collective action toward sustainable resource management is poorly found among Kachok minorities, even after their common pool resource degraded. More than that, some of them started to loot the resource of another ethnicity. The whole community get involved heavily in short livelihood activities that makes long-term benefits of sustainable livelihood practices which are gained from common pool resource less interesting.

The effort of the committee prevent logging and land encroachment is ineffective. Even villagers have full access to information about forest crime and other issues related to resource management which shared by tribal leader and chief of the village, they continue practicing activities leading to self-destruction. Quick generation of monetary has disguised common pool resource as extra resource to exploit making the forest lose its potential in providing long-term benefit.

Knowledge identification capacity:

Without official forest community, Kachok minorities have to manage their common pool resource by themselves. And, the chief of the village has responsibility to authorize villagers to cut the woods upon their request. However, they haven't success in protecting common resources. The short livelihood activities have ruined their management. Villagers individually try to get maximum benefits from the forest breaking the rule of nature conservation. And, some of them are now becoming loggers in other forests. They all understand that sustainable resource use cannot be achieved without collective action from the community. But, villagers are baffled by quick generation of monetary income. They follow one after another in choosing short livelihood activities by overlooking the long-term benefits of common pool resources.

Their basic needs have differed since the forestland conversion. They cannot hunt animal as before. There are less fishes in the stream. Wild vegetables keep decreasing. They have turned to use their monetary income to afford them-buying meat and other necessities from traveling salesmen or market. They also realize that they cannot do anything else than keep increasing cash crop productivity if the remaining degraded forest cannot provide enough NTFP. The expansion is targeted at foothills of the forest, slope area, and riparian bank that can cause environmental degradation. The forest restoration in Kanat needs to be done from scratch by seeking approval and cooperation with relevant authorities.

Knowledge transfer

Kachoks have get involved in quick livelihood activities one after another as a means to acquire basic needs after large-scale forestland conversion around their village. It has made them lose the big part of their source of subsistent resource. As evidence, they are now buying meat, fish, and some vegetables from traveling salesmen. And, the affordability for modern living necessities made short livelihood activities appealing among youths. The good impression of properties among villagers is clearly appearing. They have left their traditional livelihoods behind while focusing more on quick generation of monetary income. And, this makes indigenous knowledge transfer hardly possible. Noticeably, livelihoods activities such as animal hunting and wild fruit collection are less practiced.

Functioning feedback mechanisms:

Ton Blon has not been approved and recognized by Forestry Administration as community forest. The collective action toward to common pool resource management was initiated by villagers themselves. But, villagers have not rightly been following their vision of sustainable resource use. The large-scale forestland conversion of concession companies did not only affect their source of livelihoods, but also ruined their patience to use the long-term benefits of the remaining forest. Moreover, leopard skin policy which aims to solve land conflict between villagers and concession companies has totally ended their shifting cultivation. And, it fueled unsustainable livelihood activities among them afterward as their practice is still done in the picture of shifting cultivation on prohibited areas. The difference from

the past is that they do not only abandon the old place, but also find a new place for cultivation. They keep their entitled land as old farmland. This is similar to old practice which allowed them to cultivate their crops wherever they want as long as it is available in the vicinity of their village, even on the abandoned farmland of other villagers.

Photo 19: Cassava planted on stream's bank

Source: Own research, 2017

The crackdown on forestland encroachment in Kanat is ineffective while actors themselves get involved more in short livelihood activities than in common resource protection. It reminds us the ineffectiveness of actors' operation against illegal logging in Ton Blon that made the forest totally ran out of timbers. The current mechanism does not allow actors to remove the stimulus to environmental degradation as collective action. Self-serving action and irregularities have made their operations less sense of nature conservation, but more sense of doing business. It does not happen only in the forest, but also outside of it. And, it breaks feedback mechanism at the response stage at all levels.

6.2 Tampoun minorities:

Photo 20: Tampoun students go to school

Source: Own research, 2017

6.2.1 Buffer Capacity:

Human capital:

At the end of the village and at the right-hand side of the cart track to the main red soil dirt road, there is a primary school where Tampoun children travel and attend their class. The numbers of dropouts and repetition is less than those in Kanat village. Those who pass primary school exam have to travel 10,7 km to Andoung Meas junior high school. Normally, they need motorbike to go to school. There are 16 students in grade 6 this year (2017). Several of them can pursue their studies with the supports such as transport means from the families. For those who missed a chance to access education at young age, they still can participate literacy class

provided by Plan International. Here, more than half of villagers can read and write Khmer. And, those who can write Khmer are youths who have completed primary education. And, a few of them continue to study at high school. And some work in the town (especially for indigenous NGOs). These youths use modern knowledge to change to their livelihoods to the modern ones. And, they don't get involved in short livelihood activities as much as most of indigenous youths in the village do.

For the unskilled villagers, they hardly abandon their village and work in the outside world. Youths and children who do not go to school are seen working in the farm with their families. The cash crop business is busier than other two villages as Malik is easily accessed both in dray and rainy. It has incited more villagers especially youths to increase the productivity for transaction. They cleared forestland at the foothill and riparian bank to grow the crops. This did not only make them become the main labor force for their family and the community, but also the drivers of local land use change.

They vastly outnumber those who continue to study at high school and those who work in town. This does make the livelihood strategies seem less unsustainable as most of them still keep practicing short-livelihoods activities to sustain their living.

Physical capital:
Tampoun minorities in Malik grow cash crops, raise livestock, and do vegetable gardening. Villagers have followed one after another in growing cash crop making their localities filled with croplands. They have got involved in short livelihood activities longer than the two villages in the area as their village is closer to the main road. Several Khmer cash crop buyers have come and built their house near and inside the village. This make the Tampouns more convenient to sell their crops at a short distance.

Moreover, villagers can buy food-vegetables fish pork and beef from traveling salesmen and from sellers in the village. Being crowded with more than 200 families who can afford to buy things they need; Malik is a target for the businessmen to sell their products. The transactions are particularly seen after harvest season. The prices of grocery products sold in the village are not much expensive than Andoung Meas market. To minimize their expenses, they collect wild vegetables from the Malik community forest to prepare their meal. The amount of mushroom and other wild vegetable has decreased due to change of its environmental conditions. The short livelihood activities are so appealing among them, especially youths. Their community forest has been logged for the tall trees, has been encroached for cash crop plantation (13°50'37.39"N, 107°14'39.33"E). Presently, there is almost no more woods for them to cut. Several remaining big trees are located on the dangerous high steep slope that does not enable loggers to get them easily.

Besides growing highland rice at the foothills, Tampouns also cultivate rice on the flat area of the village (13°52'17.56"N, 107°15'1.92"E) which located on the right side on the way to Kanat. Tampoun families

well manage subsistent livelihood by cultivating enough rice. There are family-size rice milling machines that villagers can use and pay for the service. The owners bought rice milling machines for their families and other villagers to use. Villagers can keep and consume their cultivated both upland rice and lowland rice for one year-round.

The expense for the modern necessities are pushing them get involved more in quick livelihood activities. Tampoun minorities had a chance to enjoy the high return from their cash crops in early 2010. And, they save this money until they can build new houses. All the newly built houses are taller, larger, and more modern than houses in other villages. It costs between five to ten thousand U.S dollar. And, some families build house with non-forest materials such cement, break, and sand. Their indigenous lifestyle is gradually changed from less to more materialistic. Farm walking tractors are seen to be used to transport harvests in the village. Most of them use kitchen utensils bought from the nearby market. And, some families own modern household appliances such TV, Solar energy, and fan. A few families of Tampoun minorities were seen have built pit toilets made from concrete or wood behind their houses. The ability to afford living necessities is higher than the one of Kachoks and Kreungs.

The preference for modernity blinded them to the benefits of common pool resources. Some of them can afford more than basic needs, better amenities, and modern agricultural equipment. It is clear that the community is in the win-lose situation while no more physical capital available for housing and farmland expansion. The current state of its local land use change was formerly and largely caused by environmental degradation since they have been pioneered in short livelihood activities in the area.

Social capital:

In Malik, the forest is officially recognized by the authority and Forestry administration as forest community. Previously, there was NTFP project supported by DPA. The committee of Malik community forest consist of the tribal leader, chief of village, and other five villagers. Both chief of the village and tribal leader have right to authorize villagers to cut the wood from the forest in case they need it to build house. However, illegal logging and the demand for wood among villagers made the forest run out of evergreen trees which are suitable for making house. The forest protection does not mean more than to prevent forest land encroachment from the villagers. They need to preserve the existing forest to be suitable shelter and ecological system for other NTFPs to grow. The remaining forest still provides them with wild vegetables as source of livelihoods. Before coming back home from their farmland, villagers go into the forest to collect NTFP. This could partly reduce their expenses on grocery.

Villagers participated in preventing forest land encroachment by reporting to it to the committee of forest community. And, the committee members will go and halt the activities. The villagers who committed the encroachment are warned by the committee. The chief of the village and tribal leader share this information with other villagers during the meeting. And, committee instruct them not to

encroach more forestland, and explain the importance of the remaining forest. Even so, Malik community forest has been cut and cleared for cash crop plantation very year. Tampoun families individually make their efforts to generate monetary income by getting involved in quick livelihood activities. And, this make their village filled with cropland from its center to the border with concession companies. The evergreen parts of the forest have faded out. Logging has ended since there were no more wood for making house to cut. Villagers buy woods from other community forests if they need to build house.

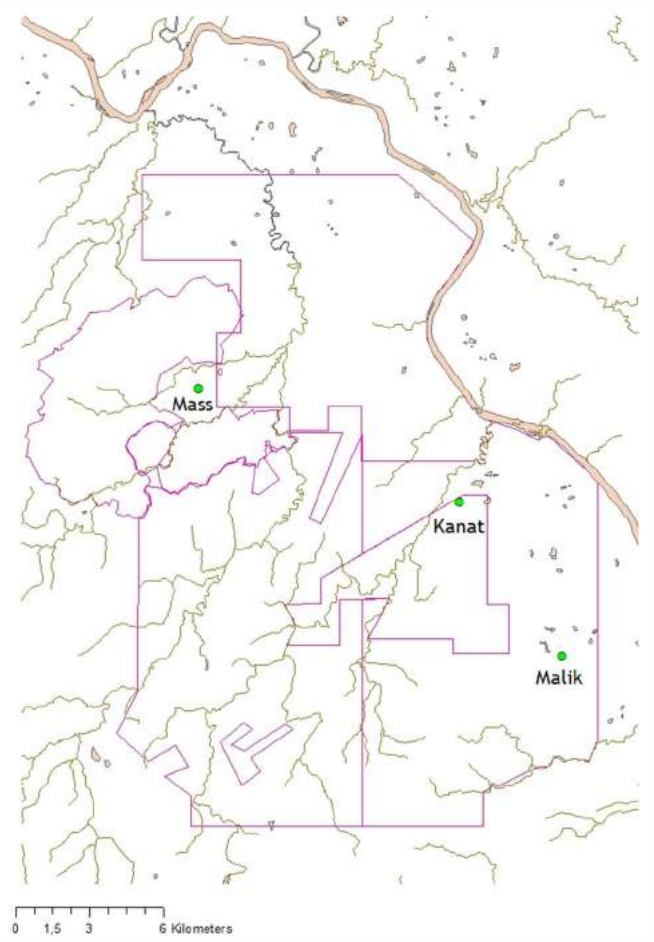
In brief, their institutionalized responsibilities to crack down the forest crime are not rightly implemented. And, it is deteriorated by self-serving activities. The previous forestland conversion and the early illegal logging have proved that their broken social network. The od form of social capital on natural resource management has gradually faded out due to the low participation from actors within the networks. And, the social cohesion needed to facilitate cooperation to protect the natural resources is hardly found in practice as villagers became possessive of their own properties. This had destroyed trust and norms among former NTFP users themselves. Gradually, villagers individually maximized their wealth on the cost of environmental degradation.

Natural capital:

Logging has been done so fast in the area even Malik was recognized by the Forestry administration as community forest. The forest was named after the Malik village. It covers 924 hectares of forest land. And, it has already run out of wood for building house.

Land encroachment at the foothill of community forest normally happens as villagers expand their croplands. They have also cleared and enlarged their farms close to that area which were previously forest and woody savannas on the map. Size of cassava and cashew nut farmlands along the foothills keep increasing. Villagers cleared the forest on less steep slope area of the mountain to make way for cash crop plantation. Latosols which have high fertility potential are found throughout the village that villagers can grow cassava on the same plot for five or six years without using fertilizer.

Figure 33: Streams and ponds



Source: Cambodian stream network, 2011

This village located on low elevation, flat area with streams. Most of them are rainfed and dried out during dry season. their croplands are located in low vegetation index. Long dry season can hit lowland rice production. However, there are many mineral lick ponds which are full of water for the whole year. During rainy, this area is flooded and suitable for lowland rice farming.

According to VIPPHEN_NDVI of USGS, the vegetation index in Malik is below the average with more visible red. Their 10-year-old cashew nut trees along the cart track from village center to the main dirt road emitting more Near Infrared red make the area filled with average and lowest vegetation index. The fertile land of the village enables the villagers to grow the crop without using chemical fertilizer. The old plots of cassava are burn and planted at the beginning of the rainy season. And the same plot may be used for a period ranging from three to five years, depending on the quality of the soil. It is said this practice can rejuvenates soil fertility without use of chemical fertilizers. If they plant it on basalt red soil, the same plot is productive from 6 to 7 years.

6.2.2 Self-organization:

Institution:

The community forest was first supported by DPA (Development and Partnership in Action) through Integrated Community Development program 2006-2008 emphasizing on natural resource management. The committee of Malik community forest consists of the tribal leader, chief of village, and other five villagers. Some materials such as raincoat, boots, and flashlight were provided to committee to operate their work.

However, the forest management was ineffective while logging and forestland encroachment happened throughout the forest. The evergreen parts of forest have become light green. The mix forest along the foothills has been burned down for cash crop plantation. The existing regulations which preventing the

certain types and sizes of trees from being cut were not fully followed by villagers. No more woods for making house left in the Malik forest. Their collective institution has failed to protect the forest. This is because there are irregularities in their operation against illegal logging. And, their collective institution cannot maintain the role in resource protection. Practically, this institution could not fullfill its overall functions since its members did not exercise their individual responsibility to protect and use the forest in sustainable way.

After their common pool resource has dried up, villagers got involved more in short livelihood activities. Malik produces more cash crops than other two villages. This attracts more buyers to come to the village. And, a few Khmer buyers have already built their own store in the village and close to the plantation. This convenience of selling their cash crop make the transaction faster than other villages. This makes short livelihood activities so appealing among them. And, it also makes them less care about long-term benefits of common pool resources. Villagers go against the norm of sustainable resource use by practicing short livelihood activities in prohibited area.

Cooperation and networks:

Tampoun have used all the land they have in the village. They try to maximize their production, not by using fertilizer, but by enlarging their farmland. Currently, there is no more space to expand their farmland, except the foothills of community forest and rainfed riparian bank. The forest whose woods have vanished due to logging are now the target for encroachers. One after another, the foothills are filled with cassava and cashew nut farms. And, the less steep slope areas inside the area are also cut and cleared for cash crop plantation.

There were attempts of forest committee to prevent forest encroachment. However, their operations turned out unsuccessful. The continuing unsustainable practices has forewarned of the weak cooperation among actors within the network. And, villagers did not work together with forest committee to protect common pool resources from being encroached. The concerned actors such department of land management who prepared the map of land use and forestry administration cantonment who own state forest are not well informed from forest committee.

Network structure:

Being located near the main road, Malik community forest is easily accessible by loggers. The early logging happened since the late 1990s. Tampoun minorities have been given right to manage their own forest up to 15 years after they have made community forest agreement with Forestry Administration. And, community forest is still considered as state public property.

Due to the community forest agreement, they have become actors within network structure of forest protection. They can seek assistance from Forestry Administration to crack down any forest crime within

their localities. During the last year of the agreement, they need to request Forestry Administration Cantonment to renew it. Forestry administration can reject the request for renewal if they find any non-compliance with agreement and management plan during their previous community forest management process. Communities cannot harvest forest products and NTFPs greater than the terms and conditions of the Community Forest Management Plan.

Even the network structure exists, their cooperation between actors is weak, especially preventing logging and forest land encroachment. Malik has already run out of woods. And, its foothills of the forest degrade due to the land clearance for the expansion of cropland. More than a broken horizontal cooperation, the central or provincial departments of Forestry Administration rarely take action to improve the policy or current practice of their subordinate officers.

Reliance on own resources:

Tampoun minorities own more properties than other two minorities in the concession area. It shows that they can afford more living necessities. Actually, they have more chance to sell their harvest as their village is located near the main road. The frequent transaction has attracted some buyers to permanently install their stores in the village. This has motivated many villagers to get involved in short livelihood activities. And, it also incites them to plant more crop on new places.

From environmental perspective, the village has worse environmental degradation than other two villages. Short livelihood activities have ruined their local environment. Logging has disappeared for a bad reason. Malik has already run out of woods for them to cut. Villagers have already cultivated all their private land. Until now, there is no distinct possibility that the existing degraded common pool resource might not be further encroached.

6.2.3 Capacity for learning:

Knowledge of threats and opportunities:

Tampoun in Malik know about pricing of these crops from the local buyers who permanently stay there. They give similar prices to the price of the cash crops at the market. There are also mobile buyers traveling to the village and farmlands by trucks. Here, there is competition among buyers as they have permanently stayed in the village waiting for the harvest time. This has created a good opportunity for villagers to generate monetary income. However, this activity has caused much environmental degradation.

To maximize their production, villagers expand their cropland into environmental degradation-prone area-foothills of community forest, slope area, and riparian bank. After all woods have been vanished by logging for monetary income, cropland expansion on prohibited area is second threat to the local environment. The decrease of NTFP in Malik community forest has proved it to them. But, they saw short the livelihood activities as the opportunity to recover. The satisfaction with previous quick monetary income generation brings alive the unsustainable practices among loggers and encroachers. And, the repetition of their activities has posed a serious threat to the environment and the source of subsistent livelihoods. Their localities are now fulfilled with croplands and degraded forest.

Photo 21: Truck loading with cashew nut

Source: Own research, 2017

Shared vision:

Sustainable resource management is supposed to be a shared vision among Tampoun minorities. They have involved in this activity longer than other ethnicities in the area as DPA firstly introduced conservation project into their village. They had more chance to be guided and trained by NGO to manage their common pool resource.

However, Malik forest degraded worse and faster than other forests in the area. Villagers try to take benefits from the forest in unsustainable way, logging and encroachment, making conservation effort ineffective. They get involved heavily in short livelihood activities making long-term benefits which are gained from common pool resource less attractive. Just like any other day, the chief of the village still shares information about forest crime and other issues related to resource management to his own villagers. Logging is almost not on agenda as there is no more woods in Malik for loggers. But, forestland encroachment is frequently becoming the topic in the meeting. However, they failed to create a shared vision of sustainable resource management among its members. Villagers were individually driven self-serving by quick generation of monetary income. And, it destroyed commonality and coherence to preserve the long-term benefits of their common pool resource.

Knowledge identification capacity:

Even it is too late to prevent logging in the Malik forest, Tampouns still want to see their forest filled with big woods again. But, it would take much time for the forest to grow big again. And, it requires much effort to protect them. The decrease of collected NTFP has proved the impacts of their previous unsustainable practice. And, the sense of coherence toward resource protection is strongly needed to be restored.

Tampoun minorities have get involved in short livelihood activities earlier than other two minorities. They logged all the big trees in their evergreen forest leaving no woods behind for the next generation. Every time they build house, they need to buy woods from other minorities. Now, young immature trees at the foothills of Malik forest have also been cleared for cropland expansion making the common pool resource smaller in size. The preference for cash crops has made the community gradually lose its one source of subsistent livelihoods. And, it made their attempts to protect the forest cannot be developed into action.

Knowledge transfer

The easy access to the village from the main road has made their common pool resource become target for loggers for decades. But, it also makes their cash crop transaction with outsiders more frequent than those of Kachok and Kreung minorities. Short livelihood activities were every tempting among villagers. In the area, Tampouns are the villagers who got involved the most in short cash crop farming. The affordability for basic need and living necessities makes more of them especially youths to change their livelihood strategies.

They have gradually left their traditional livelihoods behind while focusing more on quick generation of monetary income. Noticeably, livelihoods activities such as animal hunting and wild fruit collection are less practiced. Rather than transferring the knowledge of subsistent livelihood strategies to the next generation, the old generation join with their young members to practice short livelihood activities. This has made indigenous livelihood activities die out easily.

Functioning feedback mechanisms:

In Malik, the mechanism to collectively response to unsustainable practices has been broken since villagers individually overexploited their common pool resource. This existing feedback mechanisms which was institutionalized and created by Forestry Administration with forest committee could not stop illegal activities from happening in the forest. And, it does not allow concerned actors to eliminate the stimulus to environmental degradation.

The infrequent and vague cooperation in mechanism shows their feedback unexamined and uncared. It has never become a driver of sustainable resource management. Their crackdowns on forest crimes were

hindered by many irregularities making villagers lose their trust in their own forest community and authorities in charge. Ransom was commonly offered in exchange for confiscated item and/or the arrested loggers. Until now, the forest has already run out of woods while the foothills of it are being encroached for cropland expansion.

6.3 Kreung minorities:

6.3.1 Buffer Capacity:

Human capital:

Mass primary school is located in the middle of the village. There are six rooms for six grades. Annually, three to four students pass the exam and continue their study at Taveng junior high school located 19 Km from the village. They stay in Taveng, and come home once a week or a month. As the children get involved in agricultural activities helping their families growing crops, almost a quarter of them drop out from school or repeat the grade. Children at ages of 9 and 10 years old are also seen to help their families to grow crops and collect cassava and cashew nut. In this small and isolated village with 75 families, Kreung who can read Khmer represents only half of the villagers as they had participated in literacy class provided by Plan International.

Photo 22: Mass Primary School

Source: Own research, 2017

Living in isolated place and possessing only traditional knowledge, Kreung youth mostly stay and work in the village with their families. *"I want to stay and work in my village, there are NTFP to collect and farmland to grow the crops. I do not know how to work in town. It is so far. And, I need to spend more to live there", villager said during group discussion.* The outside world seems unexplored to them even they occasionally go to buy some living necessities in town. They are self-employed in their own village by growing cash crop and collecting NTFP. Many of them expressed a strong preference to live and work

Photo 23: Kreung woman digging wild potato

Source: Own research, 2017

in their own homes. The level of education is quite low among Kreung children. Most of the time, they look for livelihood opportunities to generate extra income in the vicinity of the village. If there are woods to log or forestland to clear for farming, they do it right away without considering about the rules of forest management and the impacts of deforestation. Being impressed by their family, youths openly become the driver of environmental degradation and land use change in their own localities. The situation here is quite similar to what happens in Kanat where most youths have not finish primary school. Rather than studying more or looking for a new job in town, Kreung youths manage to make living by practicing short livelihood activities that threatens the last existing common pool resources in the village.

Physical capital:

Growing some vegetables on small plot of land is common farming activities among Kreung minorities even they can collect bamboo and other NTFP from the forest to prepare their meal. But, the amount of mushroom and other wild vegetable has decreased due to change of its environmental conditions. The resource vanished due to deforestation and encroachment. Almost all of Kreungs own vegetable garden ranging from 100 to 300 square meters with cucumber, pumpkin, corn, and melon. This could seasonally help the villagers to reduce their spending on food. Some families are seen raising livestock. And, their animals live in a free-range in village. "*our buffalos were poisoned and died after they have eaten grass which was sprayed with herbicide in the rubber plantation of economic land concessions", Mr. Toung*

Photo 24: Peacock mushroom in Yak Poy

Source: Own research, 2017

Penh, Chief of the village said. And, the companies continue this practice every year to kill the grass from their rubber plantation. The rubber plantation is currently close to their farmland leaving no space for farmland expansion, even the villagers sometimes accidently graze their animals inside the concession area.

Different from other villages in the research area, All Kreung do no own any paddy fields, but a small farmland of upland rice. Their upland rice is less effected than lowland rice in Kanat which is easily hit by drought at the end long dry season. And, they sometimes buy foods-vegetables fish pork and beef from traveling salesmen. The price of the groceries is double higher than the market. However, the local markets are far from the village. And, they cook it for one meal only when they buy food from the traveling salesmen. Almost of all families' members in the village are helping each other to grow and harvest different crops.

And, they also own farmland of their cashew nut and cassava. Many families have prepared their new farmland on the slope area, at foothills, and inside the community forest. Their community forest is facing a big threat caused by their livelihood activities. The farmland expansion is in the process especially at the early of rainy. Villagers prepare the land by burning down the trees making way for plantation.

Photo 25: Kreung boy preparing to plant cassava

Source: Own research, 2017

Here, the community is more subsistent than the others as villagers can find and collect wild vegetables and other NTFPs. However, the current livelihood activities will not keep the forest at the same state as it used to be. The trend is similar to those in Malik and Kanat where their major land use change caused by ELCs, then by villagers themselves. To afford living necessities at the cost of environmental degradation has become typical misconduct among NTFP users, especially after the huge loss of natural resources. And, this kind of physical capital keeps deteriorating until it runs out of its own resources for the members of community forest.

Social capital:

Kreung minorities living in Mass have a committee to manage Yak Poy community forest. Like other member villages, the committee is composed of five members - a chief, a deputy chief, and another

three members. They are tribal leader, chief of village, and other three villagers. Yak Poy is officially recognized by the authority and Forestry administration as community forest (RGC, 2013). There is NTFP project supported by NTFP-Cambodia. This NGO has duties to train and teach indigenous people how to manage and use natural resources in sustainable manner. Mass is one among the five villages in this committee that NTFP-Cambodia provide training on community forest management. The committee was trained to manage and operate their activities related to natural resource management according to the plan they prepared. Both chief of the village and tribal leader have right to authorize villagers to cut the wood from the forest in case they need it to build house within their village vicinity. However, illegal logging and the demand for wood among villagers made the forest run out of evergreen trees which are suitable for making house. All the equipment for logging are confiscated and kept in the village. And, the logs are kept for sale. They also sell their woods to other ethnic groups from other villages that makes Yak Poy become the remaining forest to supply wood for housing in the area after Ton Blon and Yak Min have run out of wood.

Photo 26: Wood smuggling through Krong Buk

Source: Own research, 2017

Their efforts to protect the forest from illegal logging is not worth the outcome. *"It is expected that the forest will run out of wood in the next two years, Mr. Toung Penh", chief of the village said.* Even, the amount of timbers will be varnished soon, there is no measure to protect the last resources. The cooperation between Forestry administration and the villagers is vague. More illegal logging activities are successfully done without being reported or cracked down from responsible actors. Villagers have lost trust in their own committee and also among each other. They individually started to encroach forestland at the foothills of Yak Poy while youths log and sell woods to outsiders. Everyone tries to get maximum benefits from common pool resource making their social capital weak. Their social capital in collection action against forestland encroachment and logging is deteriorated by self-serving minded activities. The unstoppable illegal logging has made villagers to overexploit the remaining common resources before they were taken by outsiders.

Photo 27: Banner of Yak Poy community forest in meeting hall of Mass village

Source: Own research, 2017

Villagers have lost the social cohesion and norms of sustainable resource management. Villagers are less conservation-minded toward common pool resource. But, the violation of their neighbor's private property does not often happen like in Malik and Kanat. The dispute over the boundary of farmland between neighbors is rare. This is because they still can expand their farmland inside common pool resource to maximize their monetary income. However, the resource will dry up in the near future due to its broken network and norms of NTFP users. And, it continues to affect social cohesion at another level which makes them more possessive, less conservation-minded, and self-serving. There is very little likelihood that everyone will limit their own potential to capture all the benefits from the common pool resources.

Natural capital:

Mass is located in the area with low vegetation index. Like other villagers, they were hit by drought last year. The long last dry season could kill their upland rice at the end of the season. In this case, the late rainfall cannot help anything with food supply. Villagers used to buy low land rice from the market to temporarily consume. During drought, the two hand pump water wells cannot generate enough water for the villager. Facing this water scarcity during drought time, Plan International has set up five thousand liters water storage tank in the middle of the village. Underground water is pumps up through 62-meters depth well and stored for the villagers to use.

Photo 28: Water storage tank

Source: Own research, 2017

Fortunately, Mass is located on basic lithosols considered as land with high fertility potential (Crocker, 1962). Villagers do not use fertilizer to grow their crops. When the crop does not grow, tall and produce crop yield as before, they will burn down the whole farm. Normally, it will take five to six years for this red soil run out of its fertility. And, the new plantation starts again during the early rainfall. Most of them plant cassava and cashew-nut as their non-subsistent livelihoods. However, some areas with steep slope are not suitable for plantation. Some areas of the slope are being cleared for planting cassava.

Photo 29: Kreungs prepare to plant cassava on slope area

Source: Own research, 2017

Being blocked in eastern part of the village by economic land concessions, villagers have expanded their cropland toward southwest into community forest with higher elevation area (13°56'18.05"N, 107° 6'56.32"E). Old stumps and trunks of

the big trees are seen in their newly grown cassava farmlands. The same practices which are widespread in the area could cause erosion/surface runoff during rainy. Living on the area with elevation between 100 to 200 meters, Kreungs do not have flooded land to grow lowland rice. They cultivate upland rice mixed with other crops.

6.3.2 Self-organization:

Institution:

With the assistance of the NTFP-Cambodia, people in each of the 5 villages select their representative to be a candidate for a central committee for Yak Poy community forestry committee members. In addition to the central committee, a community forestry committee of each village is also formed. The community forest management is supported by NTFP-Cambodia (Non-Timber-Forest Products), a local NGO through Integrated Community Development Plan emphasizing on natural resource management. NTFP-Cambodia has provided training on community forest management to the committee. Mass is one among the other five villages collect resin, rattan, traditional medicine plants, mushrooms, wild fruits, bamboo shoots, wild vegetables, honey, and wild animals in Yak Poy community forest.

Photo 30: Meeting in Mass

Source: Own research, 2017

However, illegal logging and forest land encroachment happen throughout the forest. Most of the evergreen parts of Yak Poy near Mass have deteriorated. The mix forest along the foothills has been burned down for cash crop plantation. Some part of the evergreen broadleaf forest has become croplands or woody savannas. To strive to afford living necessities, villagers have kept growing cash crops one after another by expanding their farmland to the south and the west. Their collective institution is ruined by quick livelihood activities. Mass is the last village which still has more evergreen broadleaf forest with woods for making house than other villages. And, it becomes the target for loggers in the area.

Illegal logging is unstoppable due to the irregularities in their operation. The institutionalized responsibilities of individuals are rarely exercised to protect the common pool resource from being looted and encroached. And, their role in resource protection was broken by the high return of

confiscated woods. They can sell woods at higher price to the loggers. If not, they will confiscate chainsaw and other equipment to the village. And, they can sell these woods later. The norm of sustainable resource use was ruined by their greediness for ransom during the operation.

Cooperation and networks:

To some extent, illegal logging and forest land encroachment are reported to the committee members when villagers encounter with them. And, this will be on the agenda of the meeting. There is still an effort to strengthen sustainable resource management even they recognized that illegal logging is not stoppable in the vicinity of the forest. But, the commitment to crack down the crime does not exist. Vague cooperation between the villagers and Forestry administration almost destroys natural resource management. Accord to the law, the woods are still legal if they are cut, kept, and used in the village. And, woods are transported on the vehicles along the road, forestry administration officers have right to check and confiscate them if they find it illegal (RGC, 2002a; RGC, 2003). However, the illegal loggers cut and transport the woods on their modified motorcycles through Krong Buk company and Andoug Meas district in direction to the border corridor with Vietnam in broad daylight without being arrested.

The current degradation of evergreen broadleaf forest is caused by illegal logging and forest land encroachment. There is no serious collective action taken to tackle down the problem. Even the loggers were regularly found and caught for their crimes, the deforestation in Yak Poy community forest has not been lessened. The woods are heavily cut and smuggled out of the forest. Sometimes, villagers arrest illegal loggers by themselves and ask them to pay for the woods they cut. The chainsaws and other logging materials are confiscated and kept at the village. And, the committee can sell woods to outsiders as long as they use the revenue to support community development. But, it not what usually happens. Villagers need to pay five thousand riels (1.03 euro) for 1 cubic meter. And, outsiders pay 150.000 riels (31 euro) for 1 cubic meter. Some woods are found and kept in the village for sale to outsiders. There is no control from the committee when villagers go to cut the woods.

The loose cooperation, and the low traffic area have made woods of evergreen forest of Mass be easily cut and smuggled out. The actors have enjoyed of the high return of timber. The villagers who lost trust in their own committee and the authorities in charge have participated less in the mission. And their collective action against the crimes are hardly formed. They feel the sense of frustration that the resources will vanish soon due to the negligence of the authorities in charge.

Network structure:

Power in leading and managing a CF Community is gained through the election of community members (RGC, 2003). The community forest management committee has right to allow the villagers and outsiders to cut woods as long as they follow the regulation. But, the communities cannot harvest forest products

and NTFPs greater than the terms and conditions of the Community Forest Management Plan. Community forest is still considered as state public property.

The committee can inform and ask their assistance from Forestry Administration to crack down the crime which is committed in their forest. Even the network structure exists, their cooperation is weak, especially preventing logging and forestland encroachment. Their resources have become the target for loggers for since after the forestland preparation and the degradation of other forests in the area. And, the actors within network of resource protection do not show up on time when the crime happen both inside and outside the forest. The dubious horizontal cooperation has undermined trust of villager in their institutions and the authorities in charge. Moreover, the central and provincial department of related actors seldom take action to improve the current policy or practices of their subordinate. This has made their assistance through vertical hierarchic structure ineffective.

Reliance on own resources:

Mass has plenty of basic lithosols considered as land with high fertility potential. The villagers do not need fertilizer to grow their crops. They can plant cassava on the same plot for six years. Even so, the area is drought-prone. The upland rice and vegetables could not stand with this long last dry season. If so, the villagers buy lowland rice at the local market for temporary consumption.

Being blocked by land concession in the east and north, villagers have expanded their cropland to the southwest inside community forest. The new encroached areas are found on the foothills and slope area. With short livelihood activities, villagers can generate quick monetary income to afford basic needs such as food, medicine, and clothes. Another source of livelihoods is generated from logging. This livelihood activity is normally done by youths. Approximately, they cannot benefit from this activity for within the two years. The increase of new croplands and logging activities in Yak Poy is a sign of unsustainable livelihoods transition. The tendency towards these short livelihood activities are posing a serious threat to their remaining subsistent resources.

6.3.3 Capacity for learning:

Knowledge of threats and opportunities:

As short livelihood activities have enabled Kreungs to quickly generate monetary income. To maximize their productivity, villagers are expanding their cropland into the vicinity of Yak Poy community forest. Villagers find that it is the only way to generate monetary income to afford living necessities as they do not know what else they can do after resource loss. And, they also get involved in logging as the return from selling woods is high.

Villagers acknowledged that their short livelihood activities logging activities are degrading environment condition of the forest. But, the opportunities to generate monetary income are too engaging that blinds

them to the impacts of their own practices. Moreover, the disappearance of valuable and subsistent resources in nearby forests due to illegal logging and encroachment has already proved it to them that these activities cannot provide them with long-term benefits. The impendence land use change is inevitable in their own localities in the future. And, it has already happened in their neighborhood. The resource loss can be immense as the forest has been serving as the source of subsistent livelihoods to thousands of villagers.

Shared vision:

The common pool resource of Kreungs is still better than those of the other minorities as villagers can cut woods and collect NTFPs from it. Unfortunately, villagers do not pay attention much to these benefits much. Their shared vision on sustainable resource management was spoiled by the benefits of short livelihood activities. Logging happens throughout the forest. *The noise of chainsaw can be heard from outside the forest during field observation.* Moreover, the foothills of the forest have been encroached for the expansion of cropland. And, the forest committee cannot effectively communicate their share vision to the villagers. The meeting which takes place one or two times in one trimester between villagers and committee members about forest crime and resource management does not promote any thought of common pool resource protection. Paradoxically, the unsustainable practices and the irregularities have become routine.

Knowledge identification capacity:

The community is lacking a sense of coherence toward resource protection. Each family is just busy practicing short livelihood activities to afford living necessities and basic needs. Moreover, ineffective forest protection has made villagers lose their patience to use the resource according to the rules. Improper forest management of community members and ineffective measures of Forestry Administration officers cannot halt human-caused forest degradation. Rather than spending more time to create a shared vision to rehabilitate the resource, they all rush to squeeze out the common pool resource before it is taken by others.

People keep logging more woods and encroaching more forestland. The villagers accept that the community alone cannot crack down the forest crimes. It requires the cooperation from all actors in resource protection. However, they tend to pay less attention on the environmental problem themselves while they get involved more in short livelihood activities. Because of this, they do not have a chance to interpret their knowledge of sustainable resource use into action. This latest change of livelihood pattern calls into question the ecological condition in their own localities.

Knowledge transfer

Kreung villagers get involved one after another in quick livelihood activities as a means to acquire basic needs after disturbance that degrades and filled their localities with cropland. Even there are still

subsistent resource in Yak Poy as their source of livelihoods, Krueng youths have left their traditional livelihoods behind by focusing more on short livelihood activities. The tendency towards quick generation of monetary income hinders knowledge transfer among villagers. Noticeably, livelihoods activities such as animal hunting and wild fruit collection are less practiced. Villagers seldom transfer the knowledge of subsistent livelihood strategies to the next generation. Their means to afford living necessities differ from what they did in the past. As a result, they will totally have the same livelihood pattern as the other two minorities in the area probably after their forest run out woods and subsistent resources.

Functioning feedback mechanisms:

The irregularities continue to exist in the crackdowns on forest crimes happening both inside and outside the forest are filled with. And, the ongoing degradation of common pool makes villagers lose patience to get a promising result from concerned actors. They become self-serving by rushing to use the remaining forest by any means as much as they can before it is taken by outsiders making Yak Poy lose its prestige of evergreen broadleaf forest.

The existing mechanism in resource management cannot provide any feedback to improve the current practices. The management committee who take action to crack down the crimes in the vicinity of the forest repeats their failures in resource protection. The irregularities have made their operations less sense of nature conservation, but more sense of doing business. Concisely, the feedback mechanism has already broken at the response stage. The cooperation between villagers and authorities is ambiguous as it usually makes their feedback mechanism less effective. Evidently, the unsustainable livelihood activities are being practiced at the foothills and inside the forest due to ineffective measure of related actors.

6.4 Summary of the findings:

Tampoun Minorities:

They deeply involved in short livelihood activities since before the other groups have started to do it. These activities have enabled them to generate monetary income which enable them to afford to buy some modern living necessities. Unfortunately, their community forest has been throughout logged and encroached at the same time. In Malik, villagers could not find any wood for building house many years ago. And, they normally buy it from their neighbors when they need it. They had already destroyed trust and norms among former NTFP users (in Phnom Raing community forest) themselves by individually maximizing their wealth on the cost of environmental degradation. However, their affordability for modern living necessities has also incited the other groups of minorities to follow the practices.

Kachok Minorities:

The monetary income is so influential in shaping livelihood activities and social norm of Kachok minority, especially, after they have seen other groups can afford to buy modern living necessities with it. The group has started to log and encroach their two own community forests just shortly after the degradation of Malik community forest. But, the situation in Kachok is more disastrous as villagers did not only encroach the deteriorated forestland, but also their neighbors' farmland. Villagers have lost trust and become more possessive over the properties. They often have argument over the border of cropland. And, they keep logging outside their territories. Their activities have fueled the deterioration of their former evergreen broadleaf forests of Ton Blon and Yak Min. After the recent loss of valuable forest, the small grown trees have become the target for loggers.

Kreung Minorities:

Being the last and only valuable forest with idle management, Yak Poy is facing the same fate as other community forest did. The forest is almost on the brink of destruction while Kreung community cannot protect their resources from outsiders. And, they also get involved in logging in order to grab the benefit of this last resources. The timbers will run out in the next few years. The villagers have learned fast from other groups by practicing more short-livelihood activities. However, cash crop transaction is less active than the villages of Malik and Kanat because of the poor infrastructure. The rise of self-serving attitudes among villagers is seen through their carelessness of common pool resource protection and the deep involvement in the newly emerging livelihood activities. This phenomenon has already happened in the other two villages. And, it has started to incite Kreung villagers to relentlessly follow the practice which will make their last common pool resources meet the same fate as the others in research area.

6.5 Conclusion - the actual situation in the villages:

Indigenous youths are mostly unskilled. And, they inherit basic agricultural knowledge from their parent. For instance, they know how to plow the soil, when to grow the crop, and how long the land is still arable. They currently use these knowledges to practice short livelihood activities on those land. This human capital has become drivers of environmental degradation in their own localities and neighborhood due to their livelihood activities.

Villagers lost trust in their own committee and the authorities in charge while forest crimes continue to happen. The villagers started to worry that the resources will be looted by outsiders. And, they compete to squeeze them out before it disappears. The social cohesion was broken among NTFP users while everyone tries to benefit the most from common pool resource. They became more possessive of their own properties. The villagers who lost trust in their own committee and authorities rush to squeeze out common pool resource before it is taken by outsiders. It fuels the stimulus to environmental degradation

in their own localities that makes feedback mechanism in sustainable resource management idle. They do not only encroach forestland, but also neighbor' properties. Boundary dispute of farmland often happens among villagers. In doing so, they have already violated the norms of sustainable resource management. Their social capital is deformed by self-serving attitude of individuals.

The institutionalized responsibilities of the forest committee have been exercised with many irregularities during their operations. It includes the immediate on-site releases of loggers with payoff, the permission to log the woods at unauthorized size, the non-transparent sales of confiscated woods. This has ruined their collective action as an institution against unsustainable practices. And, the individual responsibility is not well aligned with to the goal of their institution. The villagers who lost trust in their own committee and the authorities in charge have participated less in the mission.

The forest committee failed to communicate the shared vision of resource management to the villagers. And, they became frustrated that the resources will vanish soon due to the negligence of the authorities in charge. Villagers have become less conservation-minded and more self-serving. It has distracted each member and actor from their norm against forest crimes. Concisely, their shared vision on sustainable resource management was spoiled by the benefits of short livelihood activities as everyone tries to squeeze out the last common pool resource for fear that it will be taken by outsiders or other villagers.

Villagers have acknowledged that their activities are posing a serious threat to the environment, especially to their forest. And, it will severely affect their source of subsistent livelihoods, But, they did not have a chance to interpret their knowledge into action to save common pool resource as everyone is busy to generate monetary income to afford living necessities first.

Indigenous people uses practice-based learning to transfer their traditional knowledge from one generation to one generation. While short livelihood activities are appealing among villagers, especial youths, certain traditional and subsistent livelihood activities such animal hunting, wild fruit collection are dying out. Their means to afford basic needs and living necessities differ from what they did in the past. They have practiced them less than before. And, they have left their traditional livelihoods behind. Quick monetary income generation among youths does not only make traditional knowledge transfer impossible, but this strategy also is impressed by their elderly.

This continuing unsustainable practice also forewarns of the weak cooperation among actors within the network. However, this kind of feedback barely drive concerned actors to take action. And, their collective action against the crimes are hardly formed. And, the vague cooperation between actors has become the stimulus to deforestation. They failed to build the culture of trust and mutual support within the existing structure. The woods are logged and smuggled out of the forest to the border corridor everyday. The horizontal cooperation between actors, Forestry Administration and Forest Committee,

was busted. Crucially, the cooperation through vertical hierarchic structure is rare. The central and provincial departments seldom take action to improve the policy and current practices of their subordinates. And, they have shown a passive attitude in feedback mechanism through their infrequent and vague cooperation.

Presently, villagers heavily depend on physical capital almost making the area cramped for further cropland expansion. The trend towards short livelihood activities is seen as a burden on environmental protection while villager seen them as the opportunities to recover from resource loss. This growing trend also trigger off the degradation of remaining capital while villagers rush to generate quick monetary income by squeezing them out. One after another, the last forest which has valuable woods to cut is now under the threat from loggers and encroachers. Those localities will explicitly face the impendence land use change hereafter. The impacts on livelihoods could be colossal as many villagers still benefit from the forest, especially its source of subsistent livelihoods. And, the growing farmland expansion has already made the common pool resource immensely shrink. Adversely, villagers will end up cultivating on the same plots of land permanently with excessive use of fertilizer due to the cramped physical capital the current drought-prone natural capital.

Chapter 7: Sustainability under difficult circumstances-results of empirical findings in the villages.

The case studies in chapter 6 have analyzed in detail the actual situation in three research villages. There are some differences, but all have to compete with a breakdown of older community activities, social cohesion and creating short-time businesses. The arrival of the ELC´s with the logging of natural forests and establishing large plantations had brought the resilience of the villagers to its limit. The last chapter tries to analyze, how sustainability could be obtained or reestablished under such conditions.

7.1 Chronological facts of livelihood practice:

Interviews, group discussions and the zig zag approach of Creswell in combinations with the image interpretations and map interpreting allowed a comprehensive view on the livelihood practices in Ratanakiri. The following statement from Highlanders Association:

Mr. Try Khan Sanh, Deputy Director of Highlanders Association, exhibits unsuccessful efforts to halt the dynamic pressure from large scale of agricultural investment which makes local economy fragile afterward "*We received lawsuits from seventeen villages affected by economic land concessions within two years. The villages include Kress, Mass, Kanat, Mean Kak, Tanorng, Inn, Talao, Ket, Nay, Kajout, Da, Gnang, Peng, Kajork, and Malik. There are our representative in these villages. Kanat was the worst effected one as it was surrounded by ELCs. Our representative, Sal Knerch, called us to investigate the affected area in Kanat village. Our NGO helped villagers to sue the companies. And, we sought support from all levels of provincial authorities. Unfortunately, our attempt did not work. Moreover, we also wrote to Equitable Cambodia for help. The companies cleared cropland of rice, cassava, and cashew nut. Until now, the villagers have lost their land to the companies permanently*".

Photo 31: Interview at highlanders Association

Source: Research's own, 2017

7.1.1 The impact of land concessions - voices from the villages:

From group discussions made in the three villages, the members express the same thought on the impacts of Economic Land Concession. Mr. Sal Knerch, representative of Highlanders Association and Mr. Tuong Penh, the Chief of Mass village raise concern over the limited access to the resources and the impacts on indigenous livelihoods "*the companies' operation has affected grass field for animals, reserved land, farm land, and water source. And, other participants who were affected by the investment have given the details of their land loss. Most cropland that they have lost to the companies are cassava and cashew nut*".

Photo 32: Group discussion in Kanat before on-site observation

Source: Own research, 2017

Villagers have to deal with limited resources after the resource trends happen. And, a new livelihood strategy always appears. Mrs. Romjong Pheuy, from Kreung ethnicity, hardly generates monetary income while facing the shortage of land to grow cash crop. She insists on having more land "*I lost a farmland of cassava to Krong Buk. Then, I kept growing cashew nut on two hectares of land near my house and the border of rubber plantation. Besides growing crop, I also go to collect wild vegetable, fruit, and bamboo in Ton Blon forest. However, our family need more land to grow the crop. So, we can earn more. I also plant vegetables like pumpkin, cucumber, melon… etc. on a small plot of land near cashew nut farm. It helps us to save some money from buying groceries from mobile seller*".

Photo 33: Mrs Romjong Pheuy picking cashew nut

Source: Own research, 2017

Photo 34: Mr. Sal Knerch showing the effected land

Source: Own research, 2017

Sal Knerch, from Kachok ethnicity, sadly accepted the unfertile land from the company after having failed to claim his land. And, he doubtfully manage to earn a living from this unwanted resources "*I am forced to sell my land in Pa Lae village, Ke Jong Commune at 250 USD (220 Euro) to local farmer. And, I lost my shifting cropland to Krong Buk without compensation. Our villagers do not work for the companies. We prefer to work for our own. Here is our land lost the to the companies. Now, the rubber trees are one and two years old. And, they kept rocky soil for the us. Villagers cannot grow anything on it*".

For Rormam Rith, 32 years old from Kachok ethnicity, encounters similar difficulties after exposing the resource trends. He by no means has to manage his small remaining resources and to use more skills to generate income. "*I have sold my land at 100.000 riel (22 Euro) per hectare to the company. Since I cannot grow the crop in that area, I plant crop on my small farm near the village. And, it does not allow me to continue shifting cultivation. I grow cassava on half hectare of land to support my family. To save some expense, I have made some utilities to use by myself. Today, I almost finished making one basket*". However, when most youths expose to this natural resource trends, they helplessly get involved more in short livelihood activities.

Almost all villagers have to adapt to new livelihood practices to survive. Mrs. Pleng Romas, from Kachok ethnicity has abandoned shifting cultivation. "*The companies leave us no land for shifting cultivation*". Meanwhile, she and her neighbors become possessive over their own properties *"I used to have an argument over the border of cropland with another villager. Before, we do not worry about land. During that time, villagers can clear and get more land for plantation long as they work hard*".

The dynamic pressure from land concession does not only change indigenous livelihood strategies, but also their thinking on properties. Sal Dom, the deputy chief of Kanat village, who always helps to solve land disputes among villagers also complaints ongoing land encroachment in his locality "*Villagers often call me to solve land disputes. They clear land over the other's farmland. There are still land without clear border. Those land are newly cleared by villagers themselves to expand their cropland. Normally,*

they have not registered by Provincial Department of Land Management. But, villagers keep claiming their ownership over it. Some of them have cleared land along the stream's bank and the area where the companies do not plant their rubber".

Photo 35: Chief of Talao commune

Source: Own research, 2017

Tha Butlort, Chief of Talao commune, hopelessly stops the villagers from growing cash crops in environmental degradation-prone area "*Villagers have cleared the forest land near Yak Min forest. Our village does not have more land for the villagers to grow. Their encroachments are done inside or near the forest*. And, the villagers seem more possessive and self-serving minded. He usually helps to solve land disputes among villagers. *Sometimes, they prepare land over the ones of other villagers. And, they started to have argument over the border. I have solved many disputes among villagers. In the last two year, villagers cleared forest near the foothill of Yak Min for their farmland expansion. And, I went there and instructed them not to clear more forest*".

Photo 36: Chief of Malik village

Source: Own research, 2017

Living in the village with the most degraded forest, Tampoun minorities completely change to practice short livelihood strategies. By no means, they become more possessive and self-serving minded. And, they tended to focus more quick monetary income earlier than other minorities in the area did. Mr. Sorl Phern, Chief of Malik village, regrettably reminds the quick loss of the common pool resource and mentions this efforts to stop human disturbance activities in environmental degradation prone area "*In Malik, there is no more wood to cut many years ago. Villagers need to buy and get wood from other forests to build house. And, there is no more land available for shifting cultivation or farmland expansion. When the encroachment happens, I call and instruct the villagers who did it to stop their activities. The encroachment usually happens at the foothills of the mountain. We practiced cash crop farming since before the arrival of economic land concession*".

Photo 37: Chief of Kanat village

Source: Own research, 2017

The presence of ELCs does not only effect on community forest itself but, also on feeling of its users. It makes sustainable forest management hard to achieved as villagers hasten to squeeze out the common pool resources. Rormam Blorn, Chief of Kanat village, has been facing difficulties to protect and control his forest since the early years of ELCs *"Our villagers were severely affected by rubber plantation. All companies are around us. People cannot grow crops far away from the village anymore. All of us have lost land to the ELCs. You can see now the rubber plantation is close to villagers' farmland. In the past, people wrote and asked me to cut the wood when they need it. I allowed only for those who cut woods for building their own houses not for business. But, Ton Blon forest has already ran out of wood. And, the area around it were also encroached for farming".*

Photo 38: Chief of Mass village

Source: Own research, 2017

The forest protection is ineffective since villagers tend to get involved more in short livelihood activities. Villagers keep looking for valuable woods in other localities after their own one was degraded. Some villagers need to use it for basic needs such building a house while others cut it for monetary income. Mr. Tuong Penh, Chief of Mass village shows a deep concern over the future of his community forest as it becomes the only existing resource for the heavily outnumbered users "*The forest will run out of wood soon. Every day, people from other villages come to cut Yak Poy forest. The forests near here have already ran out of wood. Before, we arrest loggers from Kanat village. And, we set them free after they paid for the wood and other confiscated items to our committee. Our group with 5 to 6 people do patrol the forest, but not regularly. We are normally informed by villagers when they know there are illegal logging. Our forest is still better than the others near here. Other villagers come here to collect NTFP*".

Facing the enormous and unstoppable changes in livelihood strategies in indigenous communities, short livelihood activities are considered as the only way out of local economic fragile. Villagers are being trained by development partners how to grow and take care of their cash crops. And, the ineffective forest management is gradually forgotten. Mr. Heng Sokha, Project Manager of Land and Natural Resource Management, has worked to help strengthening Yak Poy community forest management. Now, he is providing training on how to grow the crops and to build their network in the modern market. He unsurprisingly points out the irregularities which led forest management to failure. *"Our NTFP project has finished in Yak Poy community forest since 2013. We help them to create community forest and the committee. And, they need to work with Forestry Administration. Unfortunately, they do not cooperate and crack down the illegal logging for the reason of financial shortage. And, the forest committee is uncapable to protect their forest. We do not have any funds available for the capacity building and the operation neither. The corruption always happens in their operation. Yak Poy community forest has degraded. Logging also happens everyday. People can hear the sound of chainsaw machines from the depth of the forest. The authorities in charge cannot effectively crack down the activities. Right now, we have agricultural projects for the communities living near Yak Poy. We teach them how to grow and take care cashew nut. Villagers tends to do agricultural activities nowadays. To do so, they can both use and protect their land. We also help them to build up farmer network to learn from each other and to sell the crop at good price".*

Photo 36: Mr. Heng Sokha with environmental officers

Source: NTFP-Cambodia, 2016

7.1.2 New livelihood strategies:

Since indigenous people lost their land to ELCs, their livelihood strategies have gradually changed. The forestland for subsistent livelihood activities is small. And, its advantage has become trifling among the users. The practice of short livelihood activities become more common among them. NGO whose main early mission to promote sustainable use of NTFP is also involving in agricultural projects in their former area of NTFP project. And, state actors do not effectively to prevent and crack down illegal activities. And, the indigenous communities are not able to protect their common pool resource. This phenomenon is driven by their incapacity and corruption. The trend toward cash crop farming and excessive use of forest products have been deteriorating the evergreen part of the forest. Their practice has led to

environmental degradation.

7.1.3 Historical analysis of livelihoods:

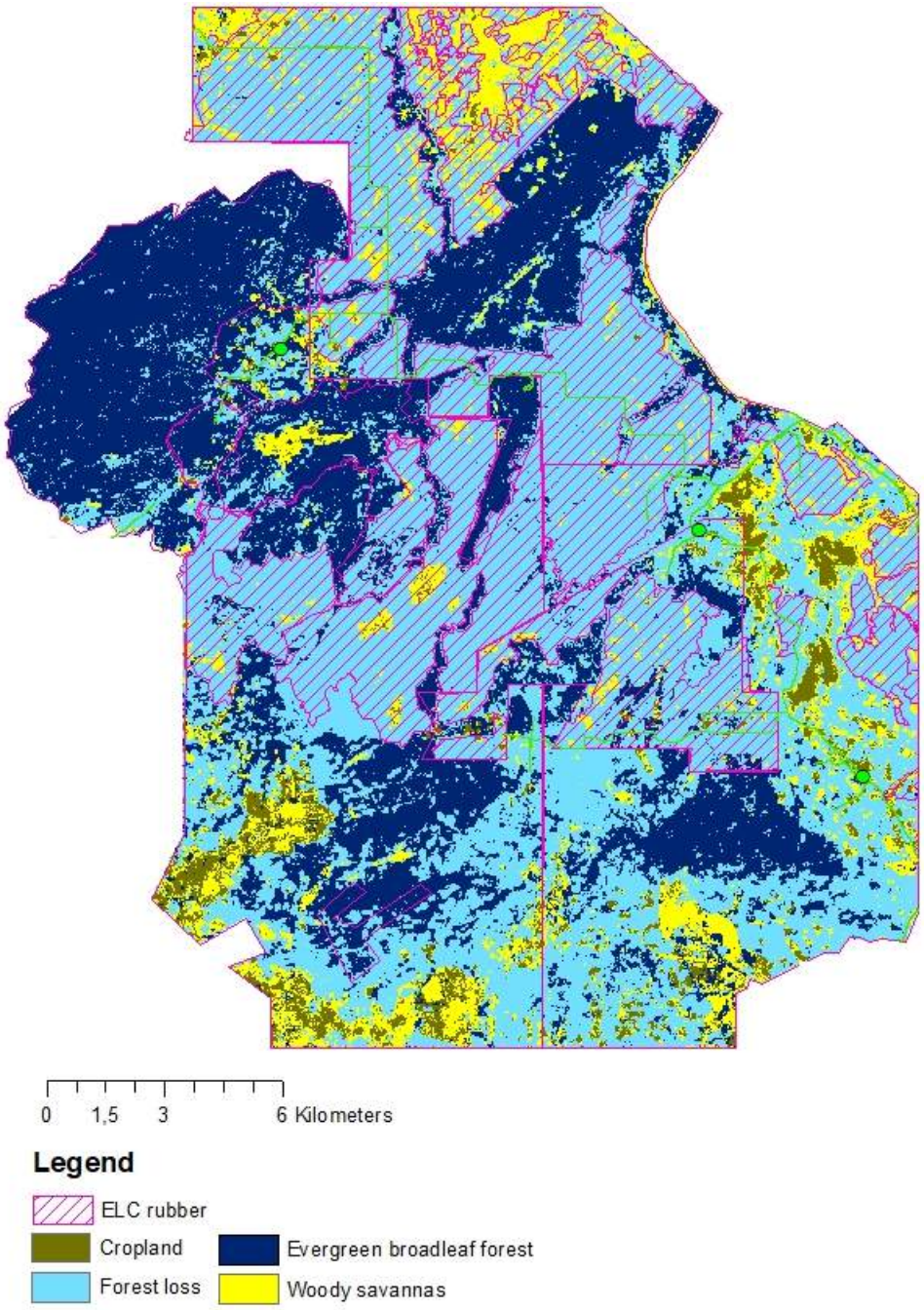
While livelihood activities have evolved, the land use has also developed. They have parallelly changed every now and then as the indigenous people livelihood activities are soil-based. Fundamentally, they need new land for its early rich fertility, and to leave old infertile farm to rejuvenate. These changes have been detected on produced map below. In the previous chapter, there are already reports from interview and group discussion on their livelihood strategies. And, it also shows a great tendency towards cash crop farming. Here, the case is brought to life again by using the map to explain the connection of land use change with the emerging livelihood activities.

The evergreen broadleaf forest has decreased while woody savannas[17] and cropland/natural vegetation mosaic increased[18]. The expansion of indigenous people's cash crop and ELCs' rubber plantation are main drivers for land use change. The cropland or woody savannas along the straight lines in checkerboard pattern-like field of ELCs are young and old rubber trees plantation belonging to economic land concessions. And, croplands along curved lines through the villages are young cashew nut trees, cassava, or rice. To see the differences, the forest is colored dark navy. In order to see how the forestland has evolved for the last few years, the pinstripe pattern of rubber plantation is used to represent the majority of the forest loss[19] in the research location. And, the remaining forest loss was fueled by farmland expansion of local villagers.

Since the presence of economic land concession in 2009, the evergreen broadleaf forest has been decreased. The new croplands and woody savannas 2015 are found on the former evergreen broadleaf forest 2009. Villagers plant both long-term and short-term crops. If they miss planting cassava in May or June of the current year, they can plant it in March of next year. It also depends how soon the rainy starts. In the research area, there are three kinds of croplands-rubber trees of the economic land concession, cashew nut and cassava of villagers. And, the cropland of paddy fields is found in the area with low elevation of the two villages-Kanat and Malik. Regrettably, villagers cannot not continue their slash and burn farming in the concession area anymore.

[17] Woody savannas are colored solar yellow.
[18] Cropland/natural vegetation mosaic is colored dark olivenite.
[19] the apatite blue area represents the forest loss between 2009 and 2015.

Figure 34: The decrease of evergreen broadleaf forest from 2009 to 2015



Source: derived from MCD12Q1 (2009), Landsat 4-5 (2009) and Landsat 8 (2015), USGS NASA LP DAAC Land Cover Type Yearly L3 Global 500m SIN Grid

When all the area of economic land concessions is prepared, and fully planted with rubber trees by the companies, the former forestland from the village center to the border of economic land concession were also cleared by villagers for farmland expansion. The area is now full of woody savannas and cropland. The expansions of farmland in Malik and Kanat occurred earlier than in Mass. And, they cultivate crops on new encroached land to generate the monetary income to afford living necessities.

For Mass, their farmlands of 2015 are slightly larger than those of 2009 only near and inside Yak Poy community forest. Their old cropland which is close to the western border of Krong Buk does not get bigger. This tells that villagers in the concession area have the same trend of cash crop farmland expansion since the arrival of ELC's. The figure below shows how former indigenous people farmland lost to concession companies and how close their new farmland expansion to rubber plantation are.

Yak Poy located outside the concession area has also lost most its evergreen part caused by logging and forestland encroachment. During field observation, the farmland-cashew nut and cassava are seen located in common pool resource. The turquoise tracking line in evergreen broadleaf forest of Yak Poy is a red soil dirt track crossing cassava plantation (13°55'55.69"N, 107°6'42.47"E). This area is newly encroached for farmland expansion. There are still trunks and stumps left on the ground in young cassava field. Some villagers were busy chopping and preparing cassava for plantation after the early rainfall.

Their short livelihood activities have eminently dominated and strongly influenced its local land use change. The former evergreen forest is now filled with farmlands of either ELCs or Indigenous people. It is just a matter of time before the villagers benefiting from the last common pool resource will maximize monetary income through resource overexploitation like their neighborhoods. The former NTFP collectors and hunters are now conducting excessive cash crop farming.

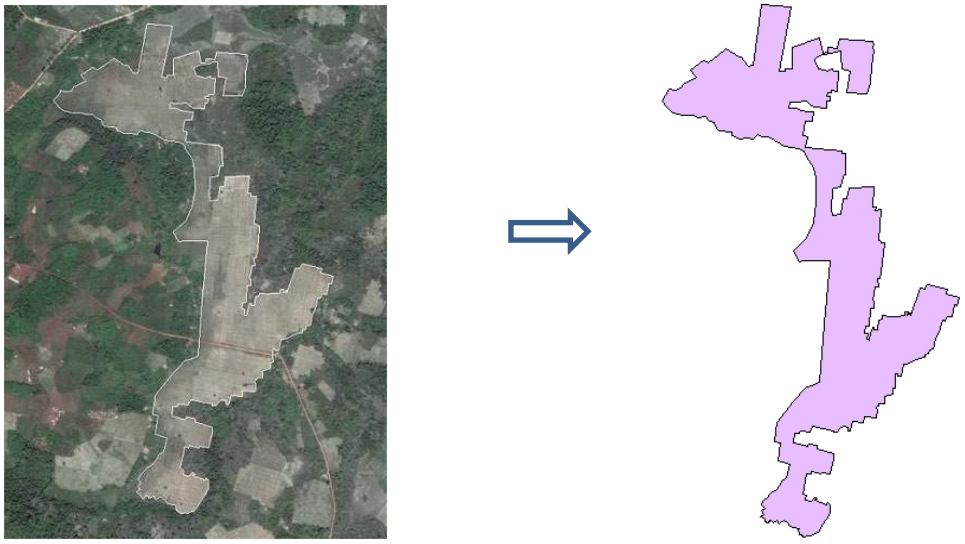
7.2 Identification of livelihood activities in the face of exposure:

When the economic land concessions first arrived, all the three villages-Malik, Kanat, and Mass were not full of cashew nut and cassava farm. The villagers mostly prepared small plot of shifting cultivation and NTFP collection. Sadly, they could not continue these activities as most parts of the area granted to ELCs. After getting approval for their investment, Economic Land Concessions rushed to implement their projects by preparing their rubber plantation by sub-region. To differentiate between villagers' farmlands and rubber plantations of the companies, rice paddy field, rubber plantation, and the remaining forest ware converted to different patterns[20].

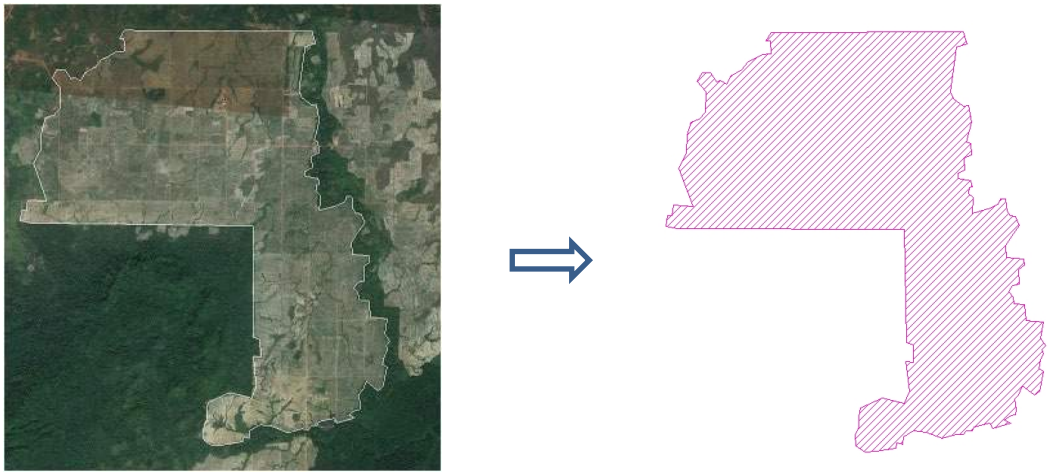
[20] Rice paddy field was converted to lilac polygon. Rubber plantation is transformed into pinstripe pattern. And, the remaining forest is colored dark blue. On satellite image of google earth, the sub-regions of rubber plantation are seen like checkerboard pattern.

Figure 35: From satellite image to polygon

Rice paddy field



Rubber plantation



Source: derived from satellite images of Google Earth.

The converted polygons are integrated with the existing woody savannas and cropland/natural vegetation mosaic to show how villagers confront with the latest development. Latitudes and longitudes, location and types of crops have been verified during field trip (in Chapter 3). The activity was done after the interviews with villagers.

The figure no. 34 shows that there is a space between the current rubber plantation of Economic Land Concession and cashew nut, cassava farmlands of Kanat and Malik. Tampoun minorities have planted cashew nut trees along the cart track from the border with Heng Brother in northwestern part of Malik to the border of Veasna in the southeastern part of it. The villagers said that they already expanded

their farmland to most parts of foothills of Malik community forest located in the western part of the village before the arrival of ELC's. Such livelihood activities already existed in their localities. But, most of the farms are small and far from each other.

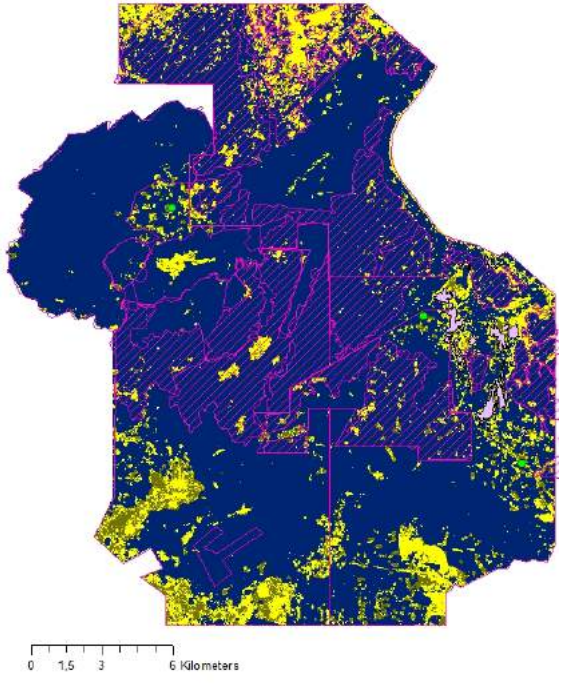
Kachok minorities own large rice paddy field in the eastern part of Kanat village. The low elevation and flooded area enable them to cultivate lowland rice as subsistent livelihoods. They also plant cashew nut and cassava around the village to sustain their living. In 2009, their woody savannas areas were not close to the border of rubber plantation of Heng Brother. But, they also had a few farmlands inside the former evergreen broadleaf forest area which is now rubber plantation of Krong Buk and Veasna. Villagers have lost most of part of their farmland to Veasna. And, it was located in the northeastern part of the village. They sell their cashew nut and cassavas one time a year. Some years, cashew nut becomes the main crop to generate income when they miss to grow cassava on time.

Tampoun minorities have already cultivated crops at some parts of the foothill of Malik community forest since 2009. And, the area of current farmland expansion near community forest is smaller than those in other villages. The fertile soil from newly burned forestland at the foothills were the target for cash crops farming. In 2013, their farmlands are seen being expanded eastward to the border of rubber plantation of Veasna. Their lowland paddy fields are close to the ones of Kachok minorities. The village did not lose much of their land to ELC as Kanat did. For Tampouns, this new farmland expansion does not mean to re-generate, but to increase their sources of livelihoods from cash crops. In 2009, Kreungs living in Mass owned some farmland inside the concession area of Krong Buk and CRD. And, some parts of it were located on current rubber plantation of large scale agriculture. The company has cleared the land and replaced the crops with rubber trees. Being unable to get the land back in eastern part of the village, Kreung minorities cleared the forest in western part of the village near Yak Poy community forest and prepared it as their new farmlands. And, those area changed from evergreen broadleaf forest to woody savannas and cropland/natural vegetation mosaic.

During the time of exposure, most villagers have increased their short livelihood activities by expanding their farmland over the area of evergreen forest, especially in Malik. Their forest also degraded due illegal logging. Kanat which were affected and surrounded by four companies had the same trends towards short livelihood activities to fullfill their immense loss of subsistent resources. Mass affected less than other villages was lately influenced by short livelihood activities. Villagers still depend on NTFP more than other villages do. However, the farmland expansion and logging continue to happen throughout the forest. Villagers have chosen short livelihood activities to recover from the shock of resource loss.

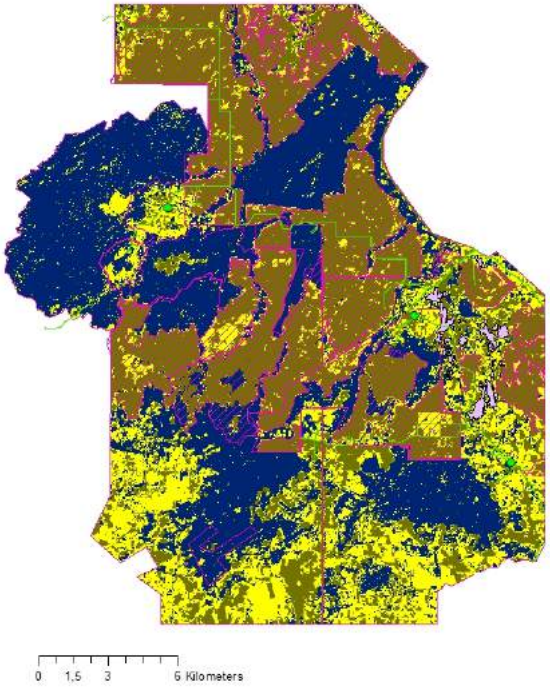
Figure 36: The evolution of land cover from 2009 to 2015

2009



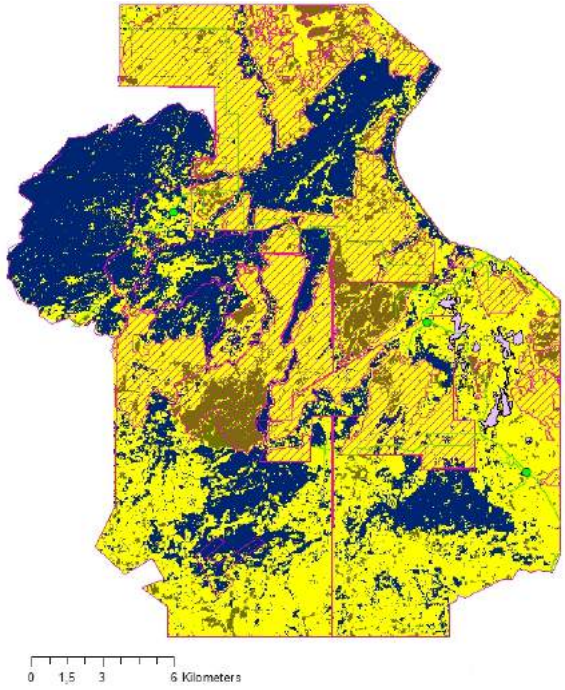
Source: MCD12Q1 (2009), Landsat 4-5 (2009)

Land preparation for rubber plantation



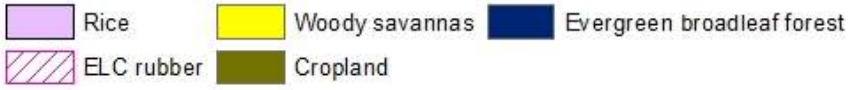
Source: MCD12Q1 (2013), Landsat 8 (2013), derived-satellite image data (2017), field GPS-tracking data.

2015



Source: Landsat 8 (2015), derived-satellite image data (2017), field GPS-tracking data.

Legend



7.3 Recovery pathway analysis to maintain livelihood resilience:

In 2009, it was rarely seen that individual farmlands were not close to each other. Villagers said that they seldom had boundary disputes among their own minority villagers. After rubber plantations have already been prepared, the affected villagers use all available lands left inside the village to plant their crops. Presently, land dispute frequently happens among villagers as some of their farmlands have no official boundary. And, they often argue each other over unclear and unofficial demarcation of farmlands, especially, in the new encroached area. These lands are found along riparian banks and inside community forest. Villagers keep sustaining their livelihoods by growing crops on new expanded farmlands.

For Tampoun minorities, their farmlands are slightly affected by rubber plantation of Heng Brother and Veasna. Without encountering land loss, villagers have developed their own community faster than Kachok minorities. Farmland expansion means to increase their sources of livelihoods while Kachoks search for new farmlands to maintain their livelihoods. More than half of residential houses is built twice time larger than others with modern construction materials. This shows that their source of short livelihood livelihoods enables them to own things more than basic needs. Their community forest has degraded due to logging and encroachment. Their affordability on living necessities and environmental degradation is win-lose situation.

Kreung minorities living in Mass village have lost some of their farmland to Krong Buk and CRD. Their situation is similar to villagers living Kanat. However, they are not surrounded by ELC. Since 2009, the farmland expansion toward eastern part of the village is not possible as there is rubber plantation of Krong Buk. villagers started to clear and burn down the forest near and at southwest of their village making a way for cash crop plantations. Their community forest is the last common pool resource that still provides woods. And, it has become target for all loggers around the area. Most youth got involved in Illegal logging in order to generate monetary income. So, they can afford their basic needs and other living necessities. Their livelihood pattern will be similar to those of other two villages after their common pool resource degraded.

It is noted that most villagers from the most to the less affected villages have expanded the farmland of cash crops. They practice short livelihood activities to generate monetary income. Some farmland expansions in Kanat are on environmental degradation-prone areas such as riparian bank and foothill with community forests. These areas have been cut out of their rubber plantation of ELC's to avoid erosion and mitigate sedimentation. However, villagers use it for farmland expansion. Until now, the border of their farmlands is already close the border of rubber plantation of concession companies while Mass still has some plot of nearby forestland for future expansion. The possibility of further forestland encroachment in Mass is high as they cannot not move to eastward where is block by ELC. And, high return of timber from Yak Poy motivates villagers of Mass get involved in logging and selling it to

outsiders. Their recovery pathway does not look sustainable as their short livelihood activities are now degrading the environment in their own localities.

7.4 Resilience in win-lose situation:

Livelihood transition is on its way after their surrounded forestland was granted to ELCs to prepare land for rubber plantation. In term of land cover change, villagers own less forest, and grow more crops on new land. The transition from subsistent to non-subsistent livelihoods looks unsustainable for indigenous people. Villagers get involved more in short livelihood activities by encroaching prohibited areas. The quick generation of monetary income of cash crop and logging made villagers pay less attention to protect common pool resource like NTFP as the forest area is degrading and getting smaller. And, it is a win-lose situation for the community.

Rather than to solve land conflicts between indigenous people and concession companies, Directive 001 has forced villagers to accept their land loss and recognize what was left. Villagers had to finish shifting cultivation and change to permanently cultivation on the recognized plot of land. Even the authorities have limited them to use their entitled land, it does not stop them from encroaching other areas outside rubber plantation such as riparian bank and foothills of community forests. It shows that the land lost to concession companies was important source of livelihoods. As result, they cannot stop from encroaching other areas to fulfil the loss. The monetary income from these short livelihood activities is used to afford basic needs and other living necessities as the source of subsistent livelihoods degrades. For example, their hunting and fishing activities do not provide much food as before because the natural habitats of the species were disrupted by forestland conversion.

In Malik, the affordability for living necessities is better than other two villages while the community forest has been encroached and ran out of woods. Kanat is on the same livelihood pattern as malik. But, they cannot afford much things especially modern living necessities like Tampouns can while their forest resource already dried out. Kachok encroached riparian bank of the streams to expand their farmland. And, some of them have become permanent loggers. They log woods in the forest of Kreung minorities after their own forest has already run out of woods. The forest community in Mass cannot protect their own common resource from being squeezed out by outsiders and their own villagers.

Concisely, the collective action against forest crimes is spoiled by self-serving attitude of villagers. They maximize their productivity by squeezing out the common pool resource. Villagers do not show any sign of shared vision on sustainable resource use. The existing feedback mechanism is idle due to the vague cooperation among concerned actors at all levels against the crimes. It makes the villagers lose trust in their own superiors and fear that their common pool resource will be taken by outsiders.

7.5 Pragmatic findings in the concepts of development studies:

7.5.1 Exposure to resource trends:

Villagers had tried with different means to halt this plantation. Their resistances which turned violent have been cracked down by force, illegalized by the law. Some of them were summoned by provincial court of Ratanakiri (Ratha, 2011). This unsuccessful attempt has already led them to unintentionally live in unsafe condition, even there is no natural hazard mentioned in this research as described in its original form of Pressure and Release (Wisner et al., 2003). This unsafe condition was driven by human activities. It increased the vulnerability of the local communities under the guise of rural economic development (Schneider, 2011) as loss of forests deprives poor rural people of an important part of their subsistence base (Rambo, 1995). The state development policy was seen the root cause of unsustainable livelihood practices. Their approval of the investment project has consequently triggered impendence land use change.

Those who permanently lost forestland to ELCs under the name of development have turned to logging and cash crop farming as their livelihood strategies. In social sense, stress encompasses disruption to groups' or individuals' livelihoods and forced adaptation to the changing physical environment (Adger, 2000). Such stresses are related to the underlying economic and social situation, both of lack of income and resources (Chambers, 1989). Living between the concession area and remaining common pool resource has shaped a new form of livelihood strategies for villagers. Villagers shortly started to focus on quick generation of monetary income by cutting and selling valuable woods and expanding farmland to new area. This is the second phase of resource depletion after forestland conversion done by ELCs. The monetary income from these activities enabled them to afford basic needs which could formerly be found throughout the forest. In aspects of long-term benefits and sustainable resource use, the current practices are causing danger to the management of common pool resource.

For instance, Kachok and Tampoun minorities have already ran out of woods for making house. The remaining common pool resources which has served as sources of livelihoods for them have been degraded by overuse. Only woods from community forest belonging to Kreung minorities are still available for the next two years. After having exposed to the resource trends, the perturbation has altered the sources of livelihoods among those communities who depended on subsistent resource. The new physical environment resulted from land preparation for rubber plantation has given them limited space to continue practicing traditional livelihood strategies to survive. It has pressured them to squeeze out the last common resource as source of livelihoods. And, the large-scale resource depletion in concession area is posing a threat to the management of nearby remaining forest since the valuable woods in remaining forest have become the target for illegal loggers.

7.5.2 Resilience:

Indigenous people managed to thrive during the resource trends in unsustainable ways- growing cash crops at fluctuation price, depleting common pool resources, and expanding crop fields into environmental degradation-prone areas. Communities may change in state (often collapse) from overusing an ecosystem that temporarily affect the ecosystem. Such shifts usually result from a complex set of events that lower the resilience of the society, making it unable to recover from an environmental shock (Walker et al., 2004). The forestland conversion to rubber plantation is permanent that will not let the communities regain the previous ecological condition.

As result of this resource loss, traditional livelihood strategies such as animal hunting and wild fruit collection have been also decreasing. They started to depend more on monetary income to afford food, medicine, and clothes. The sudden decrease of their subsistent resources has made them to rely on more on monetary income for food, medicine, and clothes. And, traditional livelihood activities have become less common livelihood activities among new generation. The newly emerging livelihood strategies to acquire living necessities are anarchically done over physical capital causing dramatic ecological change in the area. Some new farming area are located in environmental degradation-prone area such as on riparian bank, slope, and inside community forest.

Monetary income from cash crop farming and logging which enabled communities to fulfil their needs is one motive behind livelihood change for the others. Even so, their common pool resources have already run out of woods. And, their local environmental condition has degraded since before those of other communities who are following their success in thriving the disturbance. Villagers follow one after another in quick livelihood activities. And, their livelihood strategies turned out unsustainable afterward. This unsustainable practice parallels the undermined common resource management, poor integrated spatial and ecosystem planning, idle feedback mechanism, and vague cooperation among actors. The late three elements are found in attributes of resilience. And, they are identified as buffer capacity, self-organization and capacity for learning (Ifejika Sparenza et al., 2014).

- Buffer capacity

The villages are providentially covered with fertile land which allow villagers to grow the crops for several years on the same plot without using fertilizer. Born as agriculturists, indigenous people can benefit much from growing crops on their land. However, the land available for cultivation is currently much smaller than before due to concession and leopard skin policy. All villagers have gone through this disturbance strenuously. And, cultivation on the new areas was seen as a livelihood strategy to buffer the impacts on their source of livelihoods. They have shown the capacity to cushion change, and possibly to use the emerging opportunities to achieve better livelihood outcomes such as reducing poverty (Ifejika Sparenza, 2013). But, the new farmland expansion is on the brink of unsustainability as prohibited areas are encroached for plantation.

Thus, buffer capacity of indigenous people is more than to retain the same structure, function, identity to achieve better livelihoods. It is also the evolutions from subsistent to non-subsistent livelihoods, from small to large cropland, from land suitable for cultivation to environmental degradation-prone area. Since then, their social capital in common pool resource management is weakened by self-serving minded. This could be question for resource use in the long run. Villagers have become more possessive of their own properties than before. Some families in the same village had disputes over the border of their farmland, especially on the new encroachment area. Social capital is crucial for building and maintaining resilience as it can be transformed to other livelihood capitals (Cumming, 2011). However, not only trust, norms but also cohesion have been impaired by the growing self-serving attitudes. In the past, they could cultivate on the land left by other villagers by asking and informing the previous cultivators.

- Self-organization

Their social institution for collective action has deteriorated since the rule of resource protection and norm of sustainable use of natural resources are being distracted by this quick generation of monetary income. And, these short livelihood activities emerged in uncontrollable way since actors are weak-willed toward illegal logging prevention. Moreover, it was worsened by poor law enforcement of forestry administration officers, environmental officers and other concerned stakeholders on illegal logging. Their vague cooperation on resource protection enables loggers to cut and smuggle the last woods out of the forest to the border in broad daylight. Here, the questions of self-organization include how and to what extent institutions foster or hinder livelihoods and how much an actor's livelihood practices contribute to building institutions conducive to coping with and adapting to stresses and shocks (Ifejika Speranza, 2013). The institution which was once created to assure long-term benefits from subsistent livelihoods could protect the communities from being adversely disrupted due to its sustainable management of common pool resource.

In fact, the community forest management committee which is considered as collective institution could not protect their own resources as their cooperation is vague. Lack of cooperation among actors is a poor basis for self-organization (Ifejika Speranza, 2010). And, self-serving activities have deteriorated trust among actors in resource protection. The irregularities have made their operation sound more profitable. Cash generation from woods becomes routine among indigenous people. Without such trust, there is little likelihood that resources and sustainable rates of offtake could be maintained in the long-term, nor that individuals would restrict their own potential to capture all the benefits of free-riding in favor of the collective good (Pretty et al., 2004). Lately, it is likely that villagers who were affected by economic land concessions have no option but to encroach community forest for new farmland and overexploit the resource for quick generation of monetary income. The frustration that the last resource will be taken by outsiders has incited actors rush to squeeze it out. Another concern over environment

is the expansion cropland into environmental degradation-prone area such riparian bank, slope, and community forest. The new encroachment does not show only the motive of short livelihood activities, but also the absence of well-integrated spatial planning at the local level. Facing resource trends, ecosystem in their localities should not be missed out in development plan.

- Capacity for learning

Having had background as agriculturists for generations, villagers can shift from growing subsistent to non-subsistent crops easily. They have started growing cash crops by following one after another in crop selection. Meanwhile, they also get involved more in illegal logging that makes the forest run out of woods in the next few years. This short livelihood activities can let them quickly make monetary income to afford living necessities. Unfortunately, it is putting traditional livelihood activities on the verge of extinction. Appropriately, Indigenous people hardly transfers knowledge of their subsistent livelihoods to the next generations as youths prefer immediate livelihood activities. This has minimized a chance to practice traditional livelihoods among youths. In fact, learning is not just acquiring knowledge and skills but also translating the knowledge into action (Argyris et al., 1978). The traditional knowledge has gradually died out as modern practice is appealing among them. And, it has driven them to conduct self-destruction by depleting common pool subsistent resources.

In general, resilience can be undermined by disturbance in environmental system. Resilience therefore depends on the diversity of the ecosystem as well as the institutional rules which govern the social systems. The knowledge transfer among indigenous people especially between generations is gradually fading away as youths are interested more in short livelihood activities- quick generation of monetary income from smuggling common pool resources and encroaching prohibited areas. And, there is no presence of a process that creates, acquires, and transfers knowledge to improve or change the unsustainable practice. This does not modify the behavior (livelihood activities) to reflect new knowledge and insights for better performance (Garvin, 1993). Consequently, ecological condition in their localities has dramatically changed.

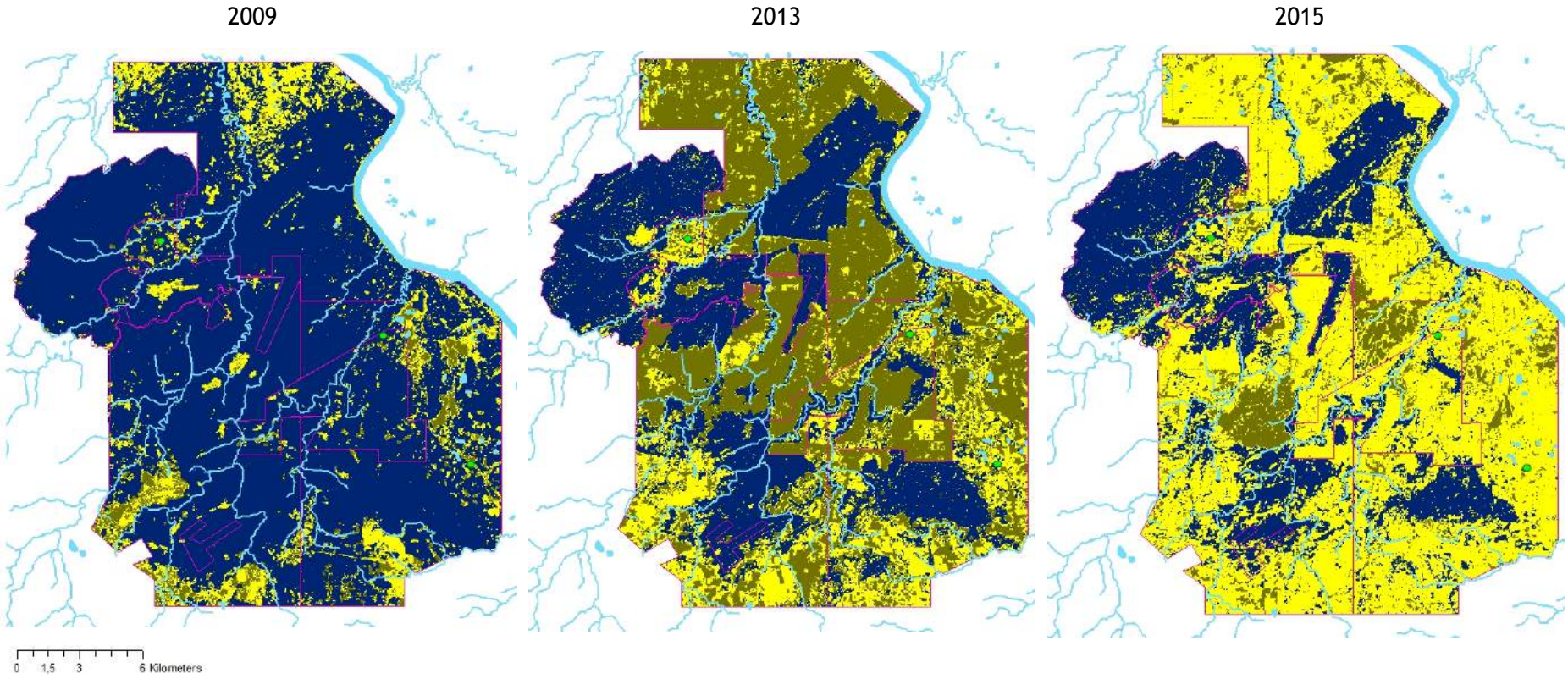
7.5.3 Sensitivity to resource dependency:

The communities had significant state of change in its livelihood dynamics. Since the arrival of ELCs, they depended more on non-subsistent livelihoods to acquire living necessities. And, the subsistent resource gradually degraded due to misuse and overexploitation for quick generation of monetary income. Even short livelihood activities have helped them out of the subsistent livelihoods crisis caused by forestland conversion, it does not look sustainable in a long run for both institution and ecosystem. Villagers turn more possessive of their own properties and less-conservation-minded as they depleted common pool resources and encroached prohibited area for their own sake. Villagers have a high sensitivity to resource dependency as they could not be patient with the situation. They rushed to practiced new types of livelihood activities which enables them to fullfill basic needs.

Buffering the livelihood loss caused by ELCs in unsustainable manner among villagers has made ecosystem undergo long-term harm. The short livelihood activities are causing another state of change in ecosystem after area was granted for rubber plantation. In a few words, ecological disturbance which was firstly caused by forestland conversion has crumbled collective institution as villagers become more self-serving. Their attitude toward monetary income has changed. And, it is seen as an alternative way to afford living necessities. The forestland conversion by ELCs, illegal logging by villagers, vague cooperation among actors which are taking place all around them has incited some of them to get involved in exploitation of the remaining forests in order to secure a share of the proceeds before the resources disappear. Villagers became irresponsible for their short livelihood activities on the environment.

The dependence on subsistent resource as localized economy demonstrates one aspect of resource dependency leading to weak resilient communities during forestland conversion, especially, when communities whose social order, livelihood and stability are a direct function of their resource production and localized economy (Machlis et al., 1990). The new images of human and natural system in the localities are describing their incapacity to resist change and the inability to return to a previous condition. This coevolutionary happens when human system cannot absorb the impacts of previous livelihood loss. Then, they use the remaining natural capital to secure their living.

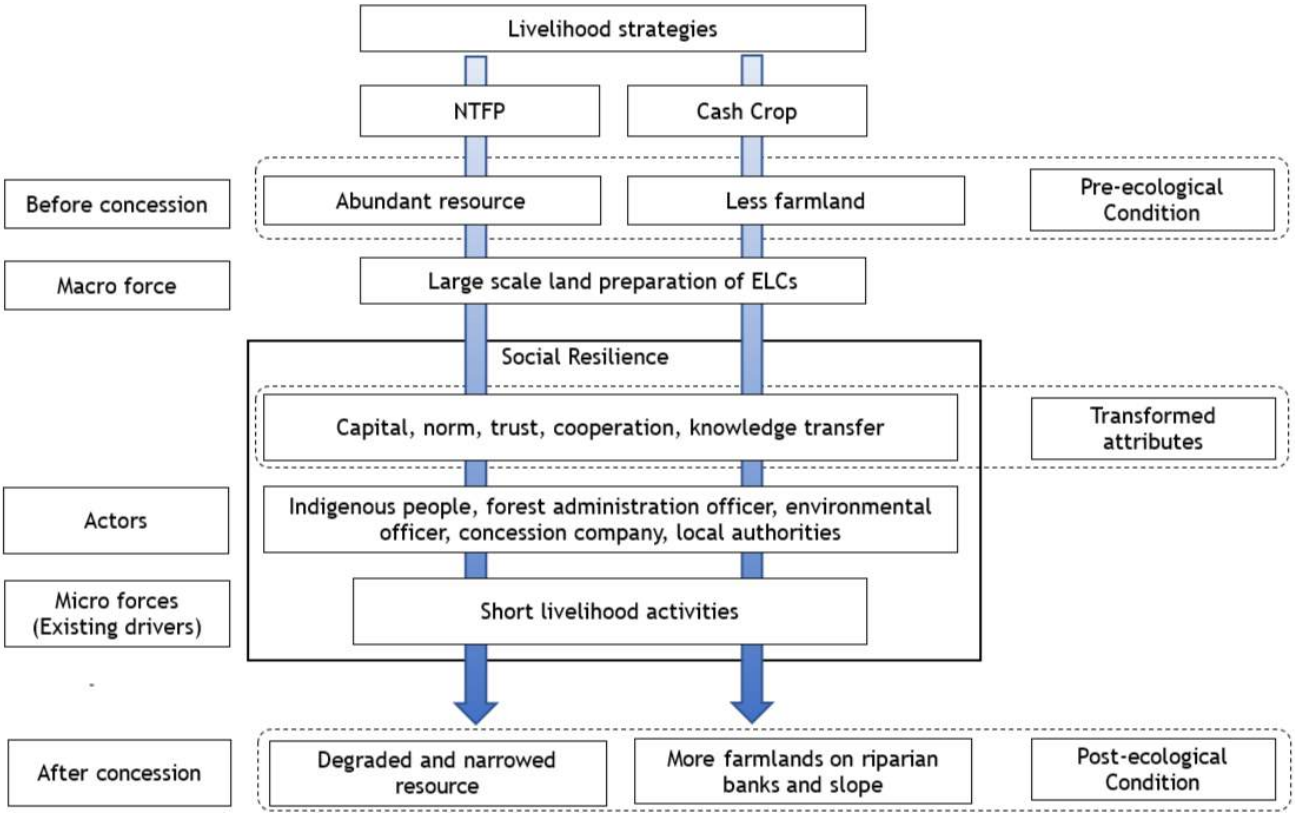
Figure 37: Crops on degradation prone area



Source: derived from LP DAAC's MCD12Q1 (2009, 2013), Landsat 4-5 (2009), Landsat 8(2013, 2015), google earth's satellite image (2017), USGS, Cambodia stream network.

Next figure briefly shows the whole finding in brief by explaining how people turned from former livelihood strategies to short livelihood activities, resilience's attributes, actors' activities in resource trends, and ecological changes in the localities.

Figure 38: Co-evolutionary of ecosystem and social resilience



Source: Own research, 2018.

In figure above, NTFP is served as indigenous people's traditional livelihood strategy before the conversion of forestland into rubber plantation. The macro force makes the indigenous people squeeze out the last common resource and pose a threat to the management of nearby remaining forest. And their struggle for surviving have fueled land encroachment in protected area.

The attempt to solve this problem from the government by issuing Directive 001 cannot halt the resource degradation. In other words, it intentionally normalizes their loss of forestland, and legally ends their claims on the lost land. It forced them to accept the change from traditional collective land use to private entitled farmland. Since this land titling and limited common resource, the indigenous people become more possessive of their own properties than before. It lessens trust among indigenous people. Some families in the same village have argument over the border of their farmland especially on new encroachment area. The traditional collectivism on farmland is ruined by state policy. In the past, villagers could do shifting cultivation on the land of other villagers by only asking permission from the

previous cultivators. The impression of private properties becomes stronger among villagers as it weakens their attention and commonality on sustainable common pool resource use.

The indigenous people themselves gradually become less conservation and more self-serving minded due to the high demand of valuable wood. They become impatient to generate monetary income by ignoring the long-term benefits of remaining common pool resource which cannot answer their needs on time. There is no encouraging sign of knowledge transfer in their subsistent livelihoods strategy as indigenous youth prefer immediate livelihood activities by getting involved more in illegal logging and cash crop farming. The traditional knowledge has gradually died out as modern practice is appealing among them. And animal hunting and wild fruit collection have become less common livelihood activities among new generation. This has deteriorated their institution as the rule of resource protection and norm of sustainable use of natural resources are being distracted by this quick generation of monetary income. It has driven them to conduct self-destruction by depleting common pool subsistent resources.

Even the law enforcement to curb the forest crimes from the actors in charge (forestry administration officers, environmental officers, local authorities, and other concerned stakeholders) is poor and ineffective. The feedback mechanism of resource protection idles due to the infrequent and vague cooperation on resource protection. This enables smugglers to transport valuable resource in broad day light and to reach their destination. Their shared vision toward sustainable resource management hardly turns into action as there is no enough commitment and cooperation among actors. The irregularities in resource protection break the feedback mechanism at the response stage. The forest management committee can also sell the confiscated resources to illegal loggers at higher price than they sell to their own villagers during their operation. If not, they will confiscate and bring the chainsaw and woods to the village. And the woods can later be sold to outsiders. Cash generation from woods becomes routine among indigenous people. The irregularities make their operations less sense of conservation, but more sense of making profit.

This sudden decrease of their subsistent resources undoubtedly makes the villagers rely more on monetary income for basic needs such as food, medicine, and clothes. The newly emerging unorganized livelihood strategies to afford living necessities has caused ecological change as it affects environmental degradation-prone area such as on riparian bank, slope, and inside community forest.

7.5.4 Strengthening resilience

Since 2009, large agricultural development has gradually exhausted indigenous people's livelihoods. The remaining natural capital could not provide indigenous people with the same state of subsistent livelihoods as before. The villagers have followed cultivating cash crop one after another are trapped in short livelihood activities to afford living necessities. Communities which bounced back in different state of change with short livelihood activities have caused the ecological condition in their own

localities gradually deteriorate. This co-evolutionary of social and natural system one after another describes their weak resilience towards disturbance. The attempt to solve land conflicts between villagers and concession companies by using leopard skin policy have ended shifting cultivation.

It has also finished the traditional agricultural practice that villagers could cultivate their crops wherever they wanted as long as it was available in the vicinity of their village. And, it fueled unsustainable practices among them afterward. The forestland encroachment is still done in the picture of shifting cultivation. But, the difference is that they do not only abandon the old place, but also find a new place for cultivation. Their cropland expansion keeps increasing on the foothills of forest, slope area and riparian bank between concession companies and common pool resources.

To avoid the further environmental degradation, they need to rehabilitate deteriorated natural capital and social capital, strengthening norm, trust, institution, and cooperation, and promoting knowledge of sustainable knowledge transfer. The existence of integrating features of social organization such as trust norms and networks is crucial for building social capital of communities (Pelling, 1998). The permanent loss of resources caused by macro force and the continuing degradation of remaining resources leave them indigenous people no choice but to strengthen buffer capacity, self-organization and capacity for learning. From the viewpoint of the sensitivity to resource dependency, concerned actors need to restore their trust, norm, and rules in sustainable resource management, to improve community livelihood strategies, to integrate environmental degradation-prone area in spatial planning, and enhance cooperation among actors. As the study shows that villagers prefer immediate livelihood activities, both short-term benefits addressing the present needs and long-term benefits providing sustainable profits for next generations should be included in community forest management plan.

And the win-lose situation between short livelihood activities and degraded ecological condition is far beyond the impacts of macro force was firstly seen. The loss resource due to large-scale forestland conversion pressured people to practice short livelihoods activities. And the expansion of short livelihood activities put common pool resource and prohibited areas in danger. In order to halt further environmental degradation, it requires all actors from different fields at different levels to get involved in the process And, it starts from the central level, ends with villagers themselves in strengthen resilience.

Actors at the central level need to create one common mechanism allowing their local representatives and authorities to work together as one team, to reinforce the law, to crack down on illegal logging in the vicinity of community forest, and to prevent transboundary resource smuggling. It helps to strengthen institutional support, especially capacity building to community forest management committee, and cooperation among indigenous people, local authorities, and concession companies in resource protection and sustainable use of it. And Actors in charge of community forests should not only

use long-term benefits as incentives for villagers to manage the forest, but they should also create quick and realistic benefits for them such as payments of ecosystem services or other similar methods. A proper market mechanism is needed to assist indigenous people to access the right information and demand of cash crops. This will minimize the fluctuation of price and demand of cash crops produced by indigenous people. And it can stop people from squeezing out the remaining common resource to fulfill their present needs.

The regular monitoring and evaluation make the resource use more sustainable in community forest. Spatial planner needs to integrate ecosystem services, environmental degradation-prone area, and farming area in land use planning for the areas affected by macro force. This will rehabilitate the degraded natural capital and mitigate hazards in research area in the future. NGOs who are implementing resource conservation projects in target area can help the community to restore participatory and accountable governance of natural resources, particularly between villagers and their neighbors, create multi-stakeholder networking platforms and interventions with proper reporting and resolution mechanisms among indigenous institutions, local authorities in charge, and concession companies. And community forest management committee needs to document and report all irregularities ruining sustainable resource management to actors in charge. To rebuild trust among villagers, their practice of resource use and protection especially during the operation must be transparent.

Chapter 8: Conclusion

8.1 The domino effect of state development:

Large-scale agriculture development has affected indigenous people livelihoods and its institution until present time. The impacts from forestland conversion to rubber plantation done by concession companies have disrupted most part of traditional livelihoods ruining hunting activities and wild fruit collection. The Directive 001 which was issued to solve land conflict between villagers and concession companies has put an end to the claim on their lost land. In order to fulfil the loss and afford basic needs, villagers started to do more short livelihood activities making the cropland expands to border of rubber land concession, inside community forest, and on environmental degradation-prone area. Local people have no other alternatives than dropping this custom and learning to grow crop with limited land left from ELC. Meanwhile, youths become more interested in quick generation of monetary income to acquire living necessities. Short livelihood activities which are appealing among them make the transfer of knowledge of traditional become more impossible. As a result, traditional livelihood activities have gradually died out. The way that communities have responded to disturbance is unsustainable as it deteriorates their collective institution and causes ecological change. They are becoming increasingly prone to the paradigm shift of the development by the government.

Their rich cultural diversity, social norm, integrity, and trust are being deteriorated as they are more self-serving, more possessive, and less conservation-minded. The trend to work in cash crop farming and illegal logging depreciates their own existing culture and traditional livelihood systems. Moreover, the vague horizontal cooperation and the idle vertical hierarchic feedback mechanism among actors in resource protection has enabled loggers to smuggle woods out the forest to border easily. This does not only make villagers weak-willed in resource protection, but it also triggers them to overexploit the last resource before it disappears. And, it has become more serious than before when the communities could not halt the continuing degradation of subsistent livelihoods in their common pool resource. The deformed social resilience and degraded environmental condition are alerting the government and development partners to the collapse of collective institutions which cannot buffer the impacts of large-scale forestland conversion. This could be the most critical awareness can be raised in this paper for concerned actors from all fields at different levels to take serious actions to reform their policies and practices. And what's more, the current drought-prone natural capital and the future cramped physical capital will make villagers end up cultivating on the same plots of land, especially within environmental degradation-prone area permanently with the help of fertilizer. It will not leave behind the communities any resources for further traditional practices.

This situation has created a domino effect between social and ecological resilience. First, the resource trends caused by economic land concession blemish social capital of indigenous people. Every one of them greedily encroaches the remaining resource even the environmental degradation-prone area. The large-scale plantation become potent driver and permanent impact on effected community that they cannot preserve their old social form to sustain their livings.

8.2 The gap in sustainability in practice:

Resilience analysis gives insight into the impacts and livelihood strategies of the communities after resource trends. It enables us to understand what policy makers has done and missed out during the process of granting forestland to concession companies. Even tiger-skin policy which was used to cut the effected land out of concession area is seen as a quick solution for land conflict between villagers and concession companies, it has made villagers more possessive of properties.

The issue of resilience is likely to become more critical in the spatial planning and resource management questions in the future. And, they should be assessed before decision-making on land concession is made. These are also advantageous in state development policy since both environmental protection and social resilience are perceived as desirable social goals for to sustainable development. It fills the gap what the policy has missed out and what the theory has not applied to the problem of development. And, it also makes the question of whether the communities were resilient enough or not before introducing large-scale agriculture development in their localities be re-opened for a debate.

8.3 The loss of commitment among actors:

Sustainable development does not only depend on the creation or the improvement of policy tool which aims to guide the practitioners and policy makers, but it also requires the commitment from their institutions. Even these existing institutions have been working to promote sustainable development (e.g. Environmental Impact Assessment), to protect the resource (e.g. Forestry Administration), and to provide guidance on the usage of common pool resource (e.g. Community Forest Management Committee), the impacts of resource loss is still haunting the community. The inept performance of the actors in charge has left the community no trust. And, it has impinged villagers by increasing pressure on local land use.

Here, the integration of resilience analysis to the impact assessment on large-scale investment project could be boosted by the commitment of the institutions. And the institutions should work side by side from the early stage of investment the until its closure. This could minimize inevitable consequences of the negligent impact assessment and decision-making done by concerned institutions. Moreover, it makes the impact assessment, the decision-making, and resource protection more integrated in the context of sustainability.

The understanding of resilience is more comprehensive and enriched by the examination of historical livelihood dynamics especially for the former subsistent resource-based community. Furthermore, its combination does benefit the exploration of self-organization of each concerned actor.

Poor self-organization, especially weak institution, has spoiled the whole structures since it deforms livelihood strategies that encourage people to overexploit the remaining natural capital. The actors have devaluated their norm and ethics in their task of resource protection and management themselves. They created irregularities in their operations against the crime. To solve this issue, institutions need to be re-strengthened with the commitment of their actors. Thus, both the improvement of current policy tool and the commitment of each actor in each institution are strongly required at the same time to effectively curb the spread of unsustainable practices.

References:

Adger, W. Neil. 2000. “Social and Ecological Resilience: Are They Related?” Progress in Human Geography 24 (3): 347–64. https://doi.org/10.1191/030913200701540465.

Adger, W. Neil. 2006. “Vulnerability.” Global Environmental Change, Resilience, Vulnerability, and Adaptation: A Cross-Cutting Theme of the International Human Dimensions Programme on Global Environmental Change, 16 (3): 268–81. https://doi.org/10.1016/j.gloenvcha.2006.02.006.

ADHOC. 2014. “Land Situation in Cambodia 2013.” http://www.adhoc-cambodia.org/report-land-situation-in-cambodia-in-2013-2/.

AIPP, IWGIA, and FORUM-ASIA. 2007. “ASEAN’s Indigenous Peoples” Chiang Mai: Asia Indigenous Peoples’ Pact, the International Work Group for Indigenous Affairs, and Asian Forum for Human Rights and Development. https://www.iwgia.org/images/publications/0511_ASEAN_BRIEFING_PAPER_eb.pdf

Argyris, Chris, and A. Schön, Donald. 1978. “Organizational Learning” A Theory of Action Perspective. Addison-Wesley Pub. Co.

Aun, Pheap, and Peter, Zsombor. 2013. “Minorities Decry Loss of Land Under National Titling Scheme.” April 25, 2013. The Cambodia Daily. https://www.cambodiadaily.com/archives/minorities-decry-loss-of-land-under-national-titling-scheme-19968/.

Bagchi, D. K., Blaikie, Piers; Cameron, John; M. Chattopadhyay; N. Gyawali; and Seddon, David. 1998. “Conceptual and Methodological Challenges in the Study of Livelihood Trajectories: Case-Studies in Eastern India and Western Nepal.” Journal of International Development 10 (4): 453–68. https://doi.org/10.1002/(SICI)1099-1328(199806)10:4<453::AID-JID538>3.0.CO;2-Q.

Baird, Ian G. 2009. “Land, Rubber and People: Rapid Agrarian Change and Responses in Southern Lao.” Journal of Lao Studies. 1. 1 47. http://www.academia.edu/1049217/Land_Rubber_and_People_Rapid_Agrarian_Change_and_Responses_in_Southern_Lao.

Baird, Ian G. 2011. “Turning Land into Capital, Turning People into Labor: Primitive Accumulation and the Arrival of Large-Scale Economic Land Concessions in the Lao People’s Democratic Republic.” New Proposals: Journal of Marxism and Interdisciplinary Inquiry 5 (1): 10–26. http://ojs.library.ubc.ca/index.php/newproposals/article/view/2264.

Baird, Matthew, and Frankel, Richard. 2015. “Environmental Impact Assessment Comparative Analysis In Lower Mekong Countries.” PACT. http://www.pactworld.org/library/environmental-impact-assessment-comparative-analysis-lower-mekong-countries.

Banks, Alexandra; Sloth, Christian; Hadley Garcia, David; and Ra Koy. 2014. “Forest-Land Conversion and Conversion Timber Estimates: Cambodia Case Study.” Forest Trends. http://beta.nepcon.org/file/2019/download?token=Q8oUNGQk.

Bann, Camille. 1997. “An Economic Analysis of Tropical Forest Land Use Options, Ratanakiri Province, Cambodia.” EEPSEA Research Report. https://ideas.repec.org/p/eep/report/rr1997112.html.

Ben, Sokhean, and Robertson, Holly. 2014. “Hun Sen’s Student Volunteer Land-Titling Program Under Fire.” The Cambodia Daily. https://www.cambodiadaily.com/archives/hun-sens-student-volunteer-land-titling-program-under-fire-65503/.

Béné, Christophe; Godfrey Wood, Rachel; Newsham, Andrew; and Davies, Mark. 2012. "Resilience: New Utopia or New Tyranny? Reflection About the Potentials and Limits of the Concept of Resilience in Relation to Vulnerability Reduction Programmes." IDS Working Papers 2012 (September). https://doi.org/10.1111/j.2040-0209.2012.00405.x.

Blaikie, Piers; Cannon, Terry; Davis, Ian and Wisner, Ben. 1994. "At Risk: Natural hazards, People's vulnerability, and disasters." 1st edition. New York & London, Routledge

Bohle, Hans-Georg. 2007. "Geographische Entwicklungs-forschung." In Geographie: physische Geographie und Humangeographie, edited by Hans Gebhardt, Rüdiger Glaser, Ulrich Radtke, and Paul Reuber, 797-815. Elsevier, Spektrum Akad. Verlag.

Bohle, Hans-Georg; Etzold, Benjamin; and Keck, Markus. 2009. "Resilience as Agency." Reframing Resilience: From Systems-Oriented to People-Centred Perspectives. IHDP Updadte 2. 8-13.

Bollig, Michael, and M. Anderson, David. 2017. "Introduction: Resilience and collapse: Histories, ecologies, conflicts and identities in the Baringo-Bogoria basin, Kenya" in Resilience and Collapse in African Savannahs: Causes and Consequences of Environmental Change in Eastern Africa, edited by Michael Bollig and David M. Anderson, 1-20. Routledge. Taylor & Francis Group.

Borras, Saturnino. 2006. "The Underlying Assumptions, Theory, and Practice of Neoliberal Land Policies." In Promised Land: Competing Visions for Agrarian Reform, edited by Peter Rosset, Raj Patel, and Michael Courville, 99–128. Institute of Food and Development Policy. New York.

Bourdieu, Pierre. 1977. "Outline of a Theory of Practice" Cambridge Studies in Social and Cultural Anthropology. R. Nice, Trans. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511812507

Bourdieu, Pierre. 2002. "The Forms of Capital." In Readings in Economic Sociology, edited by Nicole Woolsey Biggart, 280–91. Blackwell Publishers Ltd. https://doi.org/10.1002/9780470755679.ch15.

Campbell, Roderick; Knowles , Tristan; Sayasenh, Amphaphone. 2012. "Business Models for Foreign Investment in Agriculture In Lao" Report. Trade knowledge network. The International Institute for Sustainable Development. Manitoba. http://www.iisd.org/library/business-models-foreign-investment-agriculture-Lao.

Cantor, Robin and Rayner, Steve. 1994. "Changing Perceptions of Vulnerability." In Industrial Ecology and Global Change, edited by Socolow, Robert; Andrews, Clinton; Berkhout, Frans and Thomas, Valerie. 69-83. Global Change Institute. Cambridge: Cambridge Univ. Press.

Carlson, J. M., and J. Doyle. 2002. "Complexity and robustness." *Proceedings of the National Academy of Science* USA 99(suppl. 1):2538–2545. doi: 10.1073/pnas.012582499.

Carpenter, Steve; Walker, Brian; Anderies, J. Marty; and Abel, Nick. 2001. "From Metaphor to Measurement: Resilience of What to What?" Ecosystems 4 (8): 765–81. https://doi.org/10.1007/s10021-001-0045-9.

CCHR. 2016. "Access to Collective Land Titles for Indigenous Communities in Cambodia." Cambodian Center for Human Rights. Phnom Penh. https://cchrcambodia.org/admin/media/report/report/english/2016_02_11_CCHR_Report_Access_to_Collective_Land_Titles_ENG.pdf

Chambers, Robert. 1989. “Editorial Introduction: Vulnerability, Coping and Policy.” IDS Bulletin, 20: 1-7. https://doi.org/10.1111/j.1759-5436.1989.mp20002001.x.

Chea, Vannak. 2017. “Cassava Export Prices down Sharply.” Khmer Times. February 8, 2017. http://www.khmertimeskh.com/news/35213/cassava-export-prices-down-sharply/.

Cheng, Sokhorng. 2017. “Cambodian Farmers Cash in on High Cashew Prices.” The Phnom Penh Post. May 04, 2017. https://www.phnompenhpost.com/business/cambodian-farmers-cash-high-cashew-prices.

Cheng, Sokhorng. 2018. “Cassava prices up as supply drops, reversing old trend.” The Phnom Penh Post. February 21, 2018. https://www.phnompenhpost.com/business/cassava-prices-supply-drops-reversing-old-trend.

Chupinit, Kesmanee. 1988. “Hilltribe Relocation Policy in Thailand.” Quarterly Magazine. Cultural Survival. **MASSACHUSETTS.** https://www.culturalsurvival.org/publications/cultural-survival-quarterly/hilltribe-relocation-policy-thailand.

CDC. 2017. “Investment Incentives.” Cambodian Government. Council for the Development of Cambodia. Phnom Penh. http://www.cambodiainvestment.gov.kh/investment-scheme/investment-incentives.html.

CIDSE. 2009. “Land Concession Induced Livelihood Changes.” Research on Land and Livelihood Impacts from Land Concession from Mono-Culture Tree Plantation. CIDSE-Lao. Vientiane http://rightslinklao.org/wp-content/uploads/downloads/2014/11/118_Research_on_Land_Concession_Impact_Eng.pdf.

COMPAS. 2007. “Learning Endogenous Development” 1st edition. *Building on bio-cultural diversity*. Bourton on Dunsmore, Rugby, Warwickshire, UK: Practical Action Publishing. http://www.bibalex.org/Search4Dev/files/416867/362431.pdf

Creswell, John W. 2007. “Qualitative Inquiry and Research Design” Choosing Among Five Approaches. 2nd ed. Thousand Oaks: Sage Publications Ltd.

Creswell, John W. 2015. “Educational Research” Planning, Conducting, and Evaluating Quantitative and Qualitative Research. New York: Pearson.

Crocker, C.D. 1962. “Soils of Cambodia. Exploratory Survey” Phnom Penh. Direction de l’Agriculture, Division des Recherches agronomiques.

Cumming, Graeme S. 2011. “Spatial Models in Ecology and Spatial Resilience.” In Spatial Resilience in Social-Ecological Systems, 87–120. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-0307-0_5.

De Haan, Leo, and Zoomers, Annelies. 2005. “Exploring the Frontier of Livelihoods Research.” Development and Change 36 (1): 27–47. https://doi.org/10.1111/j.0012-155X.2005.00401.x.

De Zoysa, Rushini. 2013. “The Implications of Large-Scale Land Acquisition on Small Landholder’s Food Security.” DPU WORKING PAPER NO. 156. The Bartlett Development Planning Unit. University of College London. https://www.ucl.ac.uk/bartlett/development/sites/bartlett/files/migrated-files/WP156_0.pdf. https://www.ucl.ac.uk/bartlett/development/case-studies/2013/oct/156-implications-large-scale-land-acquisition-small-landholders-food-security.

Dem, Seun. 2016. “H.E Bou Lam, Ratanakiri’s Lawmaker Distributed Water to Villagers.” Areyathor news. April 28, 2016. http://www.arey-news.com/archives/133952.

DFID. 1999. “Sustainable Livelihoods Guidance Sheets.” UK DFID. Department for International Development. London. https://www.eldis.org/document/A41739

Di Marzo Serugendo G. et al. 2004. “Self-Organization: Paradigms and Applications.” In: Di Marzo Serugendo G., Karageorgos A., Rana O.F., Zambonelli F. (eds) Engineering Self-Organising Systems. ESOA 2003. Lecture Notes in Computer Science, vol 2977. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-24701-2_1

Didan, Kamel. 2016. “VIPPHEN_NDVI: Vegetation Index and Phenology (VIP) Phenology NDVI Yearly Global 0.05Deg CMG V004.” NASA EOSDIS Land Processes. USGS. DAAC. https://lpdaac.usgs.gov/dataset_discovery/measures/measures_products_table/vipphen_ndvi_v004.

Diepart, Jean-Christophe, and Schoenberger, Laura. 2017. “Concessions in Cambodia: Governing Profits, Extending State Power and Enclosing Resources from the Colonial Era to the Present.” In Handbook of Contemporary Cambodia, edited by Katherine Brickell and Simon Springer, 157–68. 1st ed. Routledge.

Down, Aisha. 2016. “Ratanakiri Running Out of Water Amid Worst Drought in Years.” The Cambodia Daily. April 4, 2016. https://www.cambodiadaily.com/archives/rkiri-running-out-of-water-amid-worst-drought-in-years-110781/.

EIA. 2011. “CROSSROADS: The Illicit Timber Trade Between Lao and Vietnam.” Environmental Investigation Agency UK. London. https://eia-international.org/crossroads.

Errico, Stefania. 2017. “The Rights of Indigenous Peoples in Asia.” ILO Report. Gender, Equality, Diversity and Inclusion Branch (GEDI). https://www.ilo.org/global/publications/WCMS_545487/lang--en/index.htm.

Esparcia, Javier. 2016. “From business to territorial and social networks in rural development? Experiences from rural Valencia (Spain).” In Sustainability and Short-Term Policies: Improving Governance in Spatial Policy Interventions, edited by Sjöblom, Stefan; Andersson, Kjell and Skerratt, Sarah. New York. Routledge. Taylor and Francis group.

FIDH. 2015. “Lao Movement for Human Rights.” International Federation Human Rights, Lao Movement for Human Rights. Joint UPR Submission Lao People’s Democratic Republic 21st Session (January-February 2015). International Federation for Human Rights. https://www.fidh.org/IMG/pdf/20140615_lao_pdr_upr__submission_en.pdf

Fiol, C. Marlene, and A. Lyles, Marjorie. 1985. “Organizational Learning.” The Academy of Management Review 10 (4): 803–13. doi.0.2307/258048.

Fisher, Janet A., Patenaude, Genevieve; Giri, Kalpana; Lewis, Kristina; Meir, Patrick; Pinho, Patricia; D. A. Rounsevell, Mark; and Williams, Mathew. 2014. “Understanding the Relationships between Ecosystem Services and Poverty Alleviation: A Conceptual Framework.” Ecosystem Services. Elsevier, vol. 7(C), pages 34–45. https://doi.org/10.1016/j.ecoser.2013.08.002.

Folke, Carl. 2006. “Resilience: The emergence of a perspective for social–ecological systems analyses, Global Environmental Change” in Resilience, Vulnerability, and Adaptation: A Cross-Cutting Theme

of the International Human Dimensions Programme on Global Environmental Change, edited by Janssen, Marco A.Janssen and Ostrom, Elinor. Volume 16, Issue 3: 253-267, ISSN 0959-3780, https://doi.org/10.1016/j.gloenvcha.2006.04.002

Folke, Carl; Jr Pritchard; Berkes, Fikret ; Colding, Johan; and Svedin. Uno, 2007. "The Problem of Fit between Ecosystems and Institutions: Ten Years Later." Ecology and Society 12 (1). https://doi.org/10.5751/ES-02064-120130.

Forestry Administration. 2013. "Community Forestry Statistic in Cambodia 2013." Cambodian Government. Department of Forest and Community Forestry. Phnom Penh. https://data.opendevelopmentmekong.net/dataset/52de3151-cef6-4e35-bcc8-4cb55119ca13/resource/4d659a27-d64d-4b58-a095-bfab97dcf574/download/communityforestrystatisticsjune2013.pdf

Frankenberger, Timothy R.; Spangler, Tom; Nelson, Suzanne ; and Langworthy, Mark. 2012. "Enhancing Resilience to Food Insecurity amid Protracted Crisis." High-level expert forum on food insecurity in protracted crises. TANGO International Inc. Rome. http://technicalconsortium.org/wp-content/uploads/2014/05/Enhancing-resilience-to-food-insecurity-amid-protracted-crises1.pdf

Fujioka, Rika. 2002. "CASE STUDY ON EDUCATION OPPORTUNITIES FOR HILL TRIBES IN NORTHERN THAILAND." FAO. RAP Publication 2002/05 http://www.fao.org/docrep/004/ak216e/ak216e04.htm#P164_25549.

Fujisaki, Taiji. 2013. "Cambodia REDD+ Readiness - State of Play." IGES Discussion Paper 2013-02. Biodiversity and Forests. Institute for Global Environmental Strategies. Kanagawa. https://www.iges.or.jp/en/pub/cambodia-redd-readiness-state-play-june-2013/en

Gallopín, Gilberto C. 2006. "Linkages between Vulnerability, Resilience, and Adaptive Capacity." Global Environmental Change, Resilience, Vulnerability, and Adaptation: A Cross-Cutting Theme of the International Human Dimensions Programme on Global Environmental Change, 16 (3): 293–303. https://doi.org/10.1016/j.gloenvcha.2006.02.004.

Garvin, David A. 1993. "Building a Learning Organization." Harvard Business Review 71 (4): 78–91. https://hbr.org/1993/07/building-a-learning-organization

Giddens, Anthony. 1984. "The Constitution of Society" Introduction of the Theory of Structuration /. Berkeley : University of California Press.

GIZ. 2015. "Land Tenure Security for Pu Trom Community in Mondulkiri: An Indigenous People Community Is Celebrating the Receipt of Their Collective Land Title." GIZ Cambodia. Publications. Monthly archives: December 2015. http://giz-cambodia.com/land-tenure-security-for-pu-trom-community-in-mondulkiri-an-indigenous-people-community-is-celebrating-the-receipt-of-their-collective-land-title/.

Global Witness. 2013. "Rubber Barons: How Vietnamese Companies and International Financiers Are Driving the Land Grabbing Crisis in Cambodia and Lao." Open Development Cambodia. ISBN: 9780957322875. Global Witness. London. https://www.globalwitness.org/.../rubber_barons_lores_0_1.pdf.

Greslikova, Ivana. 2016. "Visiting The Indigenous White Karen Hill Tribes in Thailand." No Mad Is Beautiful. Weblog. Accessed February 18, 2016. https://nomadisbeautiful.com/travel-blogs/visiting-indigenous-

white-karen-hill-tribes-thailand/.

Gryseels, C. 2017. “Resistant Humans, Mosquitos and Parasites in Cambodia: Producing contested evidence for malaria elimination strategies in the margins of a repellent trial” Amsterdam: Universiteit van Amsterdam, Faculteit der Maatschappij- en Gedragswetenschappen https://dare.uva.nl/search?identifier=a7be451a-a95c-461f-bdea-09ff7f732fba.

Gunderson, Lance; Kinzig, Ann; Quinlan, Allyson and Walker, Brian. 2010. “Assessing Resilience in Social Ecological Systems” Revived version 2.0. Workbook for practitioners. Resilience Alliance. http://www.resalliance.org/3871.php.

GVN. 2011. “Decree No.29/2011/ND-CP on Strategic environmetal Assessment, environmental impact assessment, environmental protection commitment” Part I. Legal Documents. Vietnamese government. Hanoi. http://faolex.fao.org/docs/pdf/vie107003.pdf.

Hall, Derek R.; Hirsch, Philip ; and Li, Tania. 2011. “Powers of Exclusion” Land Dilemmas in Southeast Asia. Challenges of the Agrarian Transition in Southeast Asia (ChATSEA). Honolulu: University of Hawaii Press.

Hays, Jeffrey. 2008a. “Hill Tribes in Thailand.” Facts and Details. Weblog. 2008. http://factsanddetails.com/southeast-asia/Thailand/sub5_8b/entry-3226.html.

Hays, Jeffrey. 2008b. “HIGHLANDERS IN VIETNAM | Facts and Details.” Weblog 2008. http://factsanddetails.com/southeast-asia/Vietnam/sub5_9d/entry-3395.html.

Hirsch, Philip, and Scurrah, Natalia. 2015. “The Political Economy of Land Governance in the Mekong Region: Contexts of Policy Advocacy.” Conference Paper No. 48. Chiang Mai University. https://www.iss.nl/fileadmin/ASSETS/iss/Research_and_projects/Research_networks/LDPI/CMCP_48-Hirsch___Scurrah.pdf.

Human Rights Watch. 2002. “*Repression Of Montagnards: Conflicts over Land and Religion in Vietnam's Central Highlands.”*, edited by Jones, Sidney; Saunders, Joe; Malcolm, Smart. Human Rights Watch. USA.

Ifejika Speranza, Chinwe. 2010. “Resilient Adaptation to Climate Change in African Agriculture.” Studies. Volume 54. German Development Institute/ Deutsches Institut für Entwicklungspolitik (DIE). Bonn

Ifejika Speranza, Chinwe. 2013. “Buffer Capacity: Capturing a Dimension of Resilience to Climate Change in African Smallholder Agriculture.” Regional Environmental Change 13 (3): 521–35. https://doi.org/10.1007/s10113-012-0391-5.

Ifejika Speranza, Chinwe; Wiesmann, Urs; and Rist, Stephan. 2014. “An Indicator Framework for Assessing Livelihood Resilience in the Context of Social–Ecological Dynamics.” Global Environmental Change 28 (September): 109–19. Elsevier: https://doi.org/10.1016/j.gloenvcha.2014.06.005.

Janssen, Marco; Bodin, Örjan; Anderies, John; Elmqvist, Thomas; Ernstson, Henrik; R. J. McAllister, Ryan; Olsson, Per; and Ryan, Paul. 2006. “Toward a Network Perspective of the Study of Resilience in Social-Ecological Systems.” Ecology and Society 11 (1). https://doi.org/10.5751/ES-01462-110115.

Kasperson, Jeanne X.; E. Kasperson, Roger; B. L. Turner, Hsieh, Wen; and Schiller, Andrew. 2005. “Vulnerability to Global Environmental Change.” In Social Contours of Risk, edited by Jeanne X.

Kasperson and Roger E. Kasperson. Vol II. Risk Analysis, Corporations and the Globalization of Risk. Routledge.

Keck, Markus. 2012. "Market Governance and Social Resilience: The Organization of Food Wholesaling in Dhaka, Bangladesh" dissertation thesis. University of Bonn.

Keck, Markus, and Sakdapolrak, Patrick. 2013. "What Is Social Resilience? Lessons Learned and Ways Forward." Erdkunde 67 (1): 5–19. https://doi.org/10.3112/erdkunde.2013.01.02.

Kenney-Lazar, Miles. 2015. "Authoritarian Resource Governance and Emerging Resistance in the Context of Sino-Vietnamese Tree Plantations, Southeastern Lao." BRICS Initiatives for Critical Agrarian Studies (BICAS), MOSAIC Research Project, Land Deal Politics Initiative (LDPI), RCSD Chiang Mai University, Transnational Institute. https://doi.org/10.13140/RG.2.1.3361.4965. https://www.tni.org/files/download/bicas_working_paper_1_kenney_lazar.pdf

Kham, Vanda; Nun, Assachan; Chea, Malika and Htay WIN, Moh Moh. 2016. "Collective Land Registration of Indigenous Communities in Ratanakiri Province." Briefing Note Senate Region 8. Parliamentary Institute of Cambodia. https://www.pic.org.kh/images/2016Research/20170523%20Collective%20Land%20Registration_Ratanakiri%20province_Eng.pdf

Kim, Daniel. 1993. "The Link Between Individual And Organizational Learning." Sloan Management Review 1. Fall 1993; 35, 1; ABI/INFORM Global pg. 37. https://doi.org/10.1016/B978-0-7506-9850-4.50006-3. https://sloanreview.mit.edu/article/the-link-between-individual-and-organizational-learning/

Kim, Hoang; Van Bien, Pham; and R.H. Howeler. 2000. "A Review of Cassava in Asia with Country Case Studies on Thailand and Vietnam." Proceedings of the validation forum on the global cassava development strategy. Vol 3. FAO and IFAD. Rome. http://www.fao.org/docrep/009/y1177e/Y1177E05.htm.

King, Victor T. 1996. "Environmental Change in Malaysian Borneo. Fire, Drought and Rain." In Environmental Change in South-East Asia: People, Politics and Sustainable Development, Global Environmental Change Programme, edited by Michael Parnwell and Raymond Bryant, 165–89. London [u.a]: Routledge.

Lang, Chris. 1996. "The Legacy of Savage Development: Colonisation of Vietnam's Central Highlands." in Watershed: People's forum on ecology, edited by Witoon Permpongsacharoen. Vol.1 No.2. p.36. Towards Ecological Recovery and Regional Alliance (TERRA). Bangkok. https://chrislang.org/1995/11/01/the-legacy-of-savage-development-colonisation-of-vietnams-central-highlands/.

Lang, Chris. 2006. "Lao: Vietnamese Companies Set up Rubber Plantations in the South." World Rainforest Movement. Bulletin 113. Uruguay. https://chrislang.org/2006/12/27/laos-vietnamese-companies-set-up-rubber-plantations-in-the-south/.

LICADHO. 2016. "Cambodia's Concessions." LICADHO and University of Maryland. http://www.licadho-cambodia.org/land_concessions/.

LIWG. 2012. “Introduction to Lao Land Issues: Managing Land, Forests and Natural Resources: Growing in equity or growing inequity?” Land Issues Working Group. http://www.laolandissues.org/wp-content/uploads/2011/12/NEW-Introduction-to-Lao-Land-Issues-2012-ENG-updated-05-2013.pdf.

Long, Norman. 2001. “Development Sociology: Actor Perspectives” Routledge. Taylor and Francis Group. London and New York.

Lorenz, Daniel F. 2010. “The Diversity of Resilience: Contributions from a Social Science Perspective.” Natural Hazards: Journal of the International Society for the Prevention and Mitigation of Natural Hazards, Springer;International Society for the Prevention and Mitigation of Natural Hazards, 67 (1): 7–24. https://doi.org/10.1007/s11069-010-9654-y.

Luers, Amy L. 2005. “The Surface of Vulnerability: An Analytical Framework for Examining Environmental Change.” Global Environmental Change 15 (3): 214–23. https://doi.org/10.1016/j.gloenvcha.2005.04.003.

Machlis, G.E.; Force, Jo; and Balice, Randy. 1990. “Timber, Minerals, and Social Change: An Exploratory Test of Two Resource-Dependent Communities.” Rural Sociology 55 (January): 411–24.

MARD. 2008. “Circular 127/2008/TT-BNN: Guidance on Planting Rubber Trees on Forestland.” Ministry of Agriculture and Rural Development. Vietnam. https://www.global-regulation.com/translation/vietnam/2960667/circular-no.-127-2008-tt-bnn%253a-guide-the-planting-of-rubber-on-the-forest-land.html https://thuvienphapluat.vn/van-ban/Tai-nguyen-Moi-truong/Thong-tu-127-2008-TT-BNN-trong-cao-su-dat-lam-nghiep-83750.aspx

MARD. 2009. “Circular 127/2008/TT-BNN: Guidance on Planting Rubber Trees on Forestland.” Ministry of Agriculture and Rural Development. Vietnam. https://www.global-regulation.com/translation/vietnam/2959843/circular-58-2009-tt-bnnptnt%253a-a-guide-to-the-cultivation-of-rubber-trees-on-forest-land.html https://thuvienphapluat.vn/van-ban/Tai-nguyen-Moi-truong/Thong-tu-58-2009-TT-BNNPTNT-trong-cao-su-dat-lam-nghiep-94633.aspx

Marschke, Melissa and Berkes, Fikret. 2006. “Exploring Strategies that Build Livelihood Resilience: a Case from Cambodia.” Article 42. Ecology and Society 11(1):1-16 http://www.ecologyandsociety.org/vol11/iss1/art42/.

Marschke, Melissa. 2016. “Exploring Rural Livelihoods Through the Lens of Coastal Fishers.” In Handbook of Contemporary Cambodia, edited by K. Brickell and S. Springer, 101-110. 1st ed. Routledge.

McCarthy, James; Canziani, Osvaldo; Leary, Neil; Dokken, David; and White, Kasey. 2001. “Climate Change 2001: Impacts, Adaptation and Vulnerability.” Third Assessment Report of the Intergovernmental Panel on Climate Change. IPCC. Cambridge University Press. https://www.grida.no/publications/269.

Milestad, Rebecka. 2003. “Building Farm Resilience: Challenges and Prospects for Organic Farming” Journal of Sustainable Agriculture, 22:3, 81-97, DOI: 10.1300/J064v22n03_09

Milestad, Rebecka, and Darnhofer, Ika. 2008. “Building Farm Resilience: The Prospects and Challenges of Organic Farming.” Journal of Sustainable Agriculture 22: 81–97.

https://doi.org/10.1300/J064v22n03_09.

Milner-Gulland, E. J. 2012. “Interactions between Human Behaviour and Ecological Systems.” Philosophical Transactions of the Royal Society B: Biological Sciences 367 (1586): 270–78. https://doi.org/10.1098/rstb.2011.0175.

MLMUPC. 2016. “Summary CIDA’s Supported Cambodia’s LASSP Through CLASP.” Ministry of Land Management, Urban Planning, and Construction. Cambodia http://mlmupc.gov.kh/index.php?page=detail&menu1=375&menu2=414&ctype=article&id=414&lg=en.

Narayan, Deepa, and Pritchett, Lant. 1999. “Cents and Sociability: Household Income and Social Capital in Rural Tanzania.” Economic Development and Cultural Change 47 (4): 871–97. The University of Chicago Press. https://doi.org/10.1086/452436.

NASA LP DAAC. 2009. “Land Cover Type Yearly L3 Global 500 m SIN Grid.” USGS Earth Resources Observation and Science (EROS). Center. https://lpdaac.usgs.gov/dataset_discovery/modis/modis_products_table/mcd12q1.

NASA LP DAAC. 2013. “Land Cover Type Yearly L3 Global 500 m SIN Grid.” USGS Earth Resources Observation and Science (EROS). Center. https://lpdaac.usgs.gov/dataset_discovery/modis/modis_products_table/mcd12q1.

NASA LP DAAC. 2016. “Highlights from the NASA DEVELOP National Program Summer 2015 Term.” Land Processes Distributed Active Archive Center. https://lpdaac.usgs.gov/user_resources/data_in_action/highlights_nasa_develop_national_program_summer_2016_term.

Natural Justice. 2013. “Impacts of Private Land Titling in Indigenous Communities in Cambodia.” Natural Justice. Cape Town. http://naturaljustice.org/impacts-of-private-land-titling-in-indigenous-communities-in-cambodia/.

Nay, Rong. 2010. “History: Highlander Human Rights Organization (MHRO) - Defending Human Rights in the Central Highlands of Vietnam.” Montagnard Human Rights Organization. North Carolina. http://www.mhro.org/montangards-history.

Neef, Andreas; Touch, Siphat and Chiengthong; Jamaree. 2013. “The Politics and Ethics of Land Concessions in Rural Cambodia.” Journal of Agricultural and Environmental Ethics 26 (6): 1085–1103. https://doi.org/10.1007/s10806-013-9446-y.

Nghiem, Hai. 2015. “Environmental Impact Assessment.” Ministry of Natural Resources and Environment. Vietnam. http://www.aecen.org/sites/default/files/05_presentation_on_eia_vietnam.pdf.

Norgaard, Richard B. 1994. “Development Betrayed” The End of Progress and a Coevolutionary Revisioning of the Future. London and New York [u.a.]: Routledge.

Nguyễn, Sinh Hùng. 2009. “Decision No. 750/QD-TTg: The Approval of the Planning on Development of Rubber Tree up to 2015, with a Vision toward 2020.” The Prime Minister Office. Hanoi. Vietnam. https://vanbanphapluat.co/decision-no-750-qd-ttg-of-june-3-2009-approving-the-planning-on-development-of-rubber-tree-up-to-2015-with-a-vision-toward-2020

Obein, François. 2007. “Industrial Rubber Plantation of the Viet-Lao Rubber Company, Bachiang District,

Champasack Province: Assessment of the Environmental and Social Impacts Created by the VLRC Industrial Rubber Plantation and Proposed Environmental and Social Plans." Final report. Agence Francaise de Développement, Earth Systems Lao. http://dev.rightslinklao.org/wp-content/uploads/downloads/2014/06/04-afd-vlrc_rubber_plantation_in_bachiang_district.pdf.

Obrist, Brigit; Pfeiffer, Constanze and Henley, Bob. 2010. "Multi-Layered Social Resilience: A New Approach in Mitigation Research." Progress in Development Studies 10 (September): 283–93. https://doi.org/10.1177/146499340901000402.

ODC. 2015a. "Development and Assistance for Land Tenure and Land Titling." Open Development Cambodia. https://opendevelopmentcambodia.net/topics/development-and-assistance-for-land-tenure-and-land-titling/.

ODC. 2015b. "Land Tenure and Land Titling." Open Development Cambodia (ODC). 2015. https://opendevelopmentcambodia.net/topics/land-tenure-and-titling/.

Oldenburg, Christoph, and Neef, Andreas. 2013. "Competing Frameworks and Perspectives on Land Property in Cambodia." Paper prepared for 2013 Law and Development Conference. Kyoto, Japan. https://www.lawanddevelopment.net/img/2013papers/ChristophOldenburg-AndreasNeef.pdf

Oldenburg, Christoph, and Neef, Andreas. 2014. "Reversing Land Grabs or Aggravating Tenure Insecurity? Competing Perspectives on Economic Land Concessions and Land Titling in Cambodia." Law and Development Review 7 (1): 49–77. https://doi.org/10.1515/ldr-2014-0014.

Onion, Rebecca. 2013. "Great moments in military history: he Snake-Eaters and the Yards." Slate, New York. http://www.slate.com/articles/news_and_politics/american_military_history/2013/11/the_green_berets_and_the_highlanders_how_an_indigenous_tribe_won_the_admiration.html.

O'Riordan, Timothy; Cooper, Chester; Jordan, Andrew; Rayner, Steve; Richards, Kenneth; Runci, Paul and Yoffe, Shira. 1998. "Institutional Frameworks for Political Action." In Human Choice & Climate Change, edited by Steve Rayner and Elizabeth Malone, 1:345–439. The Societal Framework. Washington: DC: Battelle Press.

Ostrom, Elinor. 1990. "Governing the Commons: The Evolution of Institutions for Collective Action" 1st edition. Cambridge; New York: Cambridge University Press.

Ostrom, Elinor. 2000. "Private and Common Property Rights." Encyclopedia of Law and Economics, Vol. II: Civil Law and Economics. Cheltenham, England. Edward Elgar.

Padwe, Jonathan. 2016. "Cambodian's Highlanders. Land, Livelihoods, and the Politics of Indigeneity." Handbook of Contemporary Cambodia, edited by K. Brickell and S. Springer, 1st ed. Routledge.

Park, Clara Mi Young, and Margherita Maffii. 2015. "Landscapes of Control and Appropriation: The Missing Indigenous Woman." Land grabbing, conflict and agrarian-environmental transformations: perspectives from East and Southeast Asia. Conference paper no.8. The regional center for social science and sustainable development. Chiang Mai University. BRICS Initiatives for Critical Agrarian Studies (BICAS).

Pelling, Mark. 1998. "Participation, Social Capital and Vulnerability to Urban Flooding in Guyana." Journal of International Development 10 (February): 469–86. https://doi.org/10.1002/(SICI)1099-

1328(199806)10:43.0.CO;2-4.

Persoon, Gerard A.; Eindhoven, Myrna; B. Modina, Rolando and M. Aquino, Dante. 2007. "Indigenous Peoples In Southeast Asia: SHARING KNOWLEDGE - BUILDING CAPACITY - FIGHTING POVERTY - SAVING DIVERSITY" Regional Network for Indigenous Peoples in Southeast Asia (RNIP). Leiden University Press. Leiden.

Phak, Seangly. 2014. "Grave sites cleared by rubber firms: NGOs." Text. The Phnom Penh Post. February 25, 2014. http://www.phnompenhpost.com/national/grave-sites-cleared-rubber-firms-ngos.

Phorn, Rina. 2011. "Sun Chay requests Prime Minister to protect indigenous people's land." Radio Free Asia, 2011. https://www.rfa.org/khmer/news/srp_mp_asks_pm_2protect_ethnic_minority_land-08172011032436.html

Phuc, To Xuan, and Huu Nghi, Tran. 2014. "Rubber Expansion and Forest Protection in Vietnam." Publications. TROPENBOS International. The Netherlands. http://www.tropenbos.org/publications/rubber+expansion+and+forest+protection+in+vietnam.

Pia, He, and K. Martin. 2015. "Effects of Rubber Cultivation on Biodiversity in the Mekong Region." CAB Reviews 10 (044): 1–7. https://www.cabdirect.org/cabdirect/abstract/20163022694.

Pretty, Jules, and Smith, David. 2004. "Social Capital in Biodiversity Conservation and Management." Conservation Biology 18 (3): 631–38. https://doi.org/10.1111/j.1523-1739.2004.00126.x.

Putnam, Robert D.; Leonardi, Robert and Y. Nanetti, Raffaella. 1994. "Making Democracy Work" Civic Traditions in Modern Italy. 1st edition. Princeton, NJ: Princeton University Press.

Rabe, Alison. 2014. "Investment and Land Titling Failures in Northeastern Cambodia: Indigenous Communities' Need for Legal Empowerment." Business Peace and Sustainable Development 3. Greenleaf Publishing.

Rambo, A. Terry. 1995 "Defining highland development challenges in Vietnam: Some themes and issues emerging from the conference" In the Challenges of Highland Development in Vietnam, edited by Rambo, A. Terry; Cuc, Le Trong; R. Digregorio, Michael; and R. Reed, Robert, xi-xxvii. Honolulu, Program on Environment. East-West Center.

Ratha, Visal. 2011. "Three indigenous people were summoned to the court over land conflict." Radio Free Asia. https://www.rfa.org/khmer/news/3_summoned_in_land_dispute-08092011061329.html.

Ratha, Visal. 2015. "Cassava farmers in Ratanakiri are hopeless when the price drops," 2015. https://www.rfa.org/khmer/news/social-economy/cassava-price-decrease-in-rattanakiri-01172015025426.html.

RGC. 1999. "Sub-Decree on Environmental Impact Assessment Process." Royal Government of Cambodia. http://www.cambodiainvestment.gov.kh/sub-decree-72-anrk-bk-on-environment-impact-assessment-process-pdf_990811.html

RGC. 2000. "Prakas on Guideline for Conducting Environmental Impact Assessment Report." Royal Government of Cambodia. http://www.sustinatgreen.com/uploads/document/Cambodia-Guidline%20For%20Conducting%20EIA-E.pdf

RGC. 2002a. “Preah Reach Kram: Forestry Law.” Royal Government of Cambodia. http://extwprlegs1.fao.org/docs/pdf/cam50411.pdf

RGC. 2002b. “Sub Decree No. 47 on Organization and Functioning of the Cadastral Commission.” Royal Government of Cambodia. https://data.opendevelopmentmekong.net/laws_record/sub-decree-on-the-organization-and-functioning-of-the-cadastral-commission.

RGC. 2002c. “Sub Decree No. 46 on the Procedures to Establish Index Map and Land Register.” Royal Government of Cambodia. https://data.laos.opendevelopmentmekong.net/en/laws_record/sub-decree-on-the-procedures-to-establish-cadastral-index-map-and-land-register

RGC. 2002d. “Sub Decree No. 48 on Sporadic Land Registration.” Royal Government of Cambodia. https://data.opendevelopmentcambodia.net/laws_record/sub-decree-on-sporadic-land-registration

RGC. 2003. “Sub-Decree No. 79 on Community Forestry Management.” Royal Government of Cambodia. https://data.opendevelopmentcambodia.net/en/laws_record/sub-decree-no-79-on-community-forestry-management

RGC. 2009. “Sub Decree 83 ANK,BK On Procedures of Regristration of Land oF Indigenous Communities.” Royal Government of Cambodia. https://data.opendevelopmentmekong.net/en/laws_record/sub-decree-no-83-on-procedure-of-indigenous-communal-land-registration

RGC. 2010. “National Strategic Development Plan Update 2009-2013” Royal Government of Cambodia. Royal Government of Cambodia. http://www.cambodiainvestment.gov.kh/wp-content/uploads/2011/09/Library_MPSP_english.pdf

RGC. 2013. “Prakas No.81 on Establishment and Management of Community Forestry in Ratanakiri Province.” Cambodian Ministry of agriculture forestry and fisheries. https://data.opendevelopmentmekong.net/en/laws_record/prakas-no-81-on-establishment-and-management-of-community-forestry-in-ratanakiri-provinc

RGC. 2015. “Notification No.678 on Result of the Inter-Ministerial Committee’s Meeting for Assessment, Measurement and Evaluation of ELCs Dated on 15 June 2015.” The office of the council of ministers. 2015. https://opendevelopmentcambodia.net/dataset/?id=prakas-no-678-23-06-2015.

Rouse, J. W.; Haas, R. H.; Schell, J. A. and Deering, D. W.. 1974. “Monitoring Vegetation Systems in the Great Plains with ERTS.” Conference paper. Paper A20. NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A. https://ntrs.nasa.gov/search.jsp?R=19740022614.

Sallu, Susannah; Twyman, Chasca; and Stringer, Lindsay. 2010. “Resilient or Vulnerable Livelihoods? Assessing Livelihood Dynamics and Trajectories in Rural Botswana.” Ecology and Society 15 (4). https://doi.org/10.5751/ES-03505-150403.

Scheffer, Marten; Carpenter, Steve; Foley, Jonathan A.; Folke, Carl; and Walker, Brian. 2001. “Catastrophic shifts in ecosystems” *Nature* **413,** 591–596 (2001). https://doi.org/10.1038/35098000

Scheidel, Arnim; N. Farrell, Katharine; Ramos-Martin, Jesús; Giampietro, Mario; and Mayumi, Kozo. 2014. “Land Poverty and Emerging Ruralities in Cambodia: Insights from Kampot Province.” Environment, Development and Sustainability 16 (4): 823–40. https://doi.org/10.1007/s10668-014-9529-6.

Schneider, Alison. 2011. “What Shall We Do without Our Land? Land Grabs and Resistance in Rural

Cambodia." Land deal politics initiative LDPI and Journal of peasant studies. International conference on global land grabbing. Institute of Development Studies. University of Sussex. https://data.opendevelopmentmekong.net/dataset/1bfbc5f6-0f88-494e-bfc3-c0a4f625e8b3/resource/cb65120b-4f90-4410-857c-4e2d05cc1ae4/download/0164a451-2d23-4b1b-943c-6edc00351008.pdf

Scoones, Ian. 2009. "Livelihoods perspectives and rural development." In Critical perspective in agrarian change and peasant studies. The Journal of Peasant Studies, 36:1, 171-196, DOI: 10.1080/03066150902820503

Sikor, Thomas. 1995. "Degree 327 and the restoration of Barren Land in the Vietnamese highlands" In the Challenges of Highland Development in Vietnam, edited by Rambo, A. Terry; Cuc, Le Trong; R. Digregorio, Michael; and R. Reed, Robert. Honolulu, Program on Environment. East-West Center. https://www.semanticscholar.org/paper/The-challenges-of-highland-development-in-Vietnam-Rambo/06399676a4be588c77628a79ca7b88f2bc91c05e

Smit, Barry; and Wandel; Johanna. 2006. "Adaptation, Adaptive Capacity and Vulnerability." Global Environmental Change, Resilience, Vulnerability, and Adaptation: A Cross-Cutting Theme of the International Human Dimensions Programme on Global Environmental Change, 16 (3): 282–92. https://doi.org/10.1016/j.gloenvcha.2006.03.008.

Smith, Neil. 2006. "There's No Such Thing as a Natural Disaster" Understanding Katrina (Perspectives from the Social Sciences). Social Science Research Council. http://understandingkatrina.ssrc.org/Smith/.

Springer, Simon. 2015. "Violent Neoliberalism" Development, Discourse, and Dispossession in Cambodia. 2015 edition. New York, NY: Palgrave Macmillan.

Thái, Huỳnh Anh Chi. 2016. "The Dynamics of Livelihood Pathways of the Indigenous People in Vietnam's Central Highlands under Land-Use Change Context: A Case Study of Community-Based Tourism." Ruprecht-Karls-Universität Heidelberg.

Thái, Huỳnh Anh Chi. 2018. "Livelihood Pathways of Indigenous People in Vietnam's Central Highlands" Exploring Land-Use Change. Springer.

The Phnom Penh Post. 2002. "Losing ground: Repression of Highlanders in Vietnam's Central Highlands." The Phnom Penh Post. http://www.phnompenhpost.com/national/losing-ground-repression-highlanders-vietnams-central-highlands.

Thet, Sambat, and McLeod, George. 2009. "Cassava prices nosedive." The Phnom Penh Post. http://www.phnompenhpost.com/business/cassava-prices-nosedive.

Thuy, Tuong. 2012. "Firms Bend over to Enter Rubber World | Investing | Funds and Investment Management." Vietnam Investment Review. 2012. http://www.vir.com.vn/firms-bend-over-to-enter-rubber-world.html.

Tucker, Will. 2015. "Lifting the Veil: Deforestation Disguised as Agriculture in Cambodia." Forest Trends. August 13, 2015. http://forest-trends.org/blog/2015/08/13/lifting-the-veil-deforestation-disguised-as-agriculture-in-cambodia/.

Turner, B. L.; E. Kasperson, Roger; A. Matsone, Pamela; J. McCarthy, James; W. Corell, Robert;

Christensene, Lindsey; Eckley, Noelle; et al. 2003. “A Framework for Vulnerability Analysis in Sustainability Science.” Proceedings of the National Academy of Sciences of the United States of America 100 (14): 8074–79. https://doi.org/10.1073/pnas.1231335100.

Ulrich, Anne; Ifejika Speranza, Chinwe; Roden, Paul; Kiteme, Boniface; Wiesmann, Urs and Nüsser, Marcus. 2012. “Small-Scale Farming in Semi-Arid Areas: Livelihood Dynamics between 1997 and 2010 in Laikipia, Kenya.” Journal of Rural Studies 28 (3): 241–51. https://doi.org/10.1016/j.jrurstud.2012.02.003.

UNDP. 2014. “Community-Based Resilience Analysis (CoBRA) Conceptual Framework and Methodology.” UNDP. http://www.undp.org/content/undp/en/home/librarypage/environment-energy/sustainable_land_management/CoBRA/cobra-conceptual-framework.html.

UNHRC. 2007. “Land Concession for Economic Purposes in Cambodia: A Human Rights Perspective.” United Nations, Cambodia Office of the High Commissioner for Human Rights. Phnom Penh. https://cambodia.ohchr.org/~cambodiaohchr/sites/default/files/Economic%20Land%20Concession%20-%20a%20human%20rights%20perspective%202007.pdf

USGS. 2009a. “Landsat 4-5 Thematic Mapper (TM) Level-1.” Data products. Earth Resources Observation and Science (EROS) Center. https://www.usgs.gov/centers/eros/science/usgs-eros-archive-landsat-archives-landsat-4-5-thematic-mapper-tm-level-1-data?qt-science_center_objects=0#qt-science_center_objects

USGS. 2009b. “Landsat 7 Enhanced Thematic Mapper Plus (ETM+) Level-1.” Data products. Earth Resources Observation and Science (EROS) Center. https://lta.cr.usgs.gov/LETMP.

USGS. 2009c. “Landsat 8 Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS) C1 Level-1.” Data products. USGS Earth Resources Observation and Science (EROS) Center. https://www.usgs.gov/centers/eros/science/usgs-eros-archive-landsat-archives-landsat-8-oli-operational-land-imager-and?qt-science_center_objects=0#qt-science_center_objects

USGS. 2015a. “Landsat 7 Enhanced Thematic Mapper Plus (ETM+) Level-1.” Data products. Earth Resources Observation and Science (EROS) Center. https://lta.cr.usgs.gov/LETMP.

USGS. 2015b. “Landsat 8 Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS) C1 Level-1.” Data products. USGS Earth Resources Observation and Science (EROS) Center. https://www.usgs.gov/centers/eros/science/usgs-eros-archive-landsat-archives-landsat-8-oli-operational-land-imager-and?qt-science_center_objects=0#qt-science_center_objects

Viet, Ho Cao; Gia Nho, Le Van and Van An, Nguyen. 2013. “Cassava Value Chain Analysis.” Australian Center for International Agricultural. Research. http://www.academia.edu/11748243/Cassava_Value_Chain_Analysis.

Voss, Martin. 2008. “The Vulnerable Can’t Speak. An Integrative Vulnerability Approach to Disaster and Climate Change Research.” BEHEMOTH - A Journal on Civilisation 1 (3): 39–56. https://doi.org/10.6094/behemoth.2008.1.3.730.

Walker, Brian; Holling, C.S.; Carpenter, Stephen; and Kinzig, Ann. 2004. “Resilience, adaptability and transformability in social–ecological systems.” Article 5. Ecology and Society **9**(2): 1-9

http://www.ecologyandsociety.org/vol9/iss2/art5/

Wayakone, Sengdeuane; Makoto, Inoue and Harashina. Sachihiko. 2013. "Environmental Impact Assessment in Lao PDR: A Comparative Study on the Gaps between Procedures and Practice with Reference to Japan." INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCES3 (no.6): 2080–2112. http://www.ipublishing.co.in/ijesarticles/thirteen/articles/volthree/EIJES31204.pdf.

Wellmann, Dominik. 2012. "The Legal Framework of State Land Leases and Concessions in the Lao PDR." Discussion paper. Integrated Rural Development in Poverty Regions of Lao (IRDP) under the Northern Upland Development Programme (NUDP). GIZ NU-IRDP. https://data.opendevelopmentmekong.net/dataset/discussion-paper-on-the-legal-framework-of-state-land-leases-and-concessions-in-the-lao-pdr/resource/7d018449-f79c-4eea-8953-7c18117248a5?type=library_record.

Wells-Dang, Andrew; Soe, Kyaw; Inthakoun, Lamphay; Tola, Prom; Socheat, Penh; Nguyen, T.T. Van; Chabada, Areerat and Youttananukorn, Worachanok. 2016. "A Political Economy of Environmental Impact Assessment in the Mekong Region." Water Alternatives 9 (February): 33–55.

Wiesmann, Urs; Ott, Cordula; Ifejika Speranza, Chinwe; Kiteme, Boniface; Müller-Böker, Ulrike; Messerli, Peter and Zinsstag, Jakob. 2011. "A Human Actor Model as a Conceptual Orientation in Interdisciplinary Research for Sustainable Development." In Research for Sustainable Development: Foundations, Experiences, and Perspectives, edited by Urs Martin Wiesmann and Hans Hurni, 6:231–56. Bern: Geographica Bernensia. https://doi.org/10.7892/boris.9027.

Win, May Kyi; E. Smith, Harold; and S. Nieminen, Gayla. 2005. "Historical Dictionary of Thailand" Historical dictionaries of Asia, Oceania, and the Middle East. 2nd edition. Lanham, Md.: Scarecrow Press

Wisner, Ben; Blaikie, Piers; Cannon, Terry and Davis, Ian. 2003. "At Risk: Natural Hazards, People's Vulnerability and Disasters" 2nd edition. Routledge.

Young, Sokphea. 2016. "Practices and Challenges towards Sustainability." In The Handbook of Contemporary Cambodia, edited by Katherine Brickell and Simon Springer, 111-122. 1st ed. Routledge.

Annex:

One-site research activities

Respondents:		**Tools:**	**Location:**
Chief of Village		Semi-structure	Office
Environmental officer		Semi-structure	Office
Forest admin officer		Semi-structure	Office
NTFP-Cambodia (NGO)		Semi-structure	Office
ELC: Krong Buk		Observation, document	Rubber plantation
ELC: CRD		Observation, document	Rubber plantation
ELC: Veasna		Observation, document	Rubber plantation
ELC: Heng Brother		Observation, document	Rubber plantation
Chief of the community		Semi-structure	Village center
Chief of Community forest		Semi-structure	Community forest
Minority group	Random household visits	Observation & Semi-structure	Village center
NTFP group	Focus group	Observation, group discussion	Community forest, village center
Agricultural group	Focus group	Observation, group discussion	Crop field, village center
Tourism group	Focus group	Observation, group discussion	Not available. Village center
Other groups	Focus group	Observation, group discussion	Not available, Village center
Resilience group	Case study	Observation, semi-structure	Working place, Village center
Vulnerable group	Case study	Observation, semi-structure	Working place, Village center

Questionnaire of Livelihood dynamics

1. Literacy level.

☐ Primary school ☐ Secondary school ☐ Senior High school ☐ Other

2. Main livelihood activities from 2009 to 2015. Reason in livelihood change.

Specific local events will be used instead of year if there are difficulty to recall.

2009 (Pre-plantation)	2013 (Young-rubber)	2015 (Mature rubber)
☐ NTFP	☐ NTFP	☐ NTFP
☐ Cash Crop	☐ Cash Crop	☐ Cash Crop
☐ Other	☐ Other	☐ Other

2.a Reasons for livelihood changes:

……

……..

3. Health condition: ability to use household labor, presence of disabled household members.

Husband	Wife	Children	Other members …….
☐ work	☐ work	☐ work	☐ work
☐ not work (……..…)	☐ not work (…….……)	☐ not work (……)	☐ not work (……..…)

4. 2017 Income source in USD (NTFP, Cash Crop, Labor, Livestock, Vegetable gardening… etc.).

NTFP	Cash Crop	Livestock	Vegetable gardening
Quantity …….	Quantity …….	Quantity …….	Quantity …….
Price …….	Price …….	Price …….	Price …….

Other

Quantity …….

Price …….

5. Labor income: Number of days of labor sale multiplied by income per man day.

Daily	Weekly	Monthly	By contract	Other …….
……..…. Riel	……..…. Riel	……..…. Riel	……..…. Riel	……..…. Riel
No. days ……	No. weeks ……	No. months ……		

6. Expenditure- recall consumption expenditure.

Food	Fertilizer	Health	Other …….

☐ Meat ……. Riel/d ☐ …… Riel/season ☐ …… Riel ☐ …… Riel
☐ Vegetable …. Riel/d ☐ …… Riel/year
☐ Rice …… Riel/month
☐ own meat
☐ own vegetable
☐ own rice

7. Dependency ratio. Number of non-working members is divided by total number of family members.

Total family member	Non-working number
…….. persons	…… persons

NTFP as main income source in 2017. Skip to question no.18 for those answer cash crop as main income source in 2017:

8. Forest products as proxy. Last rainy, last dry season.
☐ wood …… plies ☐ resin ……. liters ☐ wild vegetable …… kg ☐ meat …. kg
☐ other……

9. Number of years as NTFP users
……. years

10. Other non-subsistent activities being practiced
Answers in question no.4 and no.5

11. Increase in other assets due to membership in NTFP

12. Participation in resource protection among other members
…… times/3 months

13. Level of access to resources
☐ strict (……) ☐ easy (……..)

14. Income gained through membership
Answers in question no. 8

15. Means for resource protection.
☐ Car ☐ motorcycle ☐ gun ☐ GPS
☐ other (……..)
16. Participation access to information:

……..times/3months

☐ Listening ☐ Discussion

17. New ideas or practices a user learned from other users (and other actors) in the last season.

……

……..

Cash crop as main income source in 2017:

18. Crop yields as proxy. e.g. kilogram per hectare produced last season and last drought affected season.

☐ Cashew nut	☐ Cassava	☐ Other……
Last season	Last season	Last season
…….. kg/ha	…….. kg/ha	…….. kg/ha
Drought season	Drought season	Drought season
…….. kg/ha	…….. kg/ha	…….. kg/ha

19. Number of years in farming

……. years

20. Other non-farm skills being practiced

Answers in question no.4 and no.5

21. Increase in other assets due to membership in Agricultural Community

22. Labor support from group or family members

☐ planting ☐ harvesting ☐ transporting ☐ other ……

23. Use of group tools and equipment (what they can use)

☐ tractor ☐ plough ☐ buffalo ☐ other ……

24. Income gained through membership

Answers in question no. 8

25. Machinery, transportation means, equipment – their financial equivalents. (what they have)

☐ tractor ☐ plough ☐ buffalo ☐ other ……

26. Participation access to information: Number of times a farmer attended information events in the last season and farmer's actions in those events

……..times/season

☐ Listening ☐ Discussion

27. New ideas/practices a farmer learned from other farmers (and other actors) in the last season.

……

……..

Group discussion for resilience studies:

Group1: Resilience of subsistence livelihoods:

Buffer capacity.

- Human capital:
- Literacy level (*available in livelihood dynamics*)
- Experience as responsible NTFP users (*available in livelihood dynamics*)
- Other non-subsistence farming being practiced (*available in livelihood dynamics*)

- Physical capital:
- Forest products as proxy. Last rainy, last dry season. (*available in livelihood dynamics*)
- Livestock (*available in livelihood dynamics*)
- Vegetable garden (*available in livelihood dynamics*)
- Labor income: Number of days of labor sale multiplied by income per man day (*available in livelihood dynamics*)
- Expenditure- recall consumption expenditure (*available in livelihood dynamics*)
- Dependency ratio. Number of non-working members is divided by total number of family members (*available in livelihood dynamics*)

- Social capital:
- Increase in other assets due to membership in NTFP (*available in livelihood dynamics*)
- Participation in resource protection among other members (*available in livelihood dynamics*)
- Level of access to resources (*available in livelihood dynamics*)
- Income gained through membership (*available in livelihood dynamics*)

- Physical capital:
- Means for resource protection. Vehicles, tracking devices.

- Natural capital:
- Drought, Vegetation index and Phenology, Land cover type, tree cover percentage, Contour and stream network (*available in livelihood dynamics*)

Self-organization.

- Institution:
- Rules, regulations governing community forest, the uses of its resources.
- Technical and other Supports from stakeholders
- Partnership with Government, NGO.

- Cooperation and networks:
- Numbers and type of groups
- Numbers of meeting among NTFP users within the last 3 months
- Number of times a NTFP users missed the meeting in the last 3 months
- Trust: members use resources efficiently and effectively without control
- Reciprocity: Number of household engaged in resources protection

- Network structure:
- Network size, connectivity level, centralities, and network ties to improve and maintain resilience.
- Actors

- Opportunity for self-organization:
- NA

- Reliance on own resources:
- Inputs, contributed from members, for community forest management

Capacity for learning.

- Knowledge of threats and opportunities:
- Ability to analyze threat /potential opportunity to regenerate the resources.

- Shared vision:
- Policies on using NTFP, frequency of discussing core practice among members.

- Commitment to learning
- The regularity of the meeting, frequency of discussing the performance of the last season between NTFP users and NTFP management team, time spent per season for meeting on NTFP-related issues.

- Knowledge identification capacity:
- Knowledge of biodiversity, endangered species, its life cycles, time to collect NTFP, locations for certain species, care and protection of them.
- Planning: User's planned new practices for NTFP
- Participation access to information: Number of times a user attended information events in the last season and user's actions in those events (*available in livelihood dynamics*)
- Experimentation: New items/methods tested in the last season and how many adopted or dropped, new items/methods used in current season

- Openness: NTFP collection/management problems, number of times user discussed NTFP collection/management problems with other actors in the community during last season

- Knowledge sharing capacity:
- Number of users were informed by a user in the last season.

- Knowledge transfer capacity:
- New ideas or practices a user learned from other users (and other actors) in the last season. (*available in livelihood dynamics*)

- Functioning feedback mechanisms.
- Frequency of interaction with key actors in NTFP collection in the community in the last season (e.g. other users, officers, agricultural officers, environmental officers), new ideas and practices users learnt from these actors in the last season.

Group2: Resilience of non-subsistence livelihoods:

Buffer capacity.

- Human capital:
- Literacy level (*available in livelihood dynamics*)
- Number of years in farming (*available in livelihood dynamics*)
- Other non-farm skills being practiced (*available in livelihood dynamics*)
- Health condition: ability to use household labor, presence of disabled household members. (*available in livelihood dynamics*)

- Physical capital:
- Crop yields as proxy. e.g. kilogram per hectare produced last season and last drought affected season. (*available in livelihood dynamics*)
- NTFP, vegetable garden (*available in livelihood dynamics*)
- Livestock (*available in livelihood dynamics*)
- Labor income: Number of days of labor sale multiplied by income per man day (*available in livelihood dynamics*)
- Expenditure- recall consumption expenditure (*available in livelihood dynamics*)
- Dependency ratio. Number of non-working members is divided by total number of family members (*available in livelihood dynamics*)

- Social capital:
- Increase in other assets due to membership in Agricultural Community (*available in livelihood dynamics*)

- Labor support from group members (*available in livelihood dynamics*)
- Use of group tools, equipment and infrastructure (*available in livelihood dynamics*)
- Income gained through membership (*available in livelihood dynamics*)

- Physical capital:
- Machinery, transportation means, infrastructure, equipment – their financial equivalents.

- Natural capital:
- Drought, Vegetation index and Phenology, Land cover type, tree cover percentage, Contour and stream network (*available in livelihood dynamics*)

Self-organization.

- Institution:
- Rules, regulations governing agricultural community.
- Technical and other supports from stakeholders
- Partnership with government, NGO.

- Cooperation and networks:
- Numbers and type of groups
- Numbers of meeting among farmers within the last 3 months
- Number of times a farmer missed the meeting in the last 3 mSelf-organization.
- Trust: Village members can generally trust each other in matters of lending and borrowing money
- Reciprocity: Number of households in labor exchange

- Network structure:
- Context specific attributes of the SES' network-structure that are desirable for maintaining and improving resilience (e.g. network size, density, degree, bonding, proximity, homogeneity, connectivity levels, centrality, and network ties).
- Actors

- Opportunity for self-organization:
- NA

- Reliance on own resources:
- Major source of farm inputs (farm/non-farm); duration or distance to input source – the shorter the time/distance required to access inputs the better the livelihood resilience. (*available in livelihood dynamics and check it again in group discussion*)

Capacity for learning.

- Knowledge of threats and opportunities:

- Ability to analyze threats/potential opportunities (e.g. threats to farm production and opportunities to increase production over the last season)

- Shared vision:

- Policies on farming and their fit with farmers' practices, number of farmers with same/similar practices, frequency of discussing core practices in an extension platform in the last season.

- Commitment to learning

- The regular meetings, access of all farmers in the community to the discussion, frequency of discussing the performance of a last season with the government, NGO, traders, and with other farmers, time spent per month to access needed production information.

- Knowledge identification capacity:

- Knowledge of prices for inputs and products (at beginning, middle of farm season and after harvest); of the best time to purchase and sell; of new agricultural practices in the area in the last season, frequency of consulting forecasts.
- Planning: Farmer's planned new practices in the next farm season
- Participation access to information: Number of times a farmer attended information events in the last season and farmer's actions in those events (*available in livelihood dynamics*)
- Experimentation: New items/methods tested in the last season and how many adopted or dropped, new items/methods used in current farming season
- Openness: Farm production/management problems, number of times farmer discussed farm production/management problems with other actors in the community during last season

- Knowledge sharing capacity:

- Number of farmers a farmer gave information/new methods to in the last season

- Knowledge transfer capacity:

- New ideas/practices a farmer learned from other farmers (and other actors) in the last season. (*available in livelihood dynamics*)

- Functioning feedback mechanisms.

- Frequency of interaction with key actors in farm production in the community in the last season (e.g. other farmers, agricultural officers, local politicians, NGO staffs, researchers, traders), new ideas and practices farmers learnt from these actors in the last season.

Questions during resilience discussion:

- What livelihood risks do indigenous people face? Would indigenous livelihoods be similar before and during the presence of ELCs?
- Is there evidence that indigenous people are taking different income generation activities?
- Are local government staffs able to consider specific needs of indigenous group?
- How are indigenous people differentially impacted by ELCs especially during/in the aftermath of the presence of ELCs?
- Do indigenous groups rightly use natural resources for their livelihood activities?
- Are there villagers' groups that take collective action to overcome their vulnerabilities?

Land cover conversion:

Land cover type	Landsat		MCD12Q1's mosaic
Evergreen broadleaf forest		⇨	
Woody savannas		⇨	
Cropland		⇨	

NATURWISSENSCHAFTLICH-MATHEMATISCHE GESAMTFAKULTÄT

COMBINED FACULTY OF NATURAL SCIENCES AND MATHEMATICS

RUPRECHT-KARLS-
UNIVERSITÄT
HEIDELBERG

Eidesstattliche Versicherung gemäß § 8 der Promotionsordnung für die Naturwissenschaftlich-Mathematische Gesamtfakultät der Universität Heidelberg / Sworn Affidavit according to § 8 of the doctoral degree regulations of the Combined Faculty of Natural Sciences and Mathematics

1. Bei der eingereichten Dissertation zu dem Thema / The thesis I have submitted entitled

   The Impacts of Economic Land Concession on Indigenous People's Livelihoods. Ratanakiri, Cambodia

   handelt es sich um meine eigenständig erbrachte Leistung / is my own work.

2. Ich habe nur die angegebenen Quellen und Hilfsmittel benutzt und mich keiner unzulässigen Hilfe Dritter bedient. Insbesondere habe ich wörtlich oder sinngemäß aus anderen Werken übernommene Inhalte als solche kenntlich gemacht. / I have only used the sources indicated and have not made unauthorised use of services of a third party. Where the work of others has been quoted or reproduced, the source is always given.

3. Die Arbeit oder Teile davon habe ich wie folgt/bislang nicht[1)] an einer Hochschule des In- oder Auslands als Bestandteil einer Prüfungs- oder Qualifikationsleistung vorgelegt. / I have not yet/have already[1)] presented this thesis or parts thereof to a university as part of an examination or degree.

   Titel der Arbeit / Title of the thesis: ……

   Hochschule und Jahr / University and year: ……

   Art der Prüfungs- oder Qualifikationsleistung / Type of examination or degree: ……

4. Die Richtigkeit der vorstehenden Erklärungen bestätige ich. / I confirm that the declarations made above are correct.

5. Die Bedeutung der eidesstattlichen Versicherung und die strafrechtlichen Folgen einer unrichtigen oder unvollständigen eidesstattlichen Versicherung sind mir bekannt. / I am aware of the importance of a sworn affidavit and the criminal prosecution in case of a false or incomplete affidavit.

Ich versichere an Eides statt, dass ich nach bestem Wissen die reine Wahrheit erklärt und nichts verschwiegen habe. / I affirm that the above is the absolute truth to the best of my knowledge and that I have not concealed anything.

. …… ……

Ort und Datum / Place and date Unterschrift / Signature

[1)] Nicht Zutreffendes streichen. Bei Bejahung sind anzugeben: der Titel der andernorts vorgelegten Arbeit, die Hochschule, das Jahr der Vorlage und die Art der Prüfungs- oder Qualifikationsleistung. / Please cross out what is not applicable. If applicable, please provide: the title of the thesis that was presented elsewhere, the name of the university, the year of presentation and the type of examination or degree.

The German text is legally binding.