UNIVERSITY OF TWENTE.

Community Forest Management

Conditions for its Success in the Maya Biosphere Reserve in Petén, Guatemala

Master's Thesis

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Abstract

This master's thesis analyses the conditions for successful Community Forest Management (CFM) in the Maya Biosphere Reserve in Petén, Guatemala. Following a comparative case-study, this thesis adopts the research question '*Under what conditions does CFM in the Maya Biosphere Reserve in Petén, Guatemala appear to be successful?*'.

By applying the theory of common-pool resource management, especially by Ostrom (1990, 1999), Agrawal (2003) and Pagdee et al. (2006), the conditions for successful CFM are explained as having low cost collective action.

The thesis reveals that the MBR has communities with successful and unsuccessful CFM. Conditions for successful CFM are low cost collective action, which include forest-dependency and a long and shared history (homogeneity) of the community, a small group size and clear property rights among other characteristics.

Conditions for unsuccessful CFM are high cost collective action, which include a non-forest-dependency and heterogeneity among group members, a big group size (population pressure) and unclear property rights among other characteristics.

Keywords: Common pool resource management - Community Forest Management - Maya Biosphere Reserve - community forest concessions - conditions for successful CFM

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List of Abbreviations

ACOFOP	Association of Forest Communities of Petén
CDM	Clean Development Mechanism
CONAP	National Council for Protected Areas
CFM	Community Forest Management
CPR	Common Pool Resources
FAO	Food and Agriculture Organization
FORESCOM	Community Forestry Concessions Enterprise
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
HA	Hectare
IPCC	International Panel on Climate Change
MBR	Maya Biosphere Reserve
MUZ	Multiple-Use Zone
NTFP	Non-Timber Forest Products
PFM	Participatory Forest Management
PA	Protected Area
PD	Prisoners Dilemma
POA	Annual Operational Plans
UNCEO	United Nations Conference on Environment and Development
USAID	United States Agency for International Development

1

Introduction

This chapter starts the thesis by describing why forests are crucial ecosystems and why they are essential for a stable world climate. Then, the importance of forests as natural resources for humans is stated. In addition, the reasons for forest loss are explained.

A definition of community forest management introduces this form of community-based forest management, which is seen as a solution to many problems of common-pool-resources.

The chapter subsequently presents the research question and the sub-questions of this research and shows the structure and the aim of this master's thesis.

1. Introduction

Worldwide, forests cover four billion hectares land. This resembles nearly 30% of the global land area (FAO, 2005). They are important stabilizing ecosystems for the world and its climate. For instance, forests remove huge amounts of greenhouse gases from the atmosphere and keep it in their biomass (King, 2008). Forests make photosynthesis which captures solar energy and carbon dioxide (CO_2) and converts them into stored carbon. By doing that, water and oxygen are released (FAO, 2012). According to Agrawal (2007), forests store more CO_2-emissions in its biomass alone than the entire atmosphere (283 Gt) does. In addition, Agrawal (2007) states that forests are crucial for the **'survival of humanity as a species'**. The FAO (2012) notes, that **'forests provide products and ecosystem services which are essential to the prosperity of humankind'**. Moreover, the FAO (2012) says that **'without forests the global ecosystem would collapse'**.
Forests provide many resources to humans culturally, socially and economically such as homes, food, cultural background, building materials, medicines and other products for millions of the poorest people (Lawrence et al., 2005; Lewis, 2006).

The management of the forests was mostly in the jurisdiction of central governments (Sikor, 2006). Most forests belong to governments (82%) (Carr, 2008). But according to authorities, local people could not manage their resources properly (Ostrom, 1990). However, governments more often give forest areas to communities for their own use (FAO, 2005).
Therefore, forests are a resource to economic development of rural people who live from and depend on the forest. For them, the forest represents the main opportunity to improve their living conditions to overcome their own local, environmental and development problems such as water-borne diseases, malnutrition, inadequate healthcare, poor education, indoor air pollution, transportation difficulties and lack of local job opportunities (Klooster and Masera, 2000).
However, governmental authorities in the developing world, for example in Guatemala, have supported the conversion from forests into other land use to stimulate economic development. In the past two decades, the world economy has almost tripled, from 24 trillion dollar in 1992 to 70 trillion dollar in 2011 (FAO, 2012). This was beneficial to millions of people. However, the wealth came at the price of negative externalities. Though the costs are not included in the gross domestic product (GDP), forest loss and its degradation are estimated to cost the global economy between 2 trillion and 4.5 trillion dollar a year (Sukhdev, 2010). Plus, forest loss also accelerates climate change (Lewis, 2006). A dilemma between rural economic development and forest conservation emerges. For example, forest conversion in Latin America changes the forest to pastoral and agricultural land or to soya or palm oil plantations (Lewis, 2006; Nasi and Frost, 2009). Thus, the forests in Central America were cleared at double rate of any other region in the world (FAO, 2001). For example, much of Guatemala's forest (38%) was cleared between 1966 and 1994 due to the settlement programmes in Petén (Bilsborrow and Carr, 2008).
Causes for deforestation and forest degradation are poverty, lack of secure land tenure, inadequate recognition of the rights and needs of forest-dependent indigenous and local communities, undervaluation of forest products and ecosystem services, lack of participation, lack of good governance and illegal trade (FAO, 2012).

1.1 Community Forest Management

At the United Nations Conference on Environment and Development (UNCEO), also known as the Rio Summit in 1992, the '*Brundtland'*-report introduced sustainable development as a policy goal on the level of world-politics. Sustainable development is a type of development **'to meet the needs of the present without compromising the ability of future generations to meet their own needs'** (UNs World Commission on Environment and Development, 1987). The outcome of that Summit has influenced the way forests and its inhabitants are treated by governments (Pokorny and Johnson, 2008). The central management of the forests was changed towards more decentralization.

Community Forest Management (CFM) has been seen as **'one of the most promising options to solve the dilemma of how to combine forest conservation with rural development and poverty reduction'** (Pokorny and Johnson, 2008). Barsimantov et al. (2011) state, that community forestry is **'the management of commonly owned forests for resource extraction, which can provide both forest conservation and communal income generation'**. **Pagdee, Kim and Daugherty (2006) define CFM 'as improving the livelihood and welfare of rural people and conserving natural forest systems through local participation and cooperation'**. Thus, CFM describes a human-ecosystem relationship that organizes human behavior and its interaction with forest resources (Pagdee et al., 2006).

CFM means that 'local community groups negotiate, define and guarantee among themselves an equitable sharing of the management functions, entitlements and responsibilities for a given set of natural resources' (Pagdee et al., 2006). In addition, Pagdee et al. (2006) state, that CFM uses formal and informal rules to **'ensure user rights and benefits and prevent outsiders and/or non-contributing members from benefiting from the group's management activities'**. This means that 'individuals share the uses, benefits, and responsibilities of their common resource' (Pagdee et al., 2006). Thus, CFM is a decentralized structure of forestry management. It is implemented as a goal to provide a significant sustainable income to the community members. However, if it is not applied correctly, CFM can increase ecological degradation, increase poverty and weaken governmental structures (Radachowsky et al., 2012).

1.2 Aim of the research

This master's thesis investigates under what conditions CFM seems to be successful in the Maya Biosphere Reserve (MBR) in Petén, Guatemala. The success of CFM in the MBR is measured by complying with the conditions of low cost collective action for common-pool resources. Therefore, this study adopts the following research question:

Under what conditions does CFM in the Maya Biosphere Reserve in Petén, Guatemala appear to be successful?

The sub-questions for answering the main-research question are:

1. *How can 'success' in CFM be defined?*

2. *What factors could potentially explain 'success' and 'failure' of CFM in MBR?*

3. *What are the characteristics of successful and unsuccessful communities with CFM in the MBR in Petén?*

4. *To what extent does the research support the theories of common-pool resource management propounded by Ostrom and others?*

1.3 Structure of the thesis

The thesis adopts the theoretical approach of common-pool resource management. In chapter two, the problems related to collective action are described, as well as the design principles of successful common-pool resource management. This means, the conditions for low cost collective actions are described. Plus, the principles of CFM are presented, just like more knowledge on property-rights is shown.

The third section presents the methodological choices made for the research. The study adopts the design of a comparative case study. **The dependent variable is the success of CFM in the MBR in Petén, Guatemala. The independent variables are the conditions influencing the success of CFM**. Secondary scientific data about CFM in the MBR provides the information on which this study is based.

Chapter four analyses the conditions that appear to lead to success in CFM in the MBR. The creation of the MBR in Petén and the legal requirements for the community forest concessions are also described. Then, the situation in the six communities practicing CFM in the MBR, which are divided into two groups, is presented based on the conditions for low cost collective action. To further analyse the conditions for successful CFM, one community from each group (*'Carmelita'* and *'Cruce a la Colorada'*) is shown. The characteristics of the two groups are also described.

Chapter five delivers the answer to the research question. Moreover, it also presents the implications and limits of this thesis and shows the recommendations for further studies.

1.4 Importance and Relevance of this Research

This research investigates CFM and the conditions for its success. Research on this topic is very important. Worldwide forests, especially tropical forests, suffer from deforestation due to a variety of reasons, such as economic interests for example. But forests are very important ecosystems which are crucial for the world's stable climate. This is why it is essential to know how humans can manage common-pool resources like forests. Successful CFM enables a sustainable use of the forest while social and economic conditions of the community members are improved. Therefore, it is crucial to know under what conditions community forestry appears to be successful.

2

Theory

This chapter outlines the theoretical expectations with regard to common-pool resource management. It starts by explaining the 'Tragedy of the Commons' as a negative consequence of individual behavior towards common natural resources.

This chapter explains under what conditions members of a community are expected to use a community forest under successful CFM.

2. Theory

2.1 Introduction

In this chapter the theoretical implications on which successful CFM is based, are presented. The human-nature interaction is a collective action-institution, governing common-pool resources. At first, the '*Tragedy of the Commons'* as a negative consequence of individual behavior is explained. Then, the common-pool resources are described. The next section explains how a common-pool resource can be governed and states what costs for collective action at the local level have to be handled. This is stated under the conditions for low cost collective action. After that, further information about CFM and the conditions for its successful practice are presented. The last section explains the property rights regimes and its access and withdrawal possibilities in a CFM situation.

2.2 The 'Tragedy of the Commons'

The most influential, basic assumptions about human organization in the context of common pool resource (CPR) management were made by Garret Hardin (1968) and are called '*The Tragedy of the Commons*'.
His theory, which is based on economic theory (Berkes, 1989), is of global importance. Hardin describes an important peril of human behavior and its negative consequences. One, on which many western resource managers base their management goals and policy decisions for developing countries ever since.
Hardin made two main conclusions. First, he argues that 'common property resources are open-access' (Richards, 1997). Secondly, he continues that everybody can and will use and overuse such a resource until it has been exploited. Everybody is only interested in his or her personal gain, without paying attention to the negative externalities. This behavior diminishes the common good and the joint-welfare. In such a situation, a '*Tragedy of the Commons'* has been triggered. Joint-welfare is put at risk.
Hardin argues that humans prioritize personal, short-term and selfish gains over public and long-terms gains. People want to enjoy the benefits of an action or resource without covering the social or ecological costs.
A *'Tragedy of the Commons'* explains many aspects of life. For example, the problems of international cooperation can also be explained with it. In its consequence, Hardin's model leads people to consume more benefits than the common good can bear. The problem, according to Hardin, is that one cannot be excluded from overconsumption. Thinking of a herder who adds more and more animals to his herd until the common grass is overexploited, Hardin (1968) stated:

'Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit – in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons'.

Aristotle already said 'what is common to the greatest number has the least care bestowed upon it. Everyone thinks chiefly of his own, hardly at all of the common interest' (Politics, Book II, ch.3).

In addition, Olsen (1965) describes the *'Tragedy of the Commons'* as 'the difficulty of getting individuals to pursue their joint welfare'.
To express the problems in economic words, it means that 'where a number of users have access to a common-pool resource, the total amount of resource units withdrawn from the resource will be greater than the optimal economic level of withdrawal' (Clark 1976, 1980; Dasgupta and Heal, 1979). Thus, over-using a common-pool resource is a problem of collective action, which leads to the so called *'Prisoners Dilemma'* (PD). A PD describes a paradox as Ostrom states (1990). It is the paradox that 'individually rational strategies lead to collectively irrational outcomes'. This challenges the 'fundamental faith that rational human beings can achieve rational goals' (Ostrom, 1990). Accordingly, a collective action describes the effort to avoid creating a PD.

The *'Tragedy of the Commons'* is a symbol for the degradation of the environment, which is expected to happen as soon as many individuals have access to a scarce resource in common (Ostrom, 1990). Ostrom and Cox (2010) argue that sustaining a resource is not happening in a long-term perspective, if no one has the rights to this resource, because this individual would not expect to receive any benefits from the resource.
In its consequence, Hardin's model leads people to consume more of the resource than the common good can bear, because no individual can be excluded from overconsumption.
Among the scientific world, there are many who also criticize the work of Hardin due to oversimplification of his theory. However, his work was and still is very influential (Dietz et al., 2003).
For forests, Hardin's assumptions mean that these natural resources are likely to be exploited until these ecosystems are destroyed. The individual gain drives the users of a forest to destroy the joint-benefit.

For the Maya Biosphere Reserve in Petén, Guatemala, the assumptions about individual behavior and the costs for society could mean that users of the forests would extract timber from the tropical forests in Petén until there is a massive forest loss. Users would only focus on their individual gain without paying attention to the negative externalities. This could trigger the destruction of the forest in the MBR.

2.3 Common Pool Resources

Richards (1997) defines a CPR as based on 'communal arrangements or rules that exclude or limit access to non-owners and regulate use among co-owners'. According to Richards (1997), a CPR management-system defines 'who controls the resource, how conflicts are resolved and how the resource is managed and exploited'. In the MBR, a CPR management would structure the use of the forest resources.
Thus, CPR management delivers answers on how to keep common resources in the long-term by avoiding the *'Tragedy of the commons'*. In the MBR in Petén, CPR management would explain how timber extraction can be managed without destroying the forest.

A good CPR-situation involves individuals who have the same cultural and social background, as Johnson and Libecap (1982) say, which includes views on ownership of assets, skills, knowledge, ethnicity and race.

Ostrom (1999) refers to the term CPR to describe resource-system 'regardless of the property rights involved'. Ostrom (1990) states that CPRs 'include natural and human-constructed resources in which

a) exclusion of beneficiaries through physical and institutional means is especially costly,
b) exploitation by one user reduces resource availability for others.

CPR include resources in ecosystems which are depletable and renewable at the same time such as fish, water or forests. When the average withdrawal rate of the benefit does not exceed the average rate of replenishment, the CPR is going to remain in the long-term. For the MBR in Guatemala, it means that the amount of timber taken out of the forest has to be small enough, so that the forest in the MBR can reproduce.
The difficulty of common-pool resource management is to establish a collective agreement to manage overcoming the *'Tragedy of the Commons'*. In terms of CFM, this means that a village or another group, who owns a particular area (usually the land they live on) uses it for their own purposes. Collectively, they have to decide upon the management of their forests. For example, they can decide if concessions may be given to logging firms and they may decide on others purpose with regards to the use of their forest (Klooster and Masera, 2000).

As a solution for the herders (of Hardin's example) who only think of their own gain with their many animals, a good CPR solution would mean, according to Ostrom (1990), that the herders come together, use a cooperative strategy and find themselves a binding contract, which they will carry out. Communication at several levels plays a central role within the process of decision-making (Allen et al., 2012). For CFM in the MBR, the inhabitants would need to come together, install rules about their access and their withdrawal rights to the forest and its products.

2.4 Collective Action Costs at the Local Level

Institutions, a complex of norms and behaviors that persists over time by serving some socially valued purpose (Uphoff, 1992), that govern the CFM are rarely only private or only public, usually it is a mixed form (Ostrom, 1990). According to Agrawal and Gibson (1999), an institution is 'a set of formal and informal rules and norms that shape interaction of humans with others and nature'.

A successful institution is one which 'enables individuals to achieve productive outcomes in situations where temptations to free-ride exist' (Ostrom, 1990). Free-riding occurs when someone enjoys a benefit of the resource without paying for the cost of keeping the resource (Ostrom, 1990).
In the MBR in Petén, free-riding occurs when firms or individuals engage in illegal logging or overuse their concession to a forest. They steal the natural resources from the forest, without paying the costs for keeping it. If everybody chooses to free-ride, the collective benefit, the forest, will be destroyed. Then, nobody can enjoy the benefit, not even the free-rider.

When focusing on the local level for collective action, the theory of institutional choice delivers rules which are necessary to organize a collective action. The research on institutional choice has developed a list of design principles for successful self-governance (Ostrom, 1990;

1999). McKean (2000) argues that institutional choice 'conceptualizes forestry as a problem of collective action by individual actors applying logics of individual rationality'.
Thus, **collective action helps to develop conditions under which 'groups of people are likely to develop enduring governance relations and utilize them for the definition and enforcement of operational rules'** (Sikor, 2006). These conditions take the characteristics of the resource, of the users and of external pressures on the forest into account. **Ostrom (1990) states that CPR management is likely to be successful when the collective action costs are low.**

According to Ostrom (1999), the following internal factors of the local individuals involved, can lead to failure of the CPR-management. In this case, the collective action costs are high:

- A very large number of individuals involved
- Poor people who have little attachment to their land or one another
- An extreme diversity of ethnic and cultural backgrounds
- Wealthier individuals who control benefit through illegal or questionable strategies

In addition, Ostrom (1990) also identified eight design principles with characteristics or conditions she found important for successful CPR-situations. These are shown in the table below.

Design Principles for Successful Collective Action-Institutions
1. Clearly defined boundaries
2. Congruence between appropriation and provision rules and local conditions
3. Collective-choice arrangements
4. Monitoring
5. Graduated sanctions
6. Conflict-resolution mechanisms
7. Minimal recognition of rights to organize
8. Nested enterprises

Table 1. Design Principles for successful Collective Action-Institutions (Ostrom, 1990)

The work of conditions for low cost collective action by Ostrom (1990) is widely recognized. But some critics or amendments to her work have been expressed as well. For example, Agrawal (2003) researches the conditions commonly associated with successful CPR-management. He uses the variables for successful management as identified by Ostrom (1990), Baland and Platteau (1996), Wade (1994). In summary, **Agrawal (2003) emphasizes the importance of a small size of the user group, a location close to the resource, homogeneity among group members, effective mechanisms, past experiences of cooperation in connection with successful CFM.**
For this study, a community is a group of people in a 'spatial unit with a social structure and a set of shared norms' (Agrawal and Gibson, 1999).
For the CFM in the MBR, these findings by Ostrom (1990, 1999) and Agrawal (2003) mean that CFM in the MBR is likely to be successful when the collective action costs are low.

2.5 Conditions for low Collective Action Costs

In the following the design principles for low collective action institutions applied on common-resources from Ostrom (1990) and Agrawal (2003) are presented:

Clearly defined boundaries

Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself. Having set strict rules about who is allowed to withdraw benefits of the CPR is also the difference between 'common property' with restricted access and unlimited 'open-access'-institutions (Ciriacy-Wantrup and Bishop, 1975). Without a limitation on the CPR, there is no possibility to control who gets the benefits. Then, free-riding is a great challenge. Thus, it is necessary to clearly define the boundaries of the source system and the community characteristics.
The relationship between the resource system and the community is also determining the success of CFM. Fairness in allocation of the benefits from the CFM is another variable affecting the success of the CFM. For a sustainable development and ecological security of the CPR, it is important to match restrictions on harvests to regeneration of resources.

Congruence between appropriation and provision rules and local conditions

Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labor, material, and/or money.
The institutional arrangements consist of rules which should be simple to understand for the members of the CFM. In addition, low-cost exclusion technology should be available.

Collective-choice arrangements

Most individuals affected by the operational rules can participate in modifying them. Individuals who are directly living and benefiting in or around the CPR should be able to modify the rules over time. Low-cost adjudication should also be available. Plus, ease in enforcement of rules is another determent of the success of the CFM.

Monitoring

Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to users or are themselves the users. CPR situations are longer lasting when individuals know how much each user withdraws from the common benefit pool. In many long lasting CPR-situations, the costs of monitoring are low due to the rules that are in use. Monitoring and graduated sanctioning are necessary to keep the rate of rule-following high enough to avoid triggering a process in which higher rates of infringement are occurring.

Graduated sanctions

Users who violate operational rules are likely to be assessed by graduated sanctions (depending on the seriousness and context of the offense) by other users, by officials accountable to these users or by both. Sanctions should be put on the culprit, so that other users have enough motivation to cooperate and follow the rules.
Levi (1988) points out, that strategic actors are willing to comply when they perceive that the collective objection is achieved and when they perceive that others also comply. Supportive external sanctioning institutions also increase the success of a CFM situation.

Conflict-resolution mechanisms

Users and their officials have rapid access to low-cost local arenas to resolve conflicts among community members or between users and officials.

Minimal recognition of rights to organize

The rights of community members to devise their own institutions are not challenged by external governmental authorities. When local individuals cannot take their own decisions, but must wait for external governmental officials, it will be very difficult for the community to maintain their CFM over time. Thus, central governments should not undermine local authorities.

Nested enterprises (for CPRs that are part of larger systems)

Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises. For example, the local, the regional and the national governments are involved in the CPR management. Establishing rules on one level, without including the next higher level, may lead to failure of the CPR.

2.6 Community Forest Management

In the MBR in Petén, the common pool and natural resource is the forest with its timber and its non-timber-forest-products (NTFP). The following section presents findings based on CFM research.

CFM is the term that describes a variety of programmes in which land and/or access to forests is given to the community that often used the natural resources historically (Skutsch and Ba, 2010). Local communities make arrangements among themselves and have the responsibility of a given set of natural resources. CFM gives the community the possibility to better enjoy the benefits of the forest (De Jong et al., 2006). Local knowledge and institutions for decision-making, monitoring and rule enforcement might make CFM more successful than management being implemented by remote authorities of the state (Bowler et al., 2012).

Though this research is based on CFM for timber and NFTP-extraction in community forestry, there are other types of CFM that also exist. These are for example: Participatory Forest Management (PFM) in Pakistan (Ali et al., 2007), Joint Forest Management in India (Sreedharan et al., 2005), Council Forest Management with areas under state management in India (Somanathan et al., 2009).
This shows that approaches of CFM 'differ in the rights, assistance and conditions of forests given to communities, and the social, economic and political environment' (Edmund and Wollenberg, 2003). It means that every land which implements CFM has its own CFM approach. These include extractive reserves, indigenous territories, family forests, community concessions or forest *ejidos*. It is the Mexican type of state-created common land ownership regime (Bray et al., 2008).

In the last decades, CFM has gained more attention as a means to conserve biodiversity, decrease deforestation rates and improve the local living and economic conditions (Agrawal and Gibson, 1999; Sikor, 2006; Bowler et al., 2012). Thus, there are different goals of differ-

ent CFM. For example, in West Africa the potential for CFM for crediting carbon in dry forests is investigated (Skutsch and Ba, 2010).

In general, CFM has become a part of government policy in many developing countries (Sikor, 2003). The World Bank stated that a 'growing number of countries recognize indigenous land rights in principle and allow for their internal management by the community' (Deininger, 2003). CFM is an on-going process that has to take internal and external developments, social, ecological and economic factors into account (Radachowsky et al., 2012).
Most CFM practices have in common that the Forest Department of the national government provides certain rights to forest products such as forest fruits or to timber. The success of CFM is also depending on the level of collective action costs within the community. **Based on the Ostrom's (1990) and Agrawal's (2003) findings, CFM in this study will be defined successful when the collective action costs for CFM are low.**

Pagdee et al. (2006) say that the 'success of CFM depends on the relationship between the community and its resources'. Furthermore, CFM is multidimentional. There are many different measures that could play its part in the success of CFM. These are improvement of forest covers, increase in plantation zones, equity of benefit sharing or reduction of community poverty (Pagdee et al., 2006). **In total, success in CFM should improve the outcomes of ecological sustainability, social equity and economic efficiency** (Pagdee et al., 2006).
Pagdee et al. (2006) identify various measures that influence the success of CFM. **These are internal factors such as community size, socio-economic heterogeneity, institutional setting and property right structure.** Externally, national forestry policy and market and technology pressures influence the success of CFM (Pagdee et al., 2006). **Pagdee et al. (2006) find out that the most frequently discussed measures of success of CFM are meeting local needs, improving forest conditions, addressing environmental issues and distributing equitable benefits.**
Plus, CFM is defined as a promising option to solve the dilemma of how to combine forest conservation and rural development. Via negotiation community members define their human-ecosystem relationship, which has different key conditions and rules in every CFM-situation.
Furthermore, Pagdee et al. (2006) reveal that a significant association with success of CFM belongs to these factors: well-defined property rights, effective institutional arrangements and community interests and incentives, whereby clearly defined property rights of are significant importance. Tenure security ensures stable conditions within the community and its resource use. **Therefore, property rights are of essential importance as Pagdee et al. (2006) argue.** Without tenure security, community members might get involved in unacceptable activities that could lead to overexploitation (Pagdee et al., 2006).

Pagdee et al. (2006) also describe the limits on research for successful CFM. For example, they state that scientific research is 'still unable to specify the community size and level of heterogeneity' that is most promising for a successful CFM. So far, the researcher only know that CFM in a '**small-size community with high homogeneity is more likely to be successful than CFM in a large-size community with a heterogeneity'** (Pagdee et al., 2006).

Pagdee et al. (2006) name the four attributes property rights regimes, institutional arrangements, incentives and interests of the community and decentralization as significantly asso-

ciated with the CFM's success. The attributes include the following measures: **tenure security, clear ownership, congruence between biophysical and socio-economic boundaries, effective enforcement of rules and regulations, monitoring, sanctioning, strong leadership with effective local organization, expectation that benefits will accrue to villagers, sharing of common interests among community members and local authority**.

Because Pagdee et al. (2006) emphasize the importance of a clear property rights for the success of CFM, the next section provides more information about the possible property rights of a CPR-situation.

2.7 Property Rights Regimes of in a CFM-Situation

As mentioned before, CFM includes different rights to a forest. Often there are rights of the community to use the forest and those of the government.

The state can influence the local forest and its community via legislation, programmes and projects (Sikor, 2006). Property rights within a forest 'may include a large variety of rights' (Sikor, 2006), though they might not be in the hand of a single owner.
Access to forests is source for a variety of conflicts. According to Rocheleau and Edmunds (1997), 'conflicts arise from competing claims over single resources, overlapping and nested claims, conflicting sources of legitimacy, and negotiations over the meaning of resources'. Sikor (2006) states that 'forest property involves multiple actors, different types of relationships, many objects of material or symbolic value associated with forests, and overlapping sources of authority lending legitimacy to property claims.' Different actors such as migrants, state agents, concessionaires and people from neighboring properties are involved in the struggle over the access to the forest (Bruce et al., 1993).

In order to provide successful CFM, clearly defined boundaries of the resources and land are essential. Especially, common-property rights can lead to confusion due to different types of its definition. For example, common property can belong to the community, but it might also belong to the state that distributes forest concessions to the community.
There are four different types of property-rights systems, which are used to regulate the common-pool resources. These are defined by Ostrom et al. (1999). **The property rights include open-access, common property (group property), private property (individual property) and public property (government property).** The following characteristics belong to the different types of property rights:

- ***Open-access*** means the absence of enforced property rights. Everybody can take as much as of the resource as is available such as fish in the ocean.

- ***Common property*** means that resource rights are held by a community who can exclude others from using the forest and who distribute the resources within the community.

- ***Private property*** means that the resource rights are held by individuals or by firms who can exclude others.

- ***Public property*** means that resource rights are held by a government that can regulate or subsidize the use. The government can also give resource rights under certain conditions (like forest concessions) to a community to use the resource for a certain amount of time.

2.7.1. Access and Withdrawal Rights

There is a difference between rights of *access* and *withdrawal* (Schlager and Ostrom, 1992). One can have access to a forest, without having the right to withdraw timber or non-timber-products from that forest. ***Access rights*** are the rights to enter a defined physical property. ***Withdrawal rights*** are the rights to harvest the products of a resource such as timber, non-timber-products or the wild-life of a forest.

Collective action rights may be given to a community by a government. There are four different types of withdrawal rights of a common-property (Barsimantov et al., 2011). These are:

- ***Withdrawal rights*** allow users to obtain resources at a rate defined by external authorities.

- ***Management rights*** allow the community to define extraction rates and other management features.

- ***Exclusion rights*** allow the community to define who has access to the forest.

- ***Alienation rights*** include the right to sell or lease the previous rights to the forest.

When a community has all four types of rights, it is a full common property right. A smooth property right regime is also depending on the interplay of the state and the local institutions. These two actors can work smoothly together, but the interplay of both actors can also lead to conflict (Barsimantov et al., 2011).

At last, one important obstacle to practice CFM are the costs of its maintenance. Forest management plans have to be developed, community members need to be trained and guardians need to overview the forest concessions. These costs need to be covered. Communities sometimes face difficulties to cover these financial burdens (Barsimantov et al., 2011).

2.8 Conclusion

This chapter explains the *'Tragedy of the Commons'* as a problem that leads to exploitation of common-pool resources such as the natural resources of a forest. Then, it is shown under what conditions groups or communities can manage a community forest under low collective action costs. Moreover, the findings of this chapter reveal the conditions contributing to low cost collective action in a CFM-situation, as stated by Ostrom (1990, 1999), Agrawal (2003) and Pagdee et al. (2006). They name conditions for successful CFM such as graduated sanctions and monitoring (Ostrom, 1990), small size of users group and homogeneity among group members (Agrawal, 2003) and property rights regimes (Pagdee et al., 2006).

Conditions which lead to failure in CFM include, for example, a very large number of people, poor people who have little attachment to their land and a diversity of cultural backgrounds. In addition, CFM is described and its goals are named. The last section explains the property rights regimes in a CFM-situation.
Based on the findings of this chapter, it is said that conditions for CFM in the MBR in Petén that appear to be successful should have low cost collective action as described by Ostrom (1990, 1999), Agrawal (2003) and Pagdee et al. (2006).

3

Methodology

This chapter introduces the methodological choices of this research. It is shown how this study analyses the conditions of CFM that seem to be successful in the MBR.

3. Methodology

3.1 Introduction

This section presents the methodological choices made for the research. Furthermore, this section describes how the dependent variable, the success of CFM, is measured and shows how the variables of the independent variables - the conditions influencing CFM - are defined. The data-collecting-process is also presented.

3.2 Research Strategy

Methodologically, the study adopts the design of a comparative case-study based on meta-analysis of English literature. The dependent variable, the success of CFM in the MBR, is an ordinal variable. The independent variable researches the conditions for success of CFM in the MBR. An in-deep presentation of the relevant theories was given in the theoretical section of this thesis, in chapter two.

3.3 Case Selection

For a comparative case-study about CFM, several requirements should be matched in order to answer the research question adequately. The requirements include cases that are similar in some characteristics and differ in other points. To measure the conditions for successful MCF in the MBR in Petén, the case-studies should be in the same area, but differ in some characteristics such as the outcomes of success of CFM. By doing that, it will be possible to compare conditions in communities with low and high collective action costs.

These requirements for the case-selection match the conditions in the Maya Biosphere Reserve in Petén, Guatemala. Therefore, this master's thesis conducts a comparative analysis of the MBR in Petén. The MBR is chosen for several reasons:
First, it presents successful and unsuccessful cases of CFM. This makes it very interesting for investigating the outcomes of CFM experiences. Second, the reserve has an, at least ten years, experience of CFM. The community forest concessions were distributed between 1992 and 2001 (Bray et al., 2008). The last reason for choosing the MBR is that the developments in the MBR are well documented and observed in the scientific world. This makes it possible to find enough scientific data about the developments in the MBR in Petén for a desk-research about it.

3.4 Data Sources

The scientific articles were selected by searching the available data-bases at the University of Twente and by considering the bibliographies of related scientific English literature. Reading the abstracts and introductions of articles showed if the data was valid for this research or not. Data that was used for this research included information on the Maya Biosphere Reserve in Petén, CFM and conditions for success of CFM in the MBR, as well as conditions for failure of CFM.

The data for this research is provided by different scientists. The following articles are used for the research about the MBR in Petén, Guatemala. The articles are ordered according to the amount of information taken from them.

Authors of Articles	Year of Publication	Title	Journal
Radachowsky et al.	2012	Forest concession in the Maya Biosphere Reserve, Guatemala: A decade later	*Forest Ecology and Management 268*
Barsimantov et al.	2011	When collective action and tenure allocations collide: Outcomes from community forests in Quintana Roo, Mexico and Petén, Guatemala	*Land Use Policy 28*

Table 2. Overview of scientific literature sources for the MBR in Petén, Guatemala

Radachowsky et al. (2012) investigate the forest concessions in the Multiple-Use Zone in the MBR a decade after the distribution of the community forest concessions. The objectives of their research are to provide a management unit-based analysis and evaluation of the evolution of the forest concessions. The researcher present a critical assessment of the current state of ecological integrity, socio-economic development, governance and financing in the 14 forest concessions in the MBR in Petén. They present the data as average data, which is based on two resident community concessions with forest-based history and four resident community concessions with recent immigrants. They did that by using a series of quantitative and qualitative indicators. They show the most important key drivers that may have influenced the outcomes. In addition, they present suggestions for the improvement of the multiple-use forest management practices in the MBR in Petén. Conclusively, Radachowsky et al. (2012) state that the 'success of multiple-use forest management in concessions depends upon the specific conditions and processes in the concessions which is an ongoing process'.

Barsimantov et al. (2011) examine the relationship between user group characteristics and state allocation of tenure bundles, based on comparative case-studies of community forestry in Guatemala and Mexico. They show how tenure bundles and collective actions costs interact. The field-data of Barsimantov et al. (2011) was collected during four site visits between August 2006 and May 2008. Open-ended interviews were made by Barsimantov et al. (2011) in each community with communal and municipal authorities and local with extensive knowledge of forest history and use. Plus, government officials, local and international NGO staff, representatives from community forestry unions and private foresters were conducted. Barsimantov et al. (2011) also use secondary data from government agencies about forestry management. They conclude that communities with high costs for collective action, a tenure bundle that includes management, withdrawal and exclusion rights yet omits alienation rights, may be optimal for community forestry.

3.5 Analysis of Conditions of CFM that appear to be successful in the MBR

As stated before, there are several different factors and definitions to measure the success of CFM. For this research though, the outcome of CFM will be measured based on the findings of the previous chapter. **This means that the outcome of CFM depends on the level of collective action costs. Low cost collective action mean successful CFM, whereas high col-**

lective action costs mean unsuccessful CFM in the MBR. Plus, the goals of CFM in the MBR in Petén are also considered. Though, most important are the low cost collective action.
In order to analyze conditions under which CFM appears to be successful in the MBR, the following research steps are applied:

1. Basic information about the MBR is stated.
2. The situation in the MBR until 1990 explains the conditions in the MBR before political change on the national Guatemalan level introduced new forms of forest management in the MBR in Petén.
3. Then, the Multiple-Use Zone in the MBR is described. It is the area in the MBR with community forestry.
4. The administrative structure of the MBR explains the legal requirements for obtaining a forest concession. It is also shown what types of forest concessions the MBR has.
5. The description of the results of CFM in the MBR a decade after its implementation shows positive and negative outcomes of CFM in the MBR.
6. Based on the available data of Radachowsky et al. (2012), the six communities with community forestry are presented in two groups. One group includes two communities with forest-based history. The other group includes the remaining four communities with recent immigration. **This data source is the reason why the six communities are presented in these two groups and not in single case studies.**
7. These two groups of communities are analysed according to the conditions for low collective action costs, mostly based on the findings of Radachowsky et al. (2012).
8. Data by Barsimantov et al. (2011) delivers insight about the community *'Carmelita'* and *'Cruce a la Colorada'* to see if the findings of the previous analysis of the two groups of communities are also presented in these communities.
9. The outcomes of the two groups of communities regarding their compliance with the goals of CFM in the MBR are provided.
10. Based on the previous findings, it is stated which communities in the MBR have successful CFM and which have unsuccessful CFM.
11. Plus, it is also described which conditions of CFM seem to be successful and which do not lead to success in CFM in the MBR.
12. In addition, the differences between the communities are stated.

3.5.1 Table for measuring Low Collective Action Costs

The conditions describing low cost collective action are based on the findings by Ostrom (1990 and 1999), Agrawal (2003) and Pagdee et al. (2006) as presented in the previous chapter. Their most important conditions for low collective action costs are:

Design Principles for long-lasting and successful collective action-institutions by Ostrom (1990, 1999)
1. Clearly defined boundaries
2. Congruence between appropriation and provision rules and local conditions
3. Collective-choice arrangements
4. Monitoring
5. Graduated sanctions
6. Conflict-resolution mechanisms

7. Minimal recognition of rights to organize
8. Nested enterprises

Agrawal (2003) emphasizes importance of
1. Small size of user group
2. A location close to the resource
3. Homogeneity among group members (shared norms)
4. Effective mechanisms
5. Past experiences of cooperation in connection with successful CFM (social capital)

Attributes significantly associated with CFM success by Pagdee et al. (2006)
1. Property rights regimes - tenure security - clear ownership - congruence between biophysical and social-economic boundaries
2. Institutional arrangements - effective enforcement of rules and regulations - monitoring - sanctioning - strong leadership with effective local organization
3. Interests of the community - expectation that benefits will accrue to villagers - sharing of common interests among community members and local authority
4. Decentralization

Table 3. Overview of conditions for low cost collective action

The most important data for this research is the study conducted by Radachowsky et al. (2012). But they did not use the data from the MBR based on the single community level. Instead they have analysed the communities on the average concession level. This means, the information they have used, was merged together on the level of communities with concessions with forest-based history (n=2) and concessions with recent immigrants (n=4). This is why the table is not based on each single community, but on the community data put together.

For this analysis, the findings of Ostrom (1990 and 1999), Agrawal (2003) and Pagdee et al. (2006) will be merged together like this:

Conditions for low collective action by Ostrom (1990, 1999), Agrawal (2003), Pagdee et al. (2006)	**Resident community concession with forest-based history**	**Resident community concession with recent immigrants**	**Source**
Small size of user group			
Location close to the resource			

Clearly defined boundaries
Tenure security
Clear ownership
Congruence between biophysical and social-economic boundaries
Homogeneity among group members (share norms)
Past experiences of cooperation in connection with successful CFM (social capital)
Congruence between appropriation and provision rules and local conditions
Monitoring
Effective enforcements of rules and regulations
Strong leadership with effective local organization
Expectations that benefits will accrue to villagers
Sharing of common interests among community members local authority
Graduated sanctions
Conflict-resolution mechanisms
Minimal recognition of rights to organize
Nested enterprises

Table 4. Conditions for low collective action costs

3.6 Conclusion

This chapter explains the research strategy as a comparative case study based on meta-analysis. Then, it is described why the MBR in Petén, Guatemala was chosen for this re-

search. The next step was to show the most important data sources for this study, which is the research conducted by Radachowsky et al. (2012) and Barsimantov et al. (2011).
To analyse the conditions for low cost collective action, a table with the conditions for successful CFM was developed, based on the findings of Ostrom (1990 and 1999), Agrawal (2003) and Pagdee et al. (2006). In addition, the research-steps for conducting this investigation are stated.

4

Community Forest Management in the Maya Biosphere Reserve in Petén, Guatemala

In this chapter, the analysis of CFM in the MBR in Petén, Guatemala is conducted. In order to do so, successful and unsuccessful developments of CFM in the reserve are investigated.

In the end of this chapter, it is shown why communities practicing CFM in the MBR have very different outcomes.

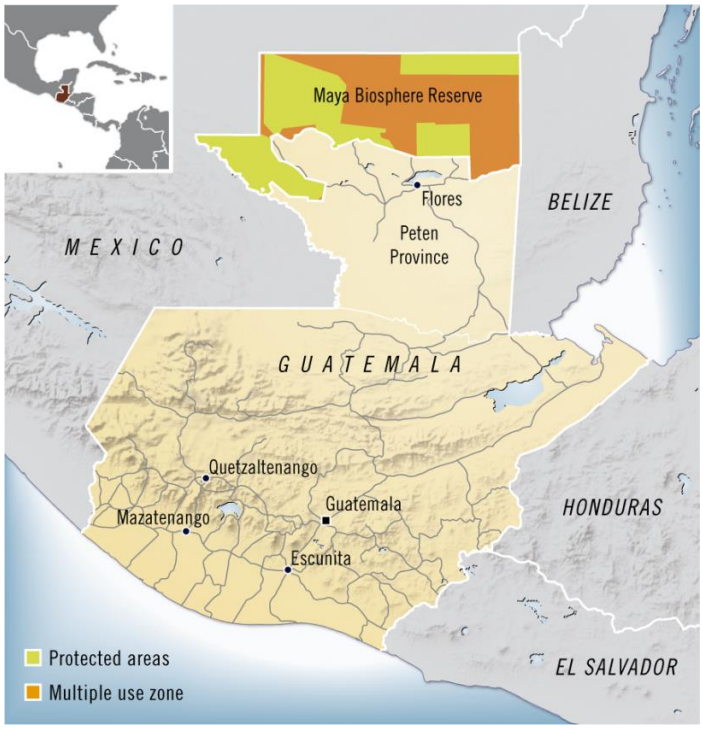
4. CFM in the Maya Biosphere Reserve

4.1 Introduction

In this chapter the conditions that seem to be important for successful CFM in the Maya Biosphere Reserve in Petén, Guatemala are analysed, mostly based on the work by Radachowsky et al. (2012) and Barsimantov et al. (2011).
The chapter starts by describing the MBR in Petén. Then, the MBR prior to 1990 is described. This is followed by the developments in the MBR after 1990 when national political change led to new management forms in the MBR. The creation of community forest concessions in the MBR is a result of political change in Guatemala. The outcomes of CFM a decade after its introduction in the MBR present positive and negative results. Some communities practice successful CFM while others do not. The analysis also looks at *'Carmelita'* as an example of a community with low collective action costs and *'Cruce a la Colorada'* as an example for high collective action costs. In the end, the differences between the successful and unsuccessful communities are identified, along with the conditions that appear to be important for the outcomes of CFM in the MBR.

4.2 The Maya Biosphere Reserve in Petén

The area of interest is the Maya Biosphere Reserve. It lies in the Department Petén in the North of Guatemala which borders Mexico and Belize (CIFOR, 2005). The MBR is in the center of the *'Selva Maya'.* This is the largest lowland tropical forest in Central America. The reserve stretches over two million ha. The MBR covers nearly 60% of Petén (Carr, 2008). This is a fifth of the entire Guatemalan territory (Barsimantov et al., 2011). The reserve includes ancient remains of the Maya civilization (Radachowsky et al., 2012).
The MBR mostly consists of semi-humid tropical forest. But it also includes subtropical rainforests, wetlands and savannas. The trees reach a height of 15m up to 35m. The climate is hot and humid with mean temperatures between 22° and 29° Celsius (Sundberg, 1998).



Graph 1. Guatemala, case study locator map of MBR (2006), Hugo Ahlenius, UNEP-Arendal, 2013

According to official records, 366.735 people were living in the entire department in 2002 (CIFOR, 2005). Petén has a huge biodiversity with 1400 known plant species and roughly 450 animal species (CIFOR, 2005).

4.3 The Maya Biosphere Reserve in Petén until 1990

Historically, only a few villages and timber companies lived from the extraction of forest resources such as Mahogany and Spanish cedar. These were almost all the commercially sold timber species. The Manikara Zapota tree provided chicle for the production of chewing gum. Later, secondary tree species were sold, too.
Due to its isolation and low population, the area of the later MBR was mostly ignored by national policies. From 1959 until 1989, the department was governed by a para-statal authority, called *'Fomento y Desarrollo del Petén'* (Promotion and Economic Development of Petén, FYDEP). Its policy goal was to stimulate colonization and economic growth. Since then, especially after the first road was built into the region, the population of Petén increased by 9% annually. This led to major destruction of the forests by slash and burn agriculture. Logging also became a problem. The pressure on the forest was very high. Projections estimated that the entire forest could be destroyed within 30 years, if nothing was changed (Radachowsky et al., 2012; Sundberg, 1998).

4.4 The Maya Biosphere Reserve in Petén after 1990

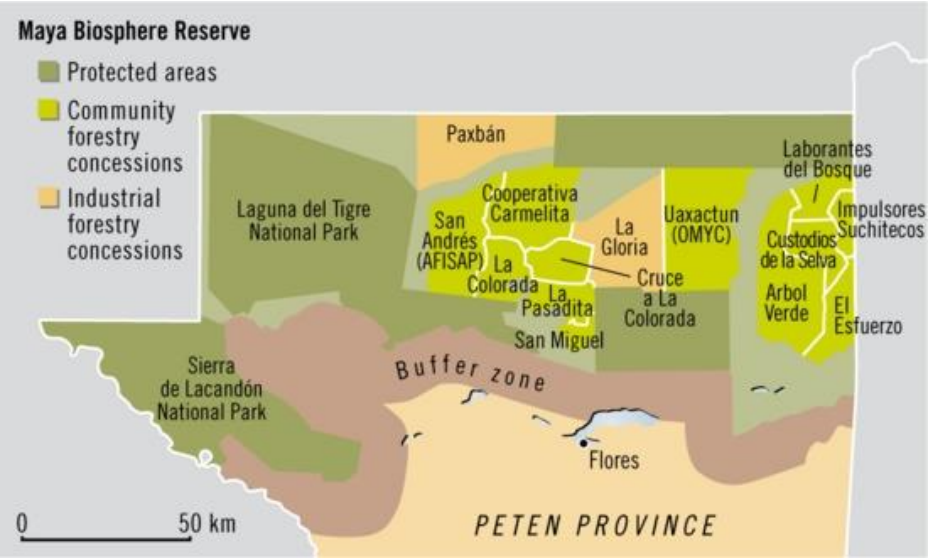
In the 1990s, the long lasting armed conflict in Guatemala ended in a peace agreement. This political change in Guatemala on the national level smoothed the way for a shift of policy goals in the department Petén. With the help of conservation and aid organizations (especially the United States Agency for International Development, USAID), the massive loss of forests and the peace development within the country led to the creation of the MBR in 1990. Community forestry was established in pilot programmes in the MBR two years after its establishment (Radachowsky et al., 2012). The governmental *'Consejo National de Areas Protegidas'* (National Council for Protected Areas, CONAP) became the governing authority in the MBR (Rainforest Alliance, 2008). CONAP emphasized the development of new management practices in the reserve (Rainforest Alliance, 2008). The focus lay on democratization, decentralization of power and resource management. In addition, CONAP also emphasized participation, access to land and the sustainable use of forest resources. Combining forest conservation and sustainable use of natural resources to maximize the ecological, economic and social benefits was the goal of the reserve (Rachachowsky et al., 2012).
In general, the goals of the MBR were (ISEAL Alliance and Trade Standards Practitioners Network, 2008):

- Conserve the natural environment (especially to slow the rate of deforestation)
- To provide the legal basis for resource protection and management
- To promote local participation in land use and management
- To promote regional planning and integrated rural development
- To conduct scientific research and to promote environmental education and training

For administrative reasons, CONAP divided the MBR into three use zones with different rights and access to the forest (Rainforest Alliance, 2008):

1. The **core zone** which is the second biggest area of the reserve with 36% of the total MBR consists of national parks and habitats. Access to the forest in the area is the lowest in the MBR. It is only granted to scientific investigation and low impact tourism.

2. The smallest zone of the MBR belongs to the **buffer zone**. It consists of 24% of the total reserve area and forms a 15-km-wide-band in the South of the MBR.
3. The biggest area of the reserve is the third zone. It is the **Multiple Use Zone (MUZ)** (Rachachowsky et al., 2012; Rainforest Alliance, 2008)**.** This part of the reserve is the area of interest in the context of the present study.



Graph 2. Map of logging concessions in the Guatemalan Maya Biosphere Reserve in 2006.

Hugo Ahlenius, UNEP-Arendal, 2013

4.5 Multiple-Use Zone

The Multiple-Use Zone consists of 848.000 ha. Its location is in the middle of the reserve. Six communities live in this area. The long-inhabited communities (~100 years) are called *'Carmelita'* and '*Uaxatún'* (Bray et al., 2008). The other four are *'Cruce a la Colorada', 'La Colorada', 'La Pasadita'* and '*San Miguel'*. These communities have been recently established (~30 years). Only sustainable and low-impact land use is allowed in the MUZ (Bray et al., 2008).
Legal requirements by CONAP have to be met in order to gain access to the forest. A community has to prove historical use of the forest, and/or show the capability to manage the forest resources in a sustainable manner. The community has to be well organized internally. For technical skills, the community can choose a NGO by themselves to comply with the management requirements. These requirements include elaborating management plans, annual work plans and environmental impact analyses, developing financial management, forest protection skills and receiving third-party forest certification within three-years. Furthermore, a small amount of lease fee per hectare has to be paid by the concessioners (Radachowsky et al., 2012).

4.6 Forest Concessions in the MBR

Once obtained, a concession is valid for 25 years. By fulfilling the contractual obligations, the concession can be renewed by CONAP after it expired. A 5-year harvest plan has to describe detailed inventories and annual operations plans. All concessions are based on the Forest Stewardship Council-certification (FSC-certification). Forest management techniques also include reduced impact logging guidelines. These demand the use of lightweight machinery. The cutting cycle is 25 to 40 years (Radachowsky et al., 2012).

According to Nittler and Tschinkel (2005), 'each concession was allocated to a legally constituted group that represented the community or a sub-set of the community'. The community members created 'community forest enterprises'. In addition, Nittler and Tschinkel (2005) state, that 'all concessions require the assembly of the concession to elect the board of directors of the community forest enterprise' for one year. The board administers the community forest enterprise itself (Nittler and Tschinkel, 2005). The length of a term of the director of the community forest enterprise also led to dispute, because some claim that one year is too short. Instead, it would be better to have one person in office who administers the work for a longer time period (Nittler and Tschinkel, 2005).

There are 14 concessions in MBR (Rainforest Alliance, 2008; Radachowsky et al., 2012). They were distributed between 1994 and 2001. The size of a concession varies between 7000 ha and 83.000 ha. In total, 500.000 ha of the 848.00 ha of the entire MUZ are included in the concessions distribution (CIFOR, 2005). There are 12 community and two industrial forest concessions. The communities in the MUZ had the highest priority for concession rights due to their historical relation to the area. They were followed by the buffer zone inhabitants. At last, two private timber companies got **industrial forest concessions**. The concession areas for the six communities of the MUZ are distributed for timber extraction. But there is also a small area of the concession which is under strict protection from timber extraction (Radachowsky et al., 2012). Community concessions have more rights to the forest than the industrial concessions have. Communities are also allowed to manage all above ground forest resources. This includes NTFP and wildlife. This means, that the community concessions have, despite the alienation rights, the full bundle of withdrawal and access rights. Since it is a reserve, alienation rights are not granted to the communities in the MBR. Therefore, the communities cannot sell their forest concession. All concessions are on state-owned property and indivisible. In addition, one can exclude non-member users from the territory (Barsimantov et al., 2011).
In addition, six ***non-resident community concessions*** have been given to communities from the buffer zone. Two ***resident communities with forest-based history concessions*** are located around each community. These communities rely on timber and NTFPs for income generation. The other four resident community concessions are called ***resident community concession with recent immigrants***. The location of the concessions is also around the communities which have an agricultural and cattle-based background (Radachowsky et al., 2012).

In summary, the objectives of the forest concessions are:

- Sustainable and low impact land-use based on FSC-certification
- Legal requirements have to be met, for example communities have to prove capabilities to manage the forest resources in a sustainable manner and for technical skills and requirements, the community has to choose a NGO
- Communities have to be well organized internally
- Forest concessions are valid for 25 years
- Alienation rights are not granted to the communities
- All concessions are state owned property and indivisible
- Non-members can be excluded from the territory
- Community concessions are for timber extraction and have more rights (in terms of access and withdrawal) to the forest than industrial concessions have, for example

communities are allowed to manage all above ground forest resources which include NTFPs and wildlife.

4.7 Community Forest Concessions

The type of CFM in the MBR is community forestry. The CFM has economic, social and ecological goals. The aim of this forest management in the MBR is to enable the inhabitants of the reserve to a sustainable use the forest while making a living out of the forests products, without destroying its natural resources. In order to reach these goals, a clear legal structure and local participation of the inhabitants were implemented.
The organizational settings of the community forest concessions are clearly defined by CONAP. The community of the forest concession has to fulfill certain requirements for obtaining the access and withdrawal rights for a forest concession. By obtaining a forest concession, the community receives the permission for timber extraction and the use of NTFPs under FSC-certification for timber-extraction. CONAP remains an important player to the community concession. They can cancel a concession in the case of severe breach of concession requirements.

4.8 Outcome of CFM in the MBR a Decade after its Implementation

According to Radachowsky et al. (2012), harvest and management activities for timber and other forest fruits have provided more than 3000 jobs annually. CFM provided income generation and social benefits to many community members. CIFOR (2005) stated that CFM has improved organizational capacities and has developed new skills for decision-making, democratic participation, oversight and accountability in the community concessions.

Forest conservation costs such as patrols, fire prevention and controls are largely covered by forest management revenues. The MBR gained more than 13 million dollar from certified timber. According to the Rainforest Alliance (2008), this NGO had certified 60% of the extracted timber until the end of 2007. This resembled a certified area of 487.000 ha. The cancelled or terminated community concessions in the MBR were not included in that statistic (Rainforest Alliance, 2008).
Community members benefited from the concessions by dividends and wages. Even non-members benefited from it by work-day. Sawmill operations had the biggest share (55%) of providing jobs and income generation (harvest contributed by 29% and pre-harvest activities by 16%) (Radachowsky et al., 2012).
In general, concessioners gained more knowledge and capacities for managing the resources. This includes technical knowledge, equipment, access to capital and the entire timber processing chain such as logging, milling and transport. For example, the NGO Rainforest Alliance started in 1996 to provide training courses for FSC-certification in the MBR (Rainforest Alliance, 2008).
To increase law enforcement, control posts were created by concession owners, just like financial management and monitoring capacities were increased. In the beginning years of the common-property management, helping NGOs and community forest enterprises received millions of dollars from USAID.
In 1995, the newly founded second-level umbrella association, the *'Asociación de Comunidades Forestales de Petén'* (Association of Forest Communities of Petén, ACOFOP) also was financially supported by USAID. At first, it was a trade union. Then, the association devel-

oped new key competencies (CIFOR, 2005). For example, it was very helpful and influential for capacity building of the communities on gender related issues, political presentation and market negotiation (CIFOR, 2005). Over the years, ACOFOP has been crucial to safe concessions from land tenure threats. Overall, NGOs have provided and co-financed conservation incentives, technical support and monitoring (Radachowsky et al., 2012). The Xate extraction was reformed with the help of CONAP and NGOs in order to increase sustainable use and financially gains in 2004 (Radachowsky et al., 2012).
In order to collectively process timber products with better prices and contractual conditions, a second level company called '*Empresa Comunitaria de Servicios de Bosque'* (Community Forestry Concessions Enterprise, FORESCOM) was founded in 2003. In addition, they have kept a strong internal governance with a responsible timber management. The average (with some exceptions) deforestation rates were kept at a low level. From 2002 until 2007, the average annual deforestation rate for the MBR was 'twenty times higher (0.88%) compared to the FSC-certified concessions in the reserve (0.04%) (Rainforest Alliance, 2008). However, the MBR holds the second largest number of community FSC-certificates worldwide (ISEAL Alliance and Trade Standards Practitioners Network, 2008). Communities with a long inhabitation had a rate of 0.03% of deforested concession area annually. Moreover, community management had positive environmental effects. The impact of forest fires was reduced, illegal logging was decreased and the number of illegal settlements has been lowered (CIFOR, 2005). In addition, in one part of the reserve, a multi-sectional table, the '*Mirador-Rio-Azul'*-roundtable, was established to manage conflict over conservation and tourism issues.
These developments of the MBR show that there is a development to clear regulation for forest products, well-defined access rights to the forest which allows commercial harvesting, local and export markets for forest products, presence of partly strong social organizations and institutions (García-Fernández et al., 2008). In total, the MBR is 'considered as one of the most successful Central American examples of the management of natural resources by a national government and local communities' (ISEAL Alliance and Trade Standards Practitioners Network, 2008).

However, despite the positive outcomes, CFM in the MBR also has produced negative outcomes. For example, poor governmental oversight and law enforcement did not stop negative tendencies in some communities. Business management, administrative capacities and sanctioning by the state was not properly installed. Some concessions have experienced financial management problems (including commercial and tax debt). This has led to internal conflict and threatened a sustainable management of concessions, because concessioners were tempted to extract more timber for increasing their revenues than the FSC-certification allowed.
The most unsuccessful developments of forest concessions took place in the resident communities with recent immigrants. Roughly a decade after the establishment, two, of the four, recent inhabited community concessions were cancelled. The other two concessions of the communities with recent immigration are suspended. The deforestation rate in the four failing forest concessions is also the highest (1.54%) compared to the other concessions (0,03%) (Radachowsky et al., 2012). According to Radachowsky et al. (2012), a decade after its implementation of the community concessions in the MBR two (one with conditions) concessions are still active. These are the resident community concessions with forest-based history. The remaining four resident community concessions with recent immigrants are inactive.

This shows a clear cut in terms of the development of the CFM within these two types of community characteristics.
In order to find out which conditions of CFM appear to be successful in the MBR, the next section investigates the collective action costs of the communities divided into two groups. One group of communities has a forest-based history (n=2). The other group includes the communities with recent immigration (n=4). The classification is based on the research of Radachowsky et al. (2012).

4.9 Resident Community Concession with Forest-Based History

The members of the communities live in the area for more than 100 years. The communities are called *'Carmelita'* and '*Uaxactún'*. The two communities lie in average 14.7 km away from permanent roads. Their mean estimated socio-economic level is medium (while it is poor in the recent established communities). The contracts of their forest concessions were granted between 1997 and 2000. The forest concessions expire between 2022 and 2025. The concession areas range between 53.792 ha and 83.553 ha. One of the two communities has 109 and the other 224 members. The mean concession area per member is 433 ha (range 373 – 494 ha) (Radachowsky et al., 2012).
The cutting cycle is 40 years for both communities. The community *'Uaxactún'* signed a conservation agreement with a conservation organization to provide incentives for adherence to agricultural zoning, control of deforestation and forest fires. Such an agreement is also considered for *'Carmelita'*. The deforestation and forest fire rate is at a low level. Non-timber fruits provided the community of *'Carmelita'* an additional estimated 2300 US-dollar income per family. Income from agricultural plays a marginal role. It is less than 5% of income generation (Radachowsky et al., 2012).

4.10 Resident Community Concession with Recent Immigrants

The recently inhabited communities established themselves in the past three decades. People came due to colonization programmes of the government to the area. The communities are called *'Cruce a la Colorada', 'La Colorada', 'La Pasadita'* and '*San Miguel'*. The communities are smaller (mean 67 members, range of members 39 up to 122) than the long-inhabited communities.
Instead of having a forestry-based background as the long-established communities have, these recent inhabited communities came from other Guatemalan areas with cattle-ranching and agricultural backgrounds. This means that members of these communities are used to generate income from land-use practices such as cattle ranching and agriculture (Radachowsky et al., 2012).
The distance of the communities to the permanent roads is 3.5 km in average. Their contracts for forest concessions were granted between 1994 until 2001. The contracts expire accordingly between 2022 and 2026 (Radachowsky et al., 2012). The concession sizes in the recent-inhabited communities vary between 7039 ha up to 22.067 ha. This means, the biggest forest concession (22.067 ha) is not even half as large as the smallest concession of the long inhabited area (53.797 ha). The cutting cycle is 35 years with a range of 25 up to 60 years (Radachowsky et al., 2012). The mean area per member is 275 ha (range of 154 up to 460 ha). In general, the recent inhabited communities are smaller in the amount of members, who share less total area of concession size than *'Carmelita'* and '*Uaxactún'* do.

The community concessions of *'La Colorada'* and '*San Miguel'* were cancelled by CONAP due to severe violation of concession requirements. In *'La Pasadita'* and *'Cruce a la Colorada'* the permissions for annual harvests were suspended. For future harvests permissions, these communities first have to demonstrate a fulfillment of the contractual conditions (Radachowsky et al., 2012). According to Rainforest Alliance (2008), forest concessions were terminated or suspended due to internal organizational difficulties, problems with illegal land acquisitions and/or economic difficulties in meeting certification requirements.

4.11 Collective Action Costs in the Communities with Forest Concessions

The table below presents the performance of the conditions for low cost collective action of the resident community concessions. Based on the theoretical findings, CFM in the MBR is expected to appear successful when the community has low cost collective action. The table only shows fulfilled low cost collective action. High cost collective action is described after the presentation of this table.

Conditions for low collective action costs by Ostrom (1990, 1999), Agrawal (2003), Pagdee et al. (2006)	**Resident community concessions with forest-based history *'Carmelita'* and '*Uaxactún'***	**Resident community concessions with recent immigrants *'Cruce a la Colorada', 'La Colorada', 'La Pasadita'* and '*San Miguel'***	**Source**
Small size of user group	• Only six small communities were located inside the MUZ		Nittler and Tschinkel (2005)
Location close to the resource	• Concessions are located around each community		Barsimantov et al. (2010)
Clearly defined boundaries	• FSC-requirements for concession use • Communities only have 0-50 cattle		Radachowsky et al. (2012)
Tenure security	• Land grabbing is only 5% in these communities • Assignment of individual and common property		Radachowsky et al. (2012)
Clear ownership	• CONAP has created a clear and coherent legal concessionaire contract system for sustainable forest management • Active land-use plan		ISEAL Alliance and Trade Standards Practitioners Network (2008)
Congruence between biophysical and social-economic	• Communities are dependent on forest-resources		

boundaries			
Homogeneity among group members (share norms)	• Shared forest-based history • Long inhabited community		Radachowsky et al. (2012)
Past experiences of cooperation in connection with successful CFM (social capital)	• Community concessions are still active (one under condition) • Shared norms such as forest dependence		Radachowsky et al. (2012)
Congruence between appropriation and provision rules and local conditions	• FSC-certification ensures sustainable management		ISEAL Alliance and Trade Standards Practitioners Network (2008)
Monitoring	• Paid forest rangers 5.5 (range 4-7) • Appropriation and other environmental crimes (6.5 in total) were largely controlled and prevented by concession managers	• paid forest rangers 3 (range 0-6)	Radachowsky et al. (2012)
Effective enforcements of rules and regulations	• Financial management and transparency is medium and poor graded • Timber is FSC-certified • Concessions are still active (one under condition)		Radachowsky et al. (2012)
Strong leadership with effective local organization	• Internal structure of the communities is well established • Competent, honest and transparent leadership • Creation of the Community Forestry Concessions Enterprise (FORESCOM) • Creation of the Association of Forest Communities of Petén (ACOFOP)		Radachowsky et al. (2012) Nittler and Tschinkel (2005) Radachowsky et al. (2012)
Expectations that	• Community generated		Radach-

benefits will accrue to villagers	60% of the income from forest-products	owsky et al. (2012)
Sharing of common interests among community members local authority		
Graduated sanctions	• In case of minor non-compliance, sanctions can be applied and misbehaviour can be corrected, for example one concession is action under condition	Radach-owsky et al. (2012)
Conflict-resolution mechanisms	• Level of internal conflict is medium	Radach-owsky et al. (2012)
Minimal recognition of rights to organize	• Creation of powerful trade union ACOFOP that developed further skills for community development	CIFOR (2005)
Nested enterprises	• ACOFOP became highly influential by the communities and gained international visibility and credibility • Creation of the Community Forestry Concessions Enterprise (FORESCOM)	CIFOR (2005) Rainforest Alliance (2008)

Table 5. Conditions for low collective action costs in the MBR

The table shows that *'Carmelita'* and '*Uaxactún'* fulfill more conditions for low cost collective action than *'Cruce a la Colorada', 'La Colorada', 'La Pasadita'* and '*San Miguel'* do. These communities have attributes that indicate high cost collective action. For example, their level of internal conflict is extremely high (Radachowsky et al., 2012). Furthermore, in *'Cruce a la Colorada', 'La Colorada', 'La Pasadita'* and '*San Miguel'* uncertain land-titling was a problem. The mean concession area affected by land grabbing was 45% in these communities. The recent populated communities had further problems with illegal forest use that is prohibited by the forest concession requirements. These infringements include large-scale cattle ranching, human trafficking, marijuana cultivation, commercial hunting, archeological looting and land speculation. For example, ten years after the establishment of the forest concessions, the mean estimated number of cattle in 2009 in *'Cruce a la Colorada', 'La Colorada', 'La Pasadita'* and '*San Miguel'* was 475 cattle (range 150-1000 cattle). The amount of environmentally registered crimes in these forest concessions is three times higher (18 crimes) than in *'Carmelita'* and '*Uaxactún'* that had 6.5 environmental crimes (Radachowsky et al., 2012).

'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and '*San Miguel'* also experienced a rapid population increase which affected between 30 and 50% of the concession area. Some of the cattle ranchers were powerful and linked to organized crime. These illegal processes led to social conflict, violence and many environmental crimes. Illegal activities led to an unknown high income generation for some residents. For example, monitoring of the resources by a NGO and governmental personal discovered an illegal deforestation in the '*La Colorada'*-concession in 2008. There was a clear cut of 110 ha of forest area. This land use change was done for cattle ranching. The internal structure of *'La Colorada'* was destroyed as 40 of the former 42 families fled the community due to illegal selling of state-owned forest areas. Then, the concession was cancelled by CONAP. The remaining residents had to leave the area. All cattle ranches were destroyed and removed from the former concession. Control posts in the area were installed and watched by park guards, police and the army (Radachowsky et al., 2012).
The internal problems, land speculation and the establishment of cattle ranches led to the highest deforestation rates of the MUZ in *'La Pasadita'* (2.31%), *'La Colorada'* (1.52%), *'San Miguel'* (1.31%) and *'Cruce a la Colorada'* (1.05%). The NGO Rainforest Alliance (2008) stated that deforestation is highest near the recent established communities due to their agricultural background which prevented the inhabitants to use the natural resources of the forest. The amount of forest fires is yet another indicator for the internal management problems in the forest concessions. It was much higher in *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* than in the forest-based communities (Radachowsky et al., 2012).
The community members of these communities felt pressed into accepting the forest management by the government. Without accepting, they would not have gotten access to the common property concessions. But they complained about the concessions, which were not assigned to previous use patterns (Radachowsky et al., 2012; CIFOR, 2005).

In summary, the table shows how *'Carmelita'* and '*Uaxactún'* and *'Cruce a la Colorada', 'La Colorada', 'La Pasadita'* and '*San Miguel*' have very contrasting costs for collective action. *'Carmelita'* and '*Uaxactún'* use withdrawals rights. Furthermore, free-riding is controlled by forest rangers. *'Carmelita'* and '*Uaxactún'* are forest-based. Therefore, community-members are highly depending on the resource. Fulfilled sustainable management requirements put restrictions on the harvest rates. Conservation NGOs help by developing use-plans.

All in all, *'Carmelita'* and '*Uaxactún'* have clearly defined boundaries of their resource system, whereas *'Cruce a la Colorada', 'La Colorada', 'La Pasadita'* and '*San Miguel'* do not fulfill this condition. These communities do not use clear withdrawal or access rights. The residents of these communities are not highly dependent on the resource, because they mostly have an agricultural and cattle ranching background. Restrictions on the harvest rates are not complied. Deforestation is a problem.
Thus, *'Carmelita'* and '*Uaxactún'*, communities with a forest-based history, have low cost collective action, whereas *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'*, recent established communities, have high cost collective action. They do not match the conditions for low cost collective action.

A closer look at the developments of CFM in the two communities *'Carmelita'* as example for a community with low cost collective action and *'Cruce a la Colorada'* as example for a com-

munity with high cost collective action shall bring deeper knowledge about the conditions that seem to indicate low cost collective action in the MBR in Petén.

4.12 'Carmelita'

The community of *'Carmelita'* includes 83 households. Its ethnic composition is that of Mestizos. *'Carmelita'* has a remote location and it has a forest-based history. With the aim to harvest chicle, the first residents of *'Carmelita'* have established this community in 1910. However, the first road to *'Carmelita'* was built recently, in 2000. The community members have a forestry-related income generation background, which is not degrading the forest they use. In order to manage their forest-concession, the community established a cooperative in 1997. They own a sawmill (Barsimantov et al., 2011).
The cooperative is joined by all but four families in 2010 (Barsimantov et al., 2011). Social benefits increased due to the cooperative. More youths received higher levels of education. Timber extraction provided more and better jobs. Less people had to work in labor-intensive chicle production. Community members fear that if the requirements for the forest concessions would not prohibit selling land to colonists, their land could suffer from extensive deforestation. In this case, the pressure to enjoy the benefits of the resource at once would be too high to resist. Thus, according to the members of *'Carmelita'*, collective action is a very important pillar to conserve the forest and generate rural development (Barsimantov et al., 2011).
Another very important factor that contributes to low cost collective action of community forestry in *'Carmelita'* is the support of CONAP to use the common-land. It was CONAP that sponsored a clear delineation of individual and common-land within the concession, which was done in 2000. It enabled the community to increase its local authority over the common-forest. Furthermore, it also decreased the pressure on the forest to be deforested by individual users. At the time Barsimantov et al. (2011) collected the data for their research, the community of *'Carmelita'* was in the process to assign each community family usufruct rights of eight hectares agricultural land. The aim of this individual land assignment is to increase clarity of exclusion rights on the common-property. The cooperative felt, that it was necessary to mark a minimal land area for individual use to decrease the pressure to sell land or for deforestation of common-land that was exerted by two powerful families within the community. Each of the two families who are not part of the cooperative to manage the forest-concession control 45 ha of land. The cooperative wants enforce the rights of the individual land. This is why the community members believe this step will help to prevent future land sells and deforestation (Barsimantov et al., 2011).

4.13 'Cruce a la Colorada'

The community of *'Cruce a la Colorada'* includes 98 households. Mestizos also live in this community. They have a recent immigration background. The inhabitants came from all over Guatemala. Thus, they have no shared history with collective action successes and experiences, at least not between each other. The access to *'Cruce a la Colorada'* is less remote and it has no forest-based history. The forest concession includes an area of 20.000 hectares. This community does not own a sawmill.

The forest concession is managed by a cooperative of 68 members. Further 30 non-member families belong to *'Cruce a la Colorada'*. They did not want to join the cooperative, because they preferred cattle ranching or have arrived in the community after the cooperative was established. The forest concession suffered from deforestation, colonization and land-speculation by non-members of the cooperative. These pressures on the forest concession led to deforestation of 5000 ha of common property. An additional 3000 hectares were largely deforested by non-members of the cooperative. The families lived on the deforested land prior to the establishment of the cooperative and are engaged in rattle ranching. Thus, the common properties of *'Cruce a la Colorada'* have been reduced from 20.000 ha to 12.000 ha of common forest land. It is likely that they only would leave this land by force of government authorities (what has not been done yet).
What is missing in *'Cruce a la Colorada'*, has helped in *'Carmelita'*. It is the lack of an active land-use plan in *'Cruce a la Colorada'* which determines common and individual land areas.

Discrepancies between the cooperative-members and CONAP has delayed the land-use plan for years. The community member felt overlooked by the state authorities (Barsimantov et al., 2011). In 2011, CONAP sponsored a land-use planning process which was divided into three phases. In the end, it should delineate the common-land into common and individual areas. Each family was supposed to get eight hectares in the last phase. But it is doubtable, if this plan works out. Several families are not content with the amount of individual land. Plus, new settlers still arrived the community at the time of the research. In case there is no improvement of the conflict, some fear that the government will cancel the forest concession at all. But the residents of *'Cruce a la Colorada'* are convinced that the rate of uncontrolled deforestation would increase, if the government revokes the forest-concession (Barsimantov et al., 2011). *'Cruce a la Colorada'* also experienced severe internal management problems. A conflict between ranchers and community concession managers arose in 2010. Death threats were used to spread fear within the community. The conflict ended in the assassination of a community leader. Then, many residents left the community due to these internal conflicts (Barsimantov et al., 2011).

4.14 Compliance with CFM-Goals in the Communities

The table below shows the performance of the goals of CFM in economic, ecological and social developments in the six communities in the MBR in Petén. The table below only presents positive outcomes.

Goals of CFM in the MBR	Forest-based communities such as 'Carmelita'	Recent-immigrated communties such as *'Cruce a la Colorada'*
Economic	• More and better jobs • Higher income	
Social	• Social benefits increased • Youth had higher level of education	
Ecological	• Common-property prevents forests from	

	intensive deforestation due to colonists pressures • Individual minimal land-use allocation • Low deforestation rate	

Table 6. Compliance of CFM-goals in the six communities in the MBR

The table shows that forest-based communities such as *'Carmelita'* improved their economic, social and ecological goals through their management of the community forest concessions. The communities generated more and better jobs. Social benefits increased. The youth in the communities received higher levels of education. The economic development did not happen at the expense of the forest conservation of the forest concessions of *'Carmelita'* and '*Uaxactún'*. The forest concessions have a low deforestation rate and the sustainable criteria of the government are complied. Individual land-use allocation within the common-land safe the forest from deforestation. **Therefore, *'Carmelita'* and '*Uaxactún'* fulfill the criteria for successful CFM.**

Contrary to the results in *'Carmelita'* and '*Uaxactún'*, did *'Cruce a la Colorada'*, *'La Colorada', 'La Pasadita'* and '*San Miguel'* not enhance their economic situation, at least not as it was legally allowed. Instead, these communities increased poverty, instability and internal conflict. Furthermore, high deforestation rates from colonization, land-speculation, a non-forest based background of the community members and a missing land-use plan did not provide forest conservation of the forest concession, among other indicators for high cost collective action. **This is why *'Cruce a la Colorada', 'La Colorada', 'La Pasadita'* and '*San Miguel'* do not fulfill the criteria for successful CFM as it is shown in the table below.**

	'Carmelita' and '*Uaxactún'*	*'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'*
Collective action costs	Low	High
Goals of CFM in the MBR	Reached	Not reached
Outcome of CFM	**Successful**	**Unsuccessful**

Table 7. Outcome of CFM in the MBR

4.15 Conditions of CFM that lead to success in the MBR

The conditions of CFM that seem to lead to success in *'Carmelita'* and '*Uaxactún'* are low cost collective action such as small user group size, a location close to the resource, clearly defined boundaries, tenure security, clear ownership, monitoring and effective rules and enforcement. Conditions that also might have played a role are the remote location of the community to the next permanent road. In addition, in *'Carmelita'* and '*Uaxactún'*, the forest concession sizes are much larger than those in *'Cruce a la Colorada', 'La Colorada', 'La Pasadita'* and '*San Miguel'.*

Above all, it seems that very important conditions for a successful CFM in the MBR is a long and shared history with shared norms of the communities members (homogeneity), a de-

pendence on the natural resource (the forest), clear property rights regimes without alienation rights of the property. For example, the community members of *'Carmelita'* stated that they appreciated the individual and common land-use assignment within their forest concession. In addition, they said that the not granted alienation rights of the forest concession prevented them from triggering a *'Tragedy of the Commons'* by using the forest irresponsibly.

4.16 Conditions of CFM that lead to failure in the MBR

The conditions of CFM that seem to be linked to lack of success in *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* are their extremely high collective actions costs. These communities almost fulfill none of the conditions for low collective action costs. Instead, *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* have conditions that include uncertain land titling with land grabbing of the forest concession area by 45% (illegal forest use), the communities suffer from population pressure and organized crime, a high deforestation rate and a very high level of internal conflict. For example, in *'Cruce a la Colorada'* the internal disputes even led to the death of a community-leader.
The table on low collective action costs presents *'Cruce a la Colorada'*, *'La Colorada', 'La Pasadita'* and '*San Miguel*' with the characteristic of a small group size. But since it is also mentioned in other scientific data that for example *'Cruce a la Colorada'* suffered from population increase by colonists, it seems that, though these communities had a small group size at one point, that immigration flows have occurred and caused problems for the internal structure of the communities.

Above all, **it seems that very important conditions for unsuccessful CFM in these communities are a missing shared history and a recent immigration, no dependence on the natural resource, instead they have an agricultural background and they do not have clear property right regimes.** In addition, the cooperation between the community and CONAP did not work out very well. These discrepancies delayed the implementation of the land-use land plan that is supposed to determine common and individual land. Due to the continuing population increase, many people could not join the cooperative.

4.17 Differences between Communities in the MUZ

Regarding the conditions for successful and unsuccessful conditions for CFM, it becomes obvious that the MBR in Petén has CFM with very different outcomes. Four *('Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel')* out of six communities are not successfully practicing CFM, only *'Carmelita'* and '*Uaxactún'* fulfill the conditions for successful CFM.

The most obvious difference between *'Carmelita'* and '*Uaxactún'* and 'Cruce a la Colorada', *'La Colorada', 'La Pasadita'* and '*San Miguel*' is the difference related to the conditions for low cost collective action.
The communities with recent immigration have high cost collective action. This shows how ineffective the internal structure in the community is. The problems to establish a functioning collective action might also be negatively influenced by the closer location of these communities to the next permanent road what might increase the population pressure. These communities lie almost four times closer to the next permanent road than *'Carmelita'*

and '*Uaxactún'* do. Plus*, 'Cruce a la Colorada'*, *'La Colorada', 'La Pasadita'* and '*San Miguel'* have smaller concessions.
The findings of this chapter reveal that among the conditions which are associated with low cost collective action, are the group characteristics of the community. It appears to be very important to have a forest-based and shared history and norms and a small group size. In addition, clear property rights are also an essential condition for successful CFM in the MBR.

The findings also reveal that among the conditions associated with high cost collective action and the resulting unsuccessful CFM, are the group characteristics of the community. Groups with an agricultural rather than a forestry background, with no shared history and norms and groups which are larger do not develop the organizations capacities needed for success in community forestry. Unclear property rights are also a condition for unsuccessful CFM in the MBR.

4.18 Compliance of theories about CPR and CFM in the MBR

The extent to which this research supports the theories of common-pool resources management is considerable. In addition, the positive and the negative predictions about human behavior in a common-pool situation do apply. For example, the failure of CFM in *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* show how common property resources became open-access resources as Hardin (1968) predicted. Moreover, the community members in the failing communities prioritized personal, short-term and selfish gains over public and long-term gains. A *'Tragedy of the Commons'* was triggered.
In contrast, the communities *'Carmelita'* and '*Uaxactún'* illustrate how community members are able to implement a CPR-management that defines who controls the resource and how the resource is managed and exploited as Richards (1997) explains a CPR-resource. By doing that, the CPR management helps to keep the forest in the long-run by avoiding a *'Tragedy of the Commons'*. Furthermore, these communities were also able to prevent 'free-riding'.
As Johnson and Libecap (1982) argue, a CPR-situation like in *'Carmelita'* and '*Uaxactún'* include individuals who have the same cultural and social background and who have the same views on ownership, skills, knowledge and race.
According to Ostrom (1999), the positive CFM-results in *'Carmelita'* and '*Uaxactún'* are present in these communities, because the communities members came together, used a cooperative strategy and found themselves a binding contract which they carried out. These examples for positive outcome of CFM show what the community members of *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* were not able to carry out.

Moreover, this chapter also supports other findings by Ostrom (1990). For example, she argued that CPR-management is likely to be successful when the collective action costs are low. The results of this study support this assumption. *'Carmelita'* and '*Uaxactún'* have low collective action costs and carry out a successful CFM, whereas *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* do have very high collective action costs and do not carry out a successful CFM. Instead the failing communities do match the conditions that Ostrom (1999) predicted for groups with high collective action costs. These include a very large number of individuals involved, poor people who have little attachment to their land or

one another, diversity of ethnic and cultural backgrounds, wealthier individuals who control benefit through illegal strategies.
In contrast, *'Carmelita'* and '*Uaxactún'* fulfill the conditions as indicated by Ostrom (1990, 1999) and Agrawahl (2003) for low cost collective action. Especially, the conditions emphasized by Agrawal (2003) are matched by the successful communities. These are a small group size, a location close to the resource, homogeneity among group members, effective mechanism and past experiences of cooperation in connection with successful CFM. In addition, Pagdee et al. (2006) also argued that the property rights structure is very important for a successful CFM. *'Carmelita'* and '*Uaxactún'* do have a clear property rights system and tenure security, contrary to *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'*.

In summary, the results of this investigation strongly support the theories of common pool resources. This research shows that theories of common pool resources by Ostrom (1990, 1999), Agrawal (2003) and Pagdee et al. (2006) are applicable to analyse the common-pool resource management (CFM) in the MBR in Petén, Guatemala.

4.19 Conclusion

The chapter starts by describing the MBR in Péten, Guatemala. Its establishment, the different use-zones and the forest concessions are shown.
The analysis of successful conditions of CFM is based on the conditions for low collective action costs. The investigation reveals that the successful forest concessions in the MBR belong to long-inhabited and forest-based communities *'Carmelita'* and '*Uaxactún'*, whereas the recent-inhabited and agriculture and cattle ranching communities *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* possess unsuccessful forest concessions.

The findings of this chapter also show that, among the conditions for low collective action costs, important conditions for successful CFM are the group characteristics of the community. As a group, it appears to be very important to have a forest-based and shared history and norms and a small group size. In addition, clear property rights are also an essential condition for successful CFM. Accordingly, the findings of this chapter reveal that, among the conditions for high collective action costs, important conditions for unsuccessful CFM are the group characteristics of the community. As a group, it appears to be very unsuccessful to have an agricultural background, no shared history and norms and a big group size. In addition, unclear property rights are also a condition for unsuccessful CFM in the MBR in Petén.

5

Conclusion and Recommendation

This chapter provides the answer to the research question of this thesis. Furthermore, it states recommendations for further research about common-pool resource management and about the possibilities to improve CFM.

5. Conclusion

5.1 Introduction

This chapter presents the findings of this research. Furthermore, it answers the research question and shows under what conditions CFM seems to be successful or unsuccessful in the MBR in Petén. The implications of the findings are stated. Recommendations for further studies and more successful CFM name the topics and problems that need additional research and attention to deepen the knowledge about successful CFM in the MBR and elsewhere.

5.2 Summary of the Findings

Drawing upon common-pool resource management, this thesis has looked at the conditions for successful community forest management in the Maya Biosphere Reserve in Petén, Guatemala.

Chapter two explains the *'Tragedy of the Commons'* as a problem that leads to exploitation of common-pool resources such as forests are. Then, it is shown under what conditions groups or communities can manage a community forest under low cost collective action. Moreover, the findings of this chapter reveal the conditions contributing to low cost collective action in a CFM-situation as indicated by Ostrom (1990, 1999), Agrawal (2003) and Pagdee et al. (2006). They name conditions for successful CFM such as graduated sanctions and monitoring (Ostrom, 1990), small size of users group and homogeneity among group members (Agrawal, 2003) and property rights regimes (Pagdee et al., 2006).
Conditions that lead to failure in CFM (Ostrom, 1999) include for example a very large number of people, poor people who have little attachment to their land and a diversity of cultural backgrounds. Based on the findings of this chapter, it has been said that conditions in the MBR that appear to be successful should have low cost collective action as described by Ostrom (1990, 1999), Agrawal (2003) (Pagdee et al., 2006).

The third chapter explains the research strategy as a comparative case study based on meta-analysis. It describes why the MBR in Petén, Guatemala was chosen for this research. The conditions for low cost collective action are shown in the table with the conditions for successful CFM as it was developed based on the findings of Ostrom (1990 and 1999), Agrawal (2003) and Pagdee et al. (2006). In addition, the research-steps for conducting this investigation are stated.

Chapter four analyses the conditions for CFM that seem to lead to success and failure in the MBR in Petén, Guatemala. Successful forest concessions in the MBR belong to long-inhabited and forest-based communities *'Carmelita'* and '*Uaxactún'*, whereas the recent-inhabited and agriculture and cattle ranching communities *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* possess unsuccessful forest concessions conditions.

The findings of this chapter show that among the conditions for low cost collective action, important conditions for a successful CFM are the group characteristics of the community. It appears to be very important for groups to have a forest-based and shared history and

norms and a small group size. In addition, clear property rights are also an essential condition for successful CFM in the MBR. Accordingly, the findings of this thesis also reveal that among the conditions for high cost collective action, an important condition for unsuccessful CFM in the MBR is the group characteristic of the community. As a group, it appears to be unsuccessful for the outcome of CFM to have an agricultural background, no shared history and norms and a big group size. In addition, unclear property rights are also a condition for unsuccessful CFM in the MBR.

Factors explaining success of CFM are the low cost collective action. If a group is able to implement a governance system for a common-pool resource, it needs a cooperative strategy, find binding rules and means to implement them. Such a group is able to prioritize public and long-term gains over personal, short-term and selfish gains. This means, the group was able to avoid a *'Tragedy of the Commons'*-situation. In such a case, individual and rational strategies did not lead to collectively irrational outcomes, the so called *'Prisoners Dilemma'*. Failure in the management of a common resource occurs when short-term gains win over long-term gains and no cooperative strategy is implemented. Then, the collective action costs are high.

This study reveals that the successful communities *'Carmelita'* and '*Uaxactún'* have very different characteristics compared to the unsuccessful communities *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'*.
'Carmelita' and '*Uaxactún'* have low cost collective action while *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* have high cost collective action.

Among the collective action costs, the group characteristics in *'Carmelita'* and '*Uaxactún'* and *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* are very different. The successful communities *'Carmelita'* and '*Uaxactún'* have a resource-dependent background, a shared and long history among themselves (homogeneity) and a small group size. The unsuccessful communities in the MBR *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* have a non-resource-dependent background, with a recent and diverse history and population pressure.
In addition, the property right systems are also very different in the successful and unsuccessful communities. *'Carmelita'* and '*Uaxactún'* have clear property rights regimes, whereas *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* suffer from unclear property rights regimes.

Comparing the results of this study with common-pool resource theories has revealed that the extent to which these research results match with the theories of common-pool resource management is very high.

The findings of this study make it possible to answer the overall research question of this master's thesis. After analysing CFM in the MBR in Petén, Guatemala, the conditions of CFM in the MBR which lead to success are clearly identifiable as <u>low cost collective action</u>. Group characteristics such as a forest-dependent background, a long and shared history (homogeneity) and a small group size are very important conditions for a successful CFM in the MBR as these appear to lower the costs for collective action. Furthermore, clear property rights are also essential for low cost collective action.

5.3 Implications and Limits of the Study

The findings of this research implicate that low cost collective action contribute to the success of a CPR-situation. This knowledge could be further promoted and, if possible, should be used to assist in policy selection. The immense importance of the CFM lies in the fact that it can conserve the forest while it improves the economic conditions of its inhabitants at the same time. CFM can help to reduce pressure on a forest, which, because of its products and ecosystem services, is 'essential to the prosperity of humankind' (FAO, 2012).

Another implication of the findings about successful and unsuccessful CFM in the MBR in Petén shows how the sustainable management of forests could be increased.
For this section, the focus lies on the unsuccessful communities *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'.* It is very likely that the unsuccessful group characteristics such as a non-forest based background, heterogeneity among the group members and a big group size are very hard to change. However, this offers the possibility of interventions through improvement of the property rights regimes. This condition for success in CFM should be central in the MBR in the communities with unsuccessful CFM. The members of *'Cruce a la Colorada'* also emphasized the importance of clear property rights. They fear that if CONAP would cancel the suspended community forest concession completely, illegal land-use changes would occur and probably result in dramatically higher deforestation rates than they already have. **So, in order to improve CFM results in the unsuccessful communities in the MBR, CONAP, the community members and the cooperative members should work on a clear property rights regime and an active land-use land with individual and common land assignment.**
It was also noted by the communities *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'* that CONAP did not enforce the legal requirements. The community members wanted CONAP to reduce their illegal activities, but CONAP did not respond to this request. **Therefore, the recommendation for a more successful CFM in the unsuccessful communities is that CONAP need to engage much more and more strictly in the communities' implementation of the concession requirements. CONAP could increase the congruence of concession requirements according to the principle: Compliance of community forest concessions requirements means less CONAP involvement and more self-governance of the community, whereas non-compliance means more involvement of CONAP and less self-governance until legal standards for the forest use are achieved.**

Limitations of this study lie in the fact that the data was taken from scientific literature and not from field-research in Guatemala itself.
Furthermore, the results of this study cannot too easily be generalized, because the number of cases-studies is low. However, the findings concerning the success of CFM in the MBR in Petén match the theories of common-pool resources. This means, that even though the specific conditions for successful CFM may vary among countries and local conditions, the overall results in terms of success of CFM are generalizable.

5.4 Recommendations

This section gives the following recommendations for further research:

First, since successful CFM helps to increase the ecological and economic conditions, it is essential to deepen knowledge about CFM.
CFM, if successfully applied, offers a great opportunity to improve socio-economic conditions of the community while the forest is conserved. Therefore, it is very important to deepen the knowledge of successful CFM and the conditions leading to its success. In this way, humans have a better chance to lower the risks and threats associated with deforestation and forest loss such as environmental insecurity, climate change, biodiversity losses and soil erosion.
Second, CFM is a multi-level and multi-actor phenomenon. Therefore, it is very important to investigate the interplay of the various actors. Keeping in mind the reasons for the failure of CFM in *'Cruce a la Colorada', 'La Colorada', 'La Pasadita' and 'San Miguel'*, it would be interesting to know why the governmental agents did not enforce the contractual forest concession requirements with more vigour in these communities. It would also be very important to learn more about the internal structures within the communities.
This research also shows that financial aid for the initial implementation of CFM is very important. In the MBR in Petén, NGOs have provided financial assets in the beginning of its implementation process. Further research regarding this topic is very important, such as the possibility of compensation payments of the UN climate change negotiation process should be further researched.

5.5 Concluding Remarks

The results of this master's thesis confirm what Ostrom et al. (1999) stated, at least for the case of the communities *'Carmelita'* and '*Uaxactún'*: **The 'lessons from CPRs are encouraging, yet humanity now faces new challenges to establish global institutions to manage biodiversity, climate change and other ecosystem services'**.

6

Appendices

6.1 Data on forestry communities in the MBR by Radachowsky et al. (2012)

Conditions in the Concessions of the MBR		Resident community Concession with forest-Based history (N=2)	Resident community Concessions with recent Immigrants (n=4)
Initial Conditions in forest concessions of the MBR			
Year contracts granted		1997-2000	1994-2001
Year certified		1999-2001	1999-2005
Year contracts expire		2022-2025	2022-2026
Concession area (ha)	Mean	68,678	17,098
	Range	53,797-83,558	7039-22,067
Number of members	Mean	167	69
	Range	109-224	39-122
Number of beneficiaries	Mean	916	380
	Range	600-1232	215-671
Area per member (ha)	Mean	433	275
	Range	373-494	154-460
Management details for forest concessions of the MBR			
Area under timber Management (ha)	Mean	53,349	13,101
	Range	34,152-72,545	4800-17,621
Area under strict Protection (ha)	Mean	13,725	1768
	Range	9314-18,135	1100-3497
Mean annual harvest Area	Range	400	472
	Mean	400	80-705
Annual harvest volume, Primary species (m^3)	Mean	820	231
	Range	719-922	68-428
Annual harvest volume, Secondary species (m^3)	Mean	364	302
	Range	246-482	120-382
Harvest intensity (m^3/ha)	Mean	3.0	1.1
Cutting cycle (years)	Mean	40.0	35.0
	Range	40.0	25-60
Number of paid forest Rangers	Mean	5.5	3
	Range	4-7	0-6
Governance indicators for forest concessions of the MBR			
Concession Contract Status		All active (one with condition)	2 cancelled, 2 suspended
Certification Status		All active	2 suspended
Financial management and Transparency		1 medium, 1 poor	2 poor, 2 cancelled
Level of internal conflict		Medium	Extremely high
Percentage of concession area affected by land grabbing	Mean	5.0%	45.0%
	Range	5%	30.0-50.0%
Estimated number of cattle (2009)	Mean	25	475
	Range	0-50	150-1000
Registered environmental Crimes	Mean	6.5	18.0
	Range	6-7	10-22
Indicators of ecological integrity in forest concession of the MBR			
Annual deforestation 2001-2009 (ha)	Mean	17.3	268.7
	Range	17.2-17.5	92.2-433-8
Percent of concession	Mean	0.03%	1.54%

deforested annually	Range	0.02-0.03%	1.05-2.31%
Mean distance from permanent roads (km)	Mean	14.7	3.5
	Range	13.1-16.2	2.3-4.7
Socio-economic conditions in forest concessions of the MBR			
Estimated mean socioeconomic level		Medium	Poor
Primary source of income		Xate palm, timber	Cattle ranching, Agriculture, Timber
Estimated population per community 2010		1237.5 803-1672	702.6 380-1095
Annual population Increase 2006-2009	Mean	1.7%	9.2%
	Range	1.3-2.1%	5.7-11.8%
Percentage of residents who are direct beneficiaries of the concession	Mean	74.2%	40.6%
	Range	73.7-74.7%	40.6-61.5%
Percentage of members who are women	Mean	39.4%	16.4%
	Range	36.6-42.2%	4.2-29.9%

7

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