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Improving livelihood and natural resource sustainability by a combination of two systems

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A case study of an intertwined CPA/CBET-system in Chambok commune, Cambodia

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Acronyms

ASEAN – Association of Southeast Asian Nations
CBET – Community-based eco-tourism
CBNRM – Community-based Natural Resource Management
CCP – Cambodian People`s Party
CF – Community Forestry
CF Community – Community Forestry Community
CFMC – Community Forestry Management Committees
CFMP – Community Forestry Management Plan
CP – Protected Areas
CPP – Cambodian People‘s Party
CPA – Community Protected Areas
CPR – Common Pool Resources
ELC – Economic Land Concessions
FA – Forest Administration
FWUC – Farmer Water User Community
IFSR – Independent Forest Sector Review
IUCN – International Union for Conservation of Nature
KPRP – Kampuchean People`s Revolutionary Party
MAFF – Ministry of Agriculture, Forestry and Fisheries
MC – Management Committee
MoE – Ministry of Environment
MoT – Ministry of Tourism
NGO – Non-Government Organization
NPCA – Nature Protection and Conservation Administration
NTFP – Non-Timber Forest Product
PA – Protected Area
PIMD – Participatory Irrigation Management and Development
PRK – People`s Republic of Kampuchea
RGC – Royal Government of Cambodia
SES – Social-Ecological System
SFM – Sustainable Forest Management

SLC – Social Land Concession

UNTAC – United Nations Transitional Authority in Cambodia

WSHG – Woman Self-help group

WTO – World Trade Organization

1. Introduction

Property rights regimes in regard to forests and forestland are different from country to the other. In Europe for example are three different forest property right regimes at stake: the publicly owned forest (stakeholders are communes, universities, cities); the state owned forest (stakeholders are the state or the church); the private owned forest (stakeholders are private persons or corporate bodies). The latter is predominant for example in Germany and Denmark were 46.3 respectively 68.5% of the total forest land is privately owned (cf. Volz 2001, p. 51). On the opposite it "[…] is estimated that some 67% of total forestlands in Asia are claimed and controlled by governments, whereas only a total of 27% is designated for use or owned by local communities and indigenous people" (Dahal et. al. 2011, p. 1). Cambodia for example is covered by 10.09 million ha[1] of forestland, whereas 8.17 million ha are state owned, 0.13 million ha owned by communities and indigenous groups, and 1.19 million ha are privately owned (cf. Dahal et. al. 2011, p. 7).

In the last quarter of the twentieth century only a few countries have faced more political harassment, political violence, and political as well as economic transformation then Cambodia. Between the years 1970 to 1998 the country was threatened by four governmental changes[2], two civil wars between 1970-1975 and 1979-1998, a genocide led by the Khmer Rouge between 1975-1979, an invasion and occupation by the army of Vietnam in 1979-1989[3], and finally one of the biggest UN peacekeeping missions between 1992-1993[4] which lead to the first democratic election in Cambodia in 1993 (cf. Chandler 1991; Kiernan 2002; Vickery 1999).

[1] The total land area in Cambodia is 17.65 million ha. This data is from the homepage of the NGO RECOFT who works intensively on forest management issues in Cambodia, see: http://www.recoftc.org/site/Cambodia/ [03.07.2013].

[2] The various government were Lon Nol (who overthrow King Sihanouk), the Khmer Rouge (who overthrow Lon Nol), the Vietnamese based government of the People`s Republic of Kampuchea (who overthrow the Khmer Rouge), and the democratic government of the 1993 newly implemented Kingdom of Cambodia (cf. Hughes/Un 2011, pp. 1-10).

[3] After the successful Vietnamese invasion in 1979, a group of fled Khmer Rouge commanders established with backing from the Vietnamese army and advisors the People`s Republic of Kampuchea (PRK) and their political organ the Kampuchean People`s Revolutionary Party (KPRP) (cf. Hughes/Un 2011, p. 1). "The withdrawal of Vietnamese troops in 1989 resulted in an intensified peace effort that included two international conferences in Paris. In the first, in 1989, representatives from 18 countries, the four Cambodian parties and the UN Secretary General met in an effort to negotiate a comprehensive settlement with the Khmer Rouge rebels. The second resulted in the signing of the Paris Peace Accord on 23rd October 1991, the return of King Norodom Sihanouk to the country as the head of state […]" (Baromey et. al. 2012, p. 14).

[4] The UNTAC (United Nations Transitional Authority in Cambodia) was a UN peacekeeping mission based on the resolution 745. The aim of the mission was to recovery of a democratic and civil system in Cambodia and the preparation and implementation of democratic elections. For further information's view the homepage of UNTAC (cf. http://www.un.org/en/peacekeeping/missions/past/untac.htm [20.06.2013]).

The economic transformations were no less radical than the political ones. During the Khmer Rouge regime, the ruling party tries to build a new collectivized peasant society without any foreign influences, currency, private property, and even without small-scale trading, market places, schools, and libraries (cf. Kiernan 1996, p. 8). After the Vietnamese invasion, the newly formed government of the People`s Republic of Kampuchea (PRK) led by the Kampuchean People`s Revolutionary Party (KPRP) "[…] attempted to rebuild the Cambodian state, economy and society based upon an imposed […] version of Vietnamese-style socialism" (Hughes/Un 2011, pp. 1-2). By the end of the Cold War, the Vietnamese army withdrew from the country and Cambodia lost their key donor, the Soviet Union. The loss of the key donor was nearly directly compensated by Western donors, who entered the country alongside the UNTAC (United Nations Transitional Authority in Cambodia) peacekeeping mission. During the process of transforming the country into a democratic regime, the KPRP renamed to Cambodian People`s Party (CPP) and gained the political power during a violent political conflict in 1997 and an "[…] dubious and highly contested victory in the 1998 election […]" (Hughes/Un 2011, p. 3). However, the CPP saw and took advantage of their opportunities and transformed the economy, based on the help of western donors, from socialism into neo-liberal capitalism. These transformations to a market economy led to the inclusion of Cambodia to the Association of Southeast Asian Nations (ASEAN) in 1999 and to the World Trade Organization (WTO) in 2004 (cf. Baromey et. al. 2012, p. 15).

Since the UNTAC mission Cambodia makes through crucial economic changes. Hughe/Un (2011, p. 10) describes that this transformation "[…] represents a visible change in the level and nature of economic activities from the 1990s to the 2000s." To illustrate this transformation Hughe/Un (cf. 2011, p. 10) provides several statistical key figures: average economic growth of 10% per year; the export volume has tripled; volume of foreign investments has significantly increased; and the poverty rate has decreased.[5] Simultaneously the social inequality increased significantly. The United Nations Development Program for Cambodia pointed out that the Gini Coefficient[6] has risen year by year from 0.35 in the year 1994 to 0.40 in 2004 and 0.43 in 2007 (cf. UNDP Online). This social inequality is growing especially within the rural areas where 90% of the poor people (cf. Van Acker 2010, p. 22) and 80% of the whole population live (cf. World Bank 2013).

For a majority of the rural population, agriculture and natural resources are the major source of livelihood. Although for the Cambodian economy, agriculture plays a key role for the development of the country. Following the statistics from the World Bank in the year 2011

[5] The World Bank published in his country profile a poverty rate (% of population below national poverty line (0,61$ per day)) of 30%; an average GDP (per capita) in the years 2001-2011 of 7%; and an average export volume in the years 2001-2011 of 13,6% (cf. http://devdata.worldbank.org/AAG/khm_aag.pdf [20.06.2013].

[6] The Gini coefficient ranked from 0 (perfect equality) to 1 (absolute inequality).

agriculture made up 36.7% of the national GDP, whereas on the opposite the industry claims 23.5% (cf. World Bank 2013).

The rural poor are highly dependent on agriculture and natural resources and therefore they are also highly dependent on land property rights. As Ratner (2011, p. 1) points out: "For many of these households, access to these resources means the difference between an adequate diet and malnutrition; for others it represents the chance for a growing income, a means to invest in children`s education, and a route out of poverty." Along with agricultural products the author talks about the importance of natural resources for food security and livelihood of the rural poor. Cambodia possesses the highest per capita endowment of arable land, water and freshwater fish as well as one of the highest endowments of forests in Asia (cf. Baromey 2012, p. 28). In addition to the agricultural products, natural resources in Cambodia play a significant role. The dependence from these resources of the rural poor increased in a heavily manner, since the Cambodian government prosecutes a politic of granting massive Economic Land Concessions (ELC) to companies who transfer the land into for example rubber or cashew plantations. Thus the rural poor "[…] becoming alienated from the land and therefore are more dependent than ever before on natural resources that are diminishing at an alarming rate" (Frieson/Pech 2010, p. 34).

The prime natural resources in Cambodia are forests and fishery products. The latter represents on the one hand the most important source for animal protein for Cambodian through a consumption of estimated 37kg per person per year. On the other hand the domestic fishery-industry is annually producing an amount of 590.000 tons of fish and other aquatic animals like shrimps, crabs etc. Therefore fishery products serve as a main food source and simultaneously as a main source of income and employment (cf. Van Acker 2010, p. 21).

The forest products are not less important than the fishery products. Chandran (2012, p. 1) points out that "[…] nearly half of Cambodia's rural households – more than five million people – rely on forest for 20-50 per cent of their livelihood. For another one million people, forest provides over half of their livelihoods." It would be wrong to reduce forest products only to fuel wood, timber, poles, or stakes. These specific products are named as timber products. A further product classification refers to so-called Non-Timber Forest Products (NFTPs), which includes fruits, natural medicines, resins, fodder, or green manure. A third group of products refers to community or global benefit from forestry like shade, soil conservation, watershed protection, carbon sequestration, microclimate regulation, and biodiversity protection (cf. Place et. al 2004, Brief 5).

The questions at stake are: who should manage these resources and how should this management be organized? The Cambodian case provides several examples of practical applications of different forest resource management approaches: a nation-wide land concession system with ELCs and Social Land Concessions (SLCs) (cf. Chandran 2012), the

systems of Community Forestry (CF) or Community Protected Areas (CPA) (cf. Brofeld et. al 2009), and traditional management systems (cf. Hornung/Vize 2013). Land concessions in Cambodia allow companies to use a defined land area in commercial ways, mostly within a timeframe of 99 years. The systems of CFs and CPAs are "[…] a form of decentralized forest management, where the responsibility of managing a forest area is delegated to a village of local community living in or near it, to ensure Sustainable Forest Management (SFM) by securing tenure of the land and user rights for the local community giving them an incentive to engage in long term (and ecologically sustainable) planning and protection of their forest resources" (Brofeldt et al. 2009, pp. 103-104). Traditional resource management systems in Cambodia can be characterized in two ways. There are on the one hand traditional forms of resource management cooperation centered on the pagodas: "They are based on the donations villagers give to a pagoda committee. In the first place, they provide for the monks´ food but are also used to repair the pagoda, establish rice banks, and give food and shelter to the most vulnerable villagers" (Weingart/ Kirk 2008, p. 4). In turn, the monks and influential villagers build specific associations, which deal with specific problems. In some reported cases forest associations were founded, to manage and protected the forest around the pagoda and the related villages (cf. Diepart 2013). On the other hand there are approximately 23 different indigenous ethnicities located in Cambodia. All these indigenous groups shared the concept of collective ownership of property, which means that they used their land collectively, among other things, as farmland. Hornung/Vize (2013, p. 6) pointed out that the "[…] concept of collective ownership is central to the identity of all indigenous peoples in Cambodia. Their beliefs, cultural systems, and ways of living are linked to the land. In a very real sense, land is culture for Cambodia's indigenous people."

Whereas CFs/CPAs and traditional systems are considered to be a sustainable way to manage resources and a good opportunity for the rural poor to improve their livelihood, the land concession system is characterized as a dangerous threat for natural resources and the rural population of Cambodia (cf. Frieson/Pech 2010, p. 38).[7]

Apart from the fully government-controlled and -managed concession system, it is possible to classify the two other approaches as follows: 1) CFs/CPAs as top-down or so called co-management models implemented by the government and realized mostly by NGOs and local actors; 2) traditional systems as bottom-up models implemented by the rural or indigenous communities and also realized by them. Several studies have shown the efficiency of such bottom-up decentralized community-based natural resource management systems and the

[7] Within the target area of a concession, economic pressure increases in a significant level. The rural population (mostly indigenous groups) within that area gets forced to sell their land. A current example is an political conflict in the Ratanakkiri province where members of the ethnic Jarai was forced to "[…] opt for private land titles instead of community land […]" (Pheap 2013) and to sell that land in order to build an cassava plantation.

inefficiency of top-down government implemented natural based resource management systems (cf. Ostrom 1990). Ostrom and her colleges (cf. Ostrom 1990, chap. 3-5; Agrawal/Ostrom 2001) provides several examples of self-governed common managed resource arrangements in which the rules have been devised and modified by the resource users themselves and are also monitored and enforced by them. Resource users are more likely to adopt rules and restrictions given by them rather than by the government. If rules imposed by outsiders, like the government, people didn't feel personally affected by them and may act heavily self-interested (Ostrom et. al. 1999, p. 281). Thus, several scholars argued that self-organized bottom-up resource management systems are more efficient than systems organized top-down by the government. Therefore, especially the top-down implemented CFs and CPAs raises interesting questions which should be answered in this thesis: Are the institutional arrangements crafted by the government able to deliver a community benefit? How robust are these schemes? Furthermore, which impacts weaken or strengthen the resource management schemes?

To answer these questions, this paper concentrates on the one hand on the "Theory of the Commons" outlined mainly by Elinor Ostrom (cf. 1990).[8] This theory provides the researcher with a helpful tool to define important aspects of resource management systems and to analyze these systems within clear scientific boundaries. On the other hand, the framework of robustness in Social-Ecological Systems (SES) as sketched by Anderies/ Janssen/ Ostrom (cf. 2004) will be used. This framework offers a way to research the cooperation among the resource, the resource users, public infrastructure and public infrastructure providers. It offers a usable tool for analyzing the outcome of natural resource management systems in terms of establishing whether or not they are sustainable. Another reason to use this framework is the attempt to weaken a critique of Agrawal (2001, p. 1655) at Ostrom, who describe that the work of Ostrom "[…] pay only little attention [to] the external social, institutional, and physical environment." With the link to external disturbances, the frameworks of robustness in SESs remark explicitly on issues like major political changes, demographic pressure, or social pressure through the increasing modernization.

This theoretical framework would be applied in an in-depth case-study of the CPA/CBET Community in Chambok commune, Phnom Sruich district, Kampong Speu province, Cambodia. The aim of this thesis is to explore which resources the local community uses, which internal regulations to manage the resources are at stake, which different actors are influential, and how robust the different systems are. To achieve these objectives, a number of semi-structured interviews with experts from local NGOs and unstructured interviews with villagers were conducted.

[8] This paper use mainly the work of Ostrom because it is one of the "[…] most significant book-length analyses of local, community-based efforts to manage and govern common-pool resources" (Agrawal 2001, p. 1651).

The following sections deals with the description of the theory of the commons, and the definition of the framework of robustness Social-Ecological Systems. But at first, we will outline the mainly used research methods.

1.2. Research methods

To answer the three research questions, a qualitative approach was used to collect sufficient data. A single-case study design is chosen because it provides the author with the ability to get an in-depth analysis of the context, history, and idiosyncrasies of the chosen case. To gain a sufficient knowledge about the theoretical background of common-pool resources, community-based resource management, and robustness of social-ecological systems an intensive desk research was conducted

The author mainly employed unstructured interviews with local villagers and semi-structured interviews with specialists from local NGOs. The method of unstructured interviews was used, because they provide the author with more flexibility in talking to the local people. For the conversations with the local people a translator must be used, which is to be seen as a potential biased source of information. Semi-structured interviews were conducted by using loose question guides, which were developed through an intensive desk review of the related literature. All interviews were conducted with the use of a voice recorder.

Furthermore, the author has written some field notes which mostly contain the description of the specific interview situations and behavior of the interviewee, but also the description of events and observations during the field trips. Some of these notes have been incorporated into this paper.

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2. The Theory of the Commons – How individuals organize their resources in a cooperative way

Approximately 30% of the global land mass is covered with forest. Over 1.6 billion people are dependent on this natural reservoir, which means that they live in it or that they actively use the forest for their livelihood (cf. Meinzen-Dick et al. 2006, p. 1). The usage of land masses like forests, dry lands or water basins are mainly managed by common property systems. Examples for common managed systems are irrigation systems, meadows (cf. Ostrom 1990, ch. 3) or fisheries (cf. Ostrom 1990, pp. 173-177). Mainly poor and especially rural people are heavily dependent on natural resources for their livelihoods; they are reliant on fish, wood, and non-timber forest products like honey for their daily food and family income (cf. Fitzgerald/So 2007, p. 24).

In a very simplistic view, scholars differentiate between two types of goods: the public good and the private good. The first one is characterized by the aspects of non-excludability and non-rivalry. On the opposite, the second one is defined by the characteristics of excludability and rivalry of consumption.[9] Ostrom in turn modified this simple dichotomy of goods in several steps. First, she replaces the term "rivalry of consumption" with the term "substractability of use". Second, she characterizes the terms of excludability and substractability in a way that makes it possible to illustrate them as units which vary from low to high. Third, she adds and defines a third type of good – the common-pool resource – "[...] that shares the attribute of subtractability with private goods and difficulty of exclusion with public goods" (Ostrom 2010, pp. 644-645). Still, all types of goods include many subtypes which are characterized by different attributes and differ substantially in regard to the number of users, the specific local conditions and many other factors (cf. Ostrom 2010, p. 645).

The similarity which is shared by the commons mentioned above is that all of them are systems, based on natural resources or the distribution of such resources, like for example in irrigation systems. In a very abstract view, these common pool resources are natural or man-made resource systems which share two fundamental characteristics. First, these systems share the difficulty to exclude someone from obtaining benefit from the resource. That means that they are too large and therefore it is too expensive to exclude actors, but it is not impossible (cf. Ostrom 1990, p. 30). Second, these systems share the aspect that the use by one actor reduces the available quantity for the use by other actors (cf. Ostrom et al. 1999, p. 278).

For these reason, the common-pool resources (CPRs) need a clear defined set of users and a management system (cf. Frieson 2010, p. 22). Both can be established by law based government programs, private firms, or by traditional systems which are defined by historical usage rights,

[9] For the classical definition of these two goods see Samuelson (cf. 1954).

by kinship ties or community membership. The last aspects refer to bottom-up models, where individuals cooperate to manage their resources by themselves. While government programs and private firms refer to the old theoretical dichotomous of "the state" and "the market", so that individual cooperation does not fit in this classification. The keyword of individual cooperation is central to create "[…] more complex frameworks, theories, and models to understand the diversity of puzzles and problems facing humans interacting in contemporary societies" (Ostrom 2010, p. 641).

When we speak about government programs, private firms or individual cooperation, we pointed intuitively the three main solutions for the problem of collective action given by scientific scholars. This problem is crucial for CPRs, because the management of such resource systems include several actions taken by individuals as a collective of resource user. In a simple manner, collective action appears when more than one individual choose to act to contribute to an action in order to achieve an outcome: "People living in rural areas and using natural resources engage in collective action on a daily basis when they plant or harvest food together; use a common facility for marketing their products […]" (Ostrom 2004, Brief 2).

2.2. One problem, three metaphors

The problem of collective action has several facets and scientific scholars developed a huge number of metaphors which try to illustrate the characteristics of the problem. For a short theoretical overview, we concentrate on the three most famous metaphors: the *Logic of Collective Action*, the *Tragedy of the Commons* and the *Prisoner's Dilemma*. As we will see, all three metaphors share the same fundamental core problem.

To start with Mancur Olson (cf. 1965), who named the problem of collective action *The Logic of Collective Action*. Olson wants to reject the view of the orthodox group theory, which pointed out, that individuals who are organized in a group tend to act in support of their group interest to achieve a benefit for the group. The rationale behind that is that if rational actors share a common goal and they know that all of them would be better off if that goal were achieved, it is logically for the group members to act in order to reach that goal (cf. Olson 1965, p. 1). Olson in turn challenged the assumption, that only the possibility of an expected benefit would lead to collective action to achieve that goal. He points out that "[…] rational, self-interested individuals will not act to achieve their common or group interests" (Olson 1965, p. 2).

His argumentation is based on the requirement that a collective good is usable without exclusion (cf. Lessing 2001). Therefore once the good is produced and it is not possible to exclude a rational actor from obtaining a benefit from that good, the actor has no incentive to cooperate in a voluntary way with other actors to produce that collective good. The dilemma of this situation is that rational actors choose the non-cooperative strategy and the situation culminate into a

Nash-equilibrium where no actor has the incentive to change his strategy and therefore the production of the collective good collapse.

In his famous article Garret Hardin (cf. 1968) argues within the same vein like Olson and illustrates the problem of collective action as the *Tragedy of the Commons*. He pointed out that when many individuals use a scare resource in common, the environment gets degraded. Hardin illustrates his finding with the picture of a willow which is usable by all actors and from the perspective of a rational herder:

> "Each herder receives a direct benefit from his own animals and suffers delayed costs from the deterioration of the commons when his and others` cattle overgraze. Each herder is motivated to add more and more animals because he receives the direct benefit of his own animals and bears only a share of the costs resulting from overgrazing." (Ostrom 1990, p. 2)

Precisely because the resource users are rational actors, they don't concern about the cost their actions imposed on other actors, therefore the addition of all actor decisions in regard to a scare resource "[…] cumulate to a tragic overuse and the potential destruction of an open-access commons" (Ostrom et al. 1999, p. 278). Thus the process of the degradation of the environment is inevitable when actors organize their resources by their own, because every actor is trapped into a system that forces him to increase his benefit without limit in a limited world (cf. Hardin 1968, p. 1244). But Hardin was not the first scientist who claimed the dilemma people are confronted with in regard to collective goods. As Ostrom (cf. 1990, pp. 2-3) notes, already Aristotle and Hobbes have observed that every actor thinks about his own well-being and to a lesser extend about the common interest. Also economical scholars have shown that if a number of actors use a common good, the production process resulted in a higher withdrawal of this good than the optimal economic level of withdrawal pretends (cf. Ostrom 1990, p. 3).

The third metaphor is the game theoretical model known as *prisoner's dilemma*. Both theoretical works mentioned above can be transferred into this game. To simplify the problem, we assume a two-person game where the actors want to use a common resource, which is free for all. For this resource, there is an upper limit of production, which should be respected in order not to over-exploit the resource. Let us call that number R. Since we have two players, the cooperative strategy for each player is to withdraw $R/2$ resource units. On the opposite, the non-cooperative strategy is for each actor to withdraw as much as they think they get a benefit from it. Therefore the number for the non-cooperative strategy is $>R/2$. If both players choose the cooperation strategy and limit their withdrawal to $R/2$ they obtain 10 units of benefit, but if both choose the non-cooperative strategy they both obtain zero benefit. If one of them chooses the cooperative way and the other the opposite, then the first one will obtain -1 units of benefit and the latter 11 units. Since the prisoner`s dilemma is a non-cooperative game in which all players have

complete information and where communication among the players is forbidden or irrelevant, both players choose, in their role as rational actors, their dominant strategy, which is to non-cooperate. If both non-cooperate, they obtaining zero benefit (see Figure 1). The strategy of non-cooperation is therefore the dominant strategy, because each player knows that in case he defects and the other player cooperates, he would gain the greater benefit. Thus every player is better off in choosing this strategy no matter what the other players choose. In doing so the actors reach an equilibrium in which nobody has an incentive to change his position and the outcome of the interaction is not a Pareto-optimal one. To understand the importance of this though experiment for social science it is vital to say that the "[...] paradox that individually rational strategies lead to collectively irrational outcomes seems to challenge a fundamental faith that rational human beings can achieve rational results" (Ostrom 1990, p. 5).

Figure 1. The prisoner's dilemma

		Player 1	
		non-cooperate	cooperate
Player 2	non-cooperate	0 0	11 -1
	cooperate	-1 11	10 10

Source: own chart

These three metaphors are useful to illustrate problems that individuals face when they want to produce collective benefit. But as different as they may be, all three share the same fundamental core problem: the free-rider problem. Once an individual cannot be excluded from the benefits other provide by producing a collective good, each person hasn`t any incentive to contribute to the production of such a good. The rational action for them is to free ride and gain the good provided by others, without any copayment to the production of that good. With Elinor Ostroms (2004, Brief 4) words: "When individuals seek out short-term benefits for themselves alone, they are better off when others contribute to the collective action and they do not. In this case, they benefit without paying the costs. Of course, if all individuals pursue short-term, self-centered benefits, no collective benefits are achieved."

This collection of several problems who dealing with the free-rider problem appears to show very clearly, that individuals who want to cooperate in order to achieve a common good have been caught in an inevitable process of resource degrading. Further, they seem to point out that individuals are unable to overcome their drive to act in a short-term and self-centered way.

Garrett Hardin`s (cf. 1998, p. 682) solution was that only external policymakers, either the state or private enterprises, could impose collective action and therefore manage common pool resources. But as pointed above, several scholars have established a third, more complex framework to understand collective action and to solve the problems occurred from the management of collective goods.

But why is it so important to find solutions for the collective action problem? If we narrow that problem down to the withdrawal of collective goods for example in Cambodia, we see the priority to find a solution. The Cambodian people use the specific idiom *robos ruom* to speak about common resources, which can be translated with "thinks that shrink". Chea Chou (2010, p. 13) explains:

> "This expression suggest that common resources are subject to shrinking because they are seen as belonging to everybody but nobody has the clear responsibility to protect them."

This quotation shows the importance of the following question: What should be done to manage the commons in a sustainable but also economically efficient way? The following sub-section will show the three main theoretical solutions scholars have established to solve collective action problem: "the state", "the market", and "self-governance".

2.2.1. One problem, three solutions

One of the most discussed approaches to manage common goods is direct state centralization, in which the state organizes the management and takes responsibility for the resource itself (cf. Chou 2010, p. 14). Within this vein several scholars insist that the only way to avoid the tragedy of commons is to create external regulation agencies like government committees and public agencies. The assumption is that the absence of a hierarchical government to induce compliance causes that "[…] self-seeking citizens and officials would fail to generate efficient levels of public goods […]" (Ostrom 2010, p. 642). Therefore the government has to reduce inefficiencies, control social groups, and limit conflicts among government and society.

Elinor Ostrom implemented the state-solution into the game theoretical model of the prisoner's dilemma. In this modified game, the central agency decides who can use the resource, when they can use the resource, and what materials they can use to withdrawal the resource. Finally the central agency is entitled to sanctioning rule breakers, e.g. with a penalty of 2 units. Further, the government knows the maximum quantity of units to withdrawal for a sustainable resource use and punishes every actor who chose to overuse the resource. In such circumstances the non-cooperative strategy would lead to 9 units of benefit and on the opposite the cooperative strategy would lead to 10 units of benefit. Thus the dominant strategy of the actors is to

cooperate (cf. Ostrom 1990, pp. 9-10). Apart from this theoretically expected outcome, the "state solution" contains several crucial internal problems:

(1) Who monitors the enforcer? Is it rational to create an institution which monitor and enforce? The last question is obvious, because; on the one hand, the creation of such an institution generates costs of maintaining, which must be financed, and on the other hand, it is not ensured, that such an institution didn't make several errors like, for example, sanctioning actors, who rely and not sanctioning exploiters (cf. Ostrom 1990, p. 10).

(2) Another problem occurs with the institution itself. Because the introduction of an institution creates, a new, a third player. In turn, this new player is also a rational egoist and therefore he acts in regard to maximize his own utility. The enforcer "[…] use[s] those powers [to monitor and enforce the other players] to maximise her own pay-off, regardless of the impacts on *A* and *B* [the other actors]" (Brennan/Hamlin 2000, p. 39). Therefore, the main problem is the forgotten incentives of the enforcer, which is different from the rest of the players (cf. Christiano 2004, p. 127). Because of these facts, the way of solving the problem with state institutions becomes discarded.

Apart from these theoretical problems, the "state-solution" indicates also important empirical problems. Pierre/Peters (cf. 2000) claimed that the huge state organization can`t think in the way small local community organizations need to think. Since resources are mostly locally managed, the state can`t provide a sustainable resource usage. Further the "state-solution" contains the threat of corruption, because state officials are interested and involved in self-interested rent-seeking, which leads to inefficient resource management and negative impacts on the resource sustainability (cf. Wade 1982).

The obvious ineffectiveness and side-effects of the "state-solution" lead us to another way of solving the collective action problem: the "private firm-solution". Garret Hardin (1998, p. 682) believed that either the state or the "privatism of free enterprises" would lead to a sustainable resource management. Since the "state-solution" seems to be checked off, the "private firm-solution" is at stake. The main argument is that privatization leads to effective investments on the resource and to equally effective governance. However, normally the market, in which private firms act, is an institution for the production and exchange of private goods. With this in mind, some analysts plead, that for a sustainable resource management the common property right system has to be transformed into a private property rights system (cf. Smith 1981, p. 467). Ostrom (cf. 1990, p. 12) refers back to Welch, who comes to the solution, that privatization is the best way for managing common pool resources. But if you had common pool resources, which means that they are undividable and that it is hard to exclude people form that good, it is "[…] difficult to know exactly what analysts mean when they refer to the necessity of developing private rights […]" (Ostrom 1990, p. 13). Further, Ostrom (cf. 1990, p. 12, emphasis in original) sees the danger, that if private rights are established, each individual "[…] will be playing a *game*

against nature in a smaller terrain […].” Finally when the land is divided into small parcels of private land, the resource system itself, e.g. an irrigation system or a forest management system, is still managed in common rather than individually. Ultimately some scholars have pointed out that privatization leads to inequality, because the people who are depended on natural resources (the rural poor) didn`t have the money to pay for a private land title (cf. Chou 2010, p. 14 and Shiva 2002).

We have shown that the “state-solution” leads to inefficiencies, and that the “private firm solution” has several vast side effects. Further both solutions doesn`t deal adequately “[…] with the wide diversity of institutional arrangements that humans craft to govern, provide, and manage public goods and common-pool resources” (Ostrom 2010, p. 642). Thus, Ostrom and other scholars have disagreed with these two solutions and argued that there exist a third way and that the answer lies in the self-government of common pool resources, or in other words in Community-based resource management (CBNRM).

It is a mistake to think that institutions which manage a resource are purely private or state-owned. As Ostrom (1990, p. 14) points out, common pool resource institutions “[…] are rich mixtures of “private-like” and “state-like […]”. Which means that there is a market provided, in which individuals can act upon, produce and share resources, and that the market-actors face several limitations by the state-rules in which they act.

Keeping the freedom to act in mind, the third solution of self-governed common pool resources includes the opportunity for the individuals to give themselves a binding contract to commit themselves to a cooperative strategy to manage their resources.[10] This self-given contract has to be embedded into the legal framework of the state in which the resource is based. To negotiate a contract means for a group of individuals that they have to figure out how to share the existing capacity of the resource, how to monitor the group members, how to enforce their agreements, how to punish rule breakers, and finally how to share the cost of monitoring, enforcing and punishment. Further, they have to give themselves an organizational and perhaps hierarchical structure for the management of the resource.

The decisions, how to punish the rule breakers, and how to monitor and enforce the agreement include the decision rather to hire an external actor as a service contractor or not. To hire an external actor would reduce the costs which monitoring, enforcing and punishment bring in its wake. On the opposite, the individuals who use the resource over a long period of time have detailed information about the resource level. They have clear incentives to monitor the other resource user and know that they are better off in reporting rule breaking actions: “Arbitrators may not need to hire monitors to observe the activities of the contracting parties. The self-interest of those who negotiated the contract will lead them to monitor each other and to report

[10] For a game-theoretic elaboration of this solution see Ostrom (1990, pp. 15-18)

observed infractions so that the contract is enforced" (Ostrom 1990, p. 17). Another problem actors are faced by hiring an external actor is the principal-agent problem, which means that the monitor seeks to reduce his own costs and acts also self-interested and therefore the arbitrators have to monitor the external actor which in turn produces additional costs. Chea Chou (2010, p. 14) describes the attractiveness of the "self-governance solution" in the following way:

> "The rational is that the closeness between the resource and the governing body reduces complexities and the cost of management, and that the ratio of long-term benefits or resource sustainability to short-term benefits is higher because the community is physically and mentally close to the resource."

To achieve this aim, the resource users have to avoid free-riding, achieve high level of commitment within the community, and build new institutions to manage their resources, monitor conformity, and establish enforcement rules.

Uncountable communities in the world have successfully faced these tasks and established robust and sustainable CPR-systems. Ostrom (cf. 1990) gives in her book *Governing the Commons* various examples of long running CPR-systems like irrigation systems in Spain and Indonesia, meadow and forest management in Switzerland and Japan, and fisheries in Turkey and Canada. Among all differences these systems share one basic similarity: all of them face the problems of uncertainty and complex environments (cf. Ostrom 1990, p. 88). But exactly this similarity makes it important, that all CPR systems establish different rules which "[…] take into account specific attributes of the related physical systems, cultural views of the world, and economic and political relationships that exist in the setting" (Ostrom 1990, p. 89). Finally, if appropriators have the opportunity to set their own rules and to define their own access rights in regard to the local conditions, they are more likely to accept restrictions and rules and to behave in accordance to that rules. That means, resource users are more likely to accept rules that facilitate their efforts and the local conditions, than rules that ignore these circumstances and are implemented in a top-down way (cf. Ostrom et al. 1999, p. 281). This subjection of individual rules for every case makes it impossible to generate a fixed set of rules and preconditions, which define an ideal type of a common pool resource management system.

Thus, Elinor Ostrom defines a set of seven design principles which characterize several CPR systems she has observed. However, also these principles are, in Ostroms (cf. 1990, p. 90-91) words, quite speculative, but even so they show significant empirical evidence and are useful to set a theoretical frame for analyzing common-pool resource management systems. The principles are designed on the basis of small-scale CPRs, where the common-pool resource is located in one country and where a small number of people (50-15.000) are heavily dependent on the resource for their livelihood (cf. Ostrom 1990, p. 26). The principles are listed in Box 1.

Box 1. CPR design principles

1. 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.
2. 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.
3. Collective-choice arrangements

   Most individuals affected by the operational rules can participate in modifying the operational rules.
4. Monitoring

   Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to the appropriators or are the appropriators.
5. Graduated sanctions

   Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, by officials accountable to these appropriators, or by both.
6. Conflict-resolution mechanism

   Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
7. Minimal recognition of rights to organize

   The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.

Source: Ostrom (1990, p. 90)

2.3. Property rights, tenure security and right holder

Ostrom provides a detailed discussion of each of the design principles in her main work *Governing the Commons* (cf. 1990, pp. 91-102). Hence, we shall discuss only one important part of these design principles and add some further helpful train of thought about property rights. The first design principle proclaims clear boundaries of the resource itself and a clear catalogue which identify who can use the resource. The hidden agenda behind that is, if the resource has

no clear defined boundaries and if it is not clear who can withdrawal from the resource, "[…] no one knows what is being managed or for whom" (Ostrom 1990, p. 91). Thus, this principle contains the idea of property rights and more specific of common-property rights. And as we have seen in the theoretical description of the "private firm-solution", property rights played a significant role within the management of common pool resources.

Property rights govern the usage-conditions for the related resource for every actor. They clearly define the charges and duties of actors to the benefits of a resource. More broadly, they "[…] can be defined as relationships among actors with respect to things such as natural resources. Property rights are always contestable. Contestation attenuates the capacity of rights holders to exercise effectively the rights they hold" (Agrawal/Ostrom 2001, p. 488). It would be false to understand property rights in the narrow understanding of ownership; they are better understood as a collection of different rights with a huge variety of combinations (cf. Meinzen-Dick et al. 2004, Brief 3). Varying kinds of resource property rights can create varying consequences for the resource user and the resource management. Nevertheless, several models exist which trials to group property rights. Whereas Meinzen-Dick et al. (cf. 2004, Brief 3) acquire a two-group model, Agrawal/Ostrom (2001, p. 489) developed a more specific four-group model. The four types of property rights are presented in Box 2.

Box 2. Four types of property rights

Withdrawal: the right to enter a defined physical area and obtain resource units or products of a resource system (e.g. cutting firewood or timber, harvesting mushrooms, diverting water).

Management: the right to regulate internal use patterns and transform the resource by making improvements (e.g. planting seedlings and thinning trees).

Exclusion: the right to determine who will have right of withdrawal and how that right may be transferred.

Alienation: the right to sell or lease withdrawal, management and exclusion rights.

Source: Agrawal/Ostrom (2001, p. 489)

The right to withdrawal includes automatically the access right, which means that the user is allowed to go on the land where the resource is located.[11]

[11] Some scholars define the access right as the first user right category (cf. Diepart 2013).

It is important to say that we have to distinguish between land property and resource property, or more precisely between resource tenure and land tenure. Land tenure might not directly mean resource tenure, and it is also possible to harvest resources and gain benefit from them without holding the ownership of the land were the resources are located (cf. Dahal et. al. 2011, p. 72011, p. 1).

The right to withdrawal resource units is located at a direct action level, whereas the rights to management, exclusion and alienation are located at a collective-choice level that affects the action level. Furthermore, there is existing a third, a constitutional or government, level which must give the legal authority to exercise the rights to the right holder (cf. Agrawal/Ostrom 2001, p. 489). That means that researchers have to look at the architecture of the state in which they are acting and have to respond to this state system. Is on the one hand the constitutional level in centralized states located only on the central-state tier, local actors are only rule followers and not rule makers. On the other hand the constitutional level in decentralized states is located on varying tiers within the state system (province, district or village level), and local actors can gain sufficient authority to act as rule makers and not only as rule followers.

As mentioned above, private goods are defined by the aspects of excludability and rivalry of consumption. In the context of property rights, the holder of a private good has the full right of alienation. On the opposite the characterization of common-pool goods within the context of property rights is more complex. Agrawal/Ostrom (cf. 2001, pp. 490-491) distinguished in the case of common-pool goods, between four right holder categories: “authorized users”, “authorized claimants”, “proprietors” and “owner”. The first have the right to enter and to withdrawal the resource, whereas the second have also the right to withdrawal plus the right to manage the resource. The management right includes the right to build a resource infrastructure (e.g. a pump within an irrigation system) or to set harvest limits. “Proprietors” hold the rights to withdrawal, manage, and to define who can use the resource, therefore the right to exclude resource user. The right of exclusion is crucial for the sustainability of a resource, because the right holders are able to exclude resource user who try to overharvest the resource. “Owners” occupy the right of alienation and therefore the right to transfer the rights of withdrawal, management and exclusion in any way the owner wishes. “An individual, a private corporation, a government, or a communal group may possess full ownership rights to any kind of good including a common-pool resource. The rights of owners, however, are never absolute. Even private owners have responsibilities not to generate particular kinds of harms for others” (Agrawal/Ostrom 2001, pp. 491-492). The right holder categories associated with the rights are showed in Table 1.

As quoted above, also communities and village groups can gain full ownership rights to manage their resources. But even the proprietors can have a significant influence for the management of a common-pool resource. They have the power to define resource boundaries to exclude other

actors; to create institutions which set withdrawal rules; and they can establish methods of monitoring the resource user and graduate sanctions against rule breakers (cf. Agrawal/Ostrom 2001, p. 492).

Table 1. Types of right holder associated with property rights

	Owner	Proprietor	Authorized Claimant	Authorized User
Withdrawal	x	x	x	x
Management	x	x	x	
Exclusion	x	x		
Alienation	x			

Source: Agrawal/Ostrom (2001, p. 491)

This shows at least, that the right holder position of "proprietor" is able to serve the design principles 1, 4 and 5 and therefore can contribute in a significant way to the robustness of a small-scale CPR system:

> "Without the collective choice right to manage a resource, local users cannot consider and decide on various ways of growing and planting seedlings, thinning noncommercial trees for use as firewood, restricting the grazing of cattle in a forest, and so on. Without the collective choice right to exclude others, local user will fear that any effort they make to limit harvesting will benefit others who can then assert a future right to harvest." (Agrawal/Ostrom 2001, p. 492)

This observation and the ineffectiveness of central managed resource systems led to the creation of programs which transfer significant resource management rights into local government levels and local user groups (cf. Meinzen-Dick et al. 2004, Brief 3). One example for such a project is the "co-management" program which is practiced in Cambodia. This program tries to build cooperation structures between the government, the communities of local resource users and external actors like NGOs, "[…] to share the responsibility and authority in decision-making over the management of natural resources" (Frieson 2010, p. 22). Finally, property rights are a key aspect of successful collective choice arrangements and they have massive influence on natural resource management. They can help to reinforce a long-term perspective for the resource user, but it is not always necessary to formalize these rights. Examples all over the world have shown that traditional indigenous management systems are able to provide sufficient incentives for the creation of common-pool resource management systems (cf. Place et al. 2004, Brief 5).

Therefore these rights are not like formal arrangements with *de jure* character, but rather customary practices with a *de facto* character.

However, the design principles quoted above are useful tools to show why individuals "[…] utilizing institutional arrangements characterized by these design principles will be motivated to replicate the institutions over time and sustain the CPR to which they are related" (Ostrom 1990, p. 102). Thus, enduring institutions are the core to govern CPR systems, which can be achieved through access control (design principle 1) and incentive mechanisms (design principles 2, 6 and 7) for the appropriators to act collectively in the interest of the commons. Therefore, the design principles contribute in a significant way to the robustness of a small-scale CPR system.

In the next section we will discuss the framework of robustness in Social-Ecological Systems (SES) as sketched by Anderies et al. (cf. 2004) and later by Janssen/Ostrom (cf. 2006) and define what is meant by robustness and social-ecological systems.

2.4. Robustness in Social-Ecological Systems

The driving point to develop the framework of robustness in SES was the upcoming environmental problems which are a result of the growing human encroachments on the ecosystem.[12] This leads to uncertainties about how dynamics of social and ecological processes will deploy. These uncertain situations led Anderies et al. (2004) to the insight that "[…] rather than asking how society can better "manage" ecological resources, we ought to be asking "what makes social-ecological systems (SESs) robust?""

Before we go deeper into the analyses of the robustness of SESs, we have to ask how we can characterize a social-ecological system in a scientific way, and how we can define a SES. Janssen/Ostrom (2006, p. 1471) views SES as complex adaptive systems, who can be described as "[…] systems in which the components, and the structure of interactions between the components, adapt over time to internal and external disturbances." The order in complex adaptive systems described as emergent and the future is unpredictable, since actor behavior is path dependant and relationships between the social and the ecological level are non-linear. Further, the key aspects in SES are individuals and institutions, whereas the latter refers to formal and informal rules that influence individual behavior. Individuals interact with other individuals as well as with the ecosystem, and they may change their action-strategies and relation networks in regard to environmental (political and ecological) changes. Janssen/Ostrom (2006, pp. 1471-1472) concludes that "[…] individual strategies and institutional rules interact

[12] A current example of massive human interventions into the biophysical processes is the unprecedented rate of dam building in the Mekong Region. These dams have massive impact e.g. on the fish migration, the rivers biodiversity, the freshwater quality, and finally on the people whose livelihood depends on the river. For further information's see the reports from WWF (cf. 2013) and Grimsditch (cf. 2012).

and co-evolve, frequently in unpredictable ways […]" further "[t]he complex adaptive systems perspective provides us the view of individuals within a variety of situations structured by the biophysical world, the institutional rules, and the community in which they interact."

The quotes below shows that it is helpful to describe social-ecological systems as a complex adaptive system, and that this description provides us with the capacity to involve different political, individual, ecological and also economic aspects into the analysis and to create a flexible and also adaptive analysis model.

It is important to note and to understand that SES aren`t totally human-made or controllable, they depend on environmental circumstances and non-linearly human-nature relationships. The analysis of SES cannot take place under clinical laboratory conditions. Nevertheless, a very clear definition of SES exists:

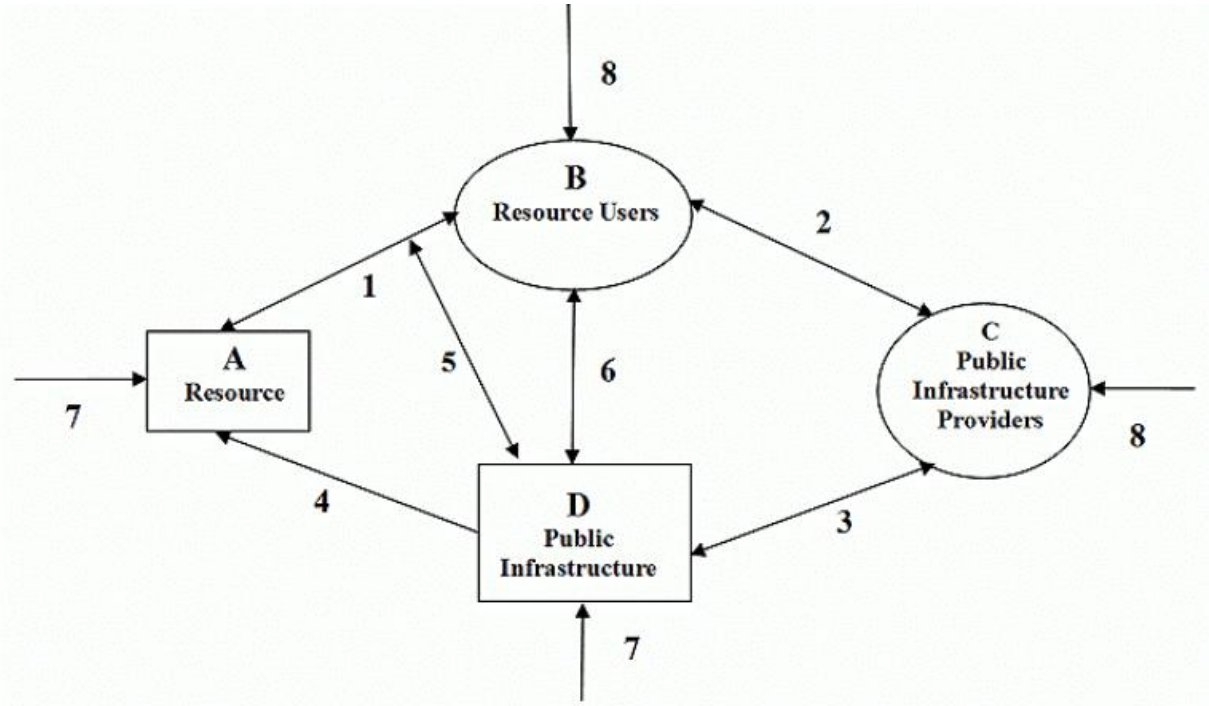
> "A SES is an ecological system intricately linked with and affected by one or more social systems. An ecological system can loosely be defined as an interdependent system of organisms or biological units. "Social" simply means "tending to form cooperative and interdependent relationships with others of one`s kind"." (Anderies et al. 2004)

This means that both systems, social and ecological, consist of several units which cooperate but also act individually and this acting and interacting create interconnected subsystems between both systems. If interconnected systems are understood in such a way, "[…] the overall SES is a complex adaptive system involving multiple subsystems, as well as being embedded in multiple lager systems" (Andries et al 2004). Figure 2 represents the ideas mentioned above.

This figure shows several interesting connections between the ecological and the social system. At first we have the four boxes which includes a resource (A), two human actor groups (B and C), and the public infrastructure (D). The resource (A) is a "[…] biophysical system or a form of natural capital that has been transformed for use by B through the efforts of C to invest in D" (Janssen/Ostrom 2006, p. 1474). The resource users (B) represent the actors who withdrawing units form the resource (A). The public infrastructure providers (C) represent the actors who manage the resource system, receive taxes from the resource user, invest capital into the infrastructure, and organize the monitoring and enforcing. In some circumstances, the two human actor groups can be overlap (cf. Janssen/Ostrom 2006, p. 1473). One example is given in the design principle number 5 mentioned above, where the appropriator (resource user) who break the rules of the CPR system can be punished by other appropriator or external agents hired by the appropriators (public infrastructure providers). The last box contains the public infrastructure (D) which combines two forms of human-made capital: physical capital and social capital. "Physical capital includes any engineered works, such as dikes, irrigation canals, etc. By social capital, we mean the rules actually used by those governing, managing, and using the

system and those factors that reduce the transaction costs associated with the monitoring and enforcement of these rules" (Andries et al. 2004).

Figure 2. Conceptual model of a social-ecological system



Source: Andries et al. (2004)

It is obvious that this model contains the core aspects, individuals and institutions, mentioned in the description of the complex adaptive system. The resource user and the public infrastructure providers represented the individuals, whereas the aspect of the social capital within the public infrastructure represents the institutions defined as informal and formal rules which shape the behavior of the involved individuals.

With this model it is possible to investigate the robustness of social-ecological systems. As Janssen/Ostrom (cf. 2006, p. 1474) pointed out, a SES can be challenged by external threats (arrows 7 and 8) and by internal fluctuations within the SES (arrows 1 to 6). But before we explain the different types of arrows, we have to define the term robustness in the circumstances of an SES. Robustness in this context means "[...] the maintenance of some desired system characteristics despite fluctuations in the behavior of its component parts or its environment" (Carlson/Doyle 2002 cited in Andries et al. 2004). Further, Andries et al (2004) make clear that it is not obvious which kinds of system failure should be measured in the context of SESs and because of that they provide three basic questions to examine robustness: "(1) What is the relevant system? (2) What are the desired system characteristics? and (3) When does the collapse of one part of a SES imply that the entire system loses its robustness?" The first two questions refer directly to the design principles from Ostrom (cf. 1990, p. 90) and the task of

examine CPR systems. The last question implies the question, at what point we can define the collapse of a system. Therefore we have to distinguish between the collapse of a resource and the collapse of the entire system. Did the collapse of the resource imply the collapse of the entire system or did it need more than the breakdown of a single aspect for the breakdown of the whole system? To answer this questions in an adequately manner, we have to go back to the SES model and to the explanation of the different kind of arrows.

As we have pointed out, social-ecological systems can be threatened by external disturbances or internal fluctuations within the SES. Internal fluctuations are possible, since the resource users and the public infrastructure providers cooperate within the system. More broadly speaking, internal fluctuations occur mostly whenever human actors doing strategic actions and interactions: resource user withdrawal units from the resource (arrow 1); resource user and public infrastructure providers interacting with each other (arrow 2); the public infrastructure provider invest into the public infrastructure (arrow 3) and the resource user uses the infrastructure (arrow 6). Further, internal fluctuations occurs when the public infrastructure is provided and affects the resource itself (arrow 4) and the resource dynamics (arrow 5). On the opposite, external disturbances occur in two different ways. First, by ecological shocks like floods, earthquakes, fires and climate change impacts, those influence the resource and the public infrastructure (arrow 7). Second, by socioeconomic shocks like economic crisis like deflation or inflation, civil war, population increases, in- or out-migration in context of economic and political changes, new political programs, major political changes, that influence the resource user and the public infrastructure providers (arrow 8). These external threats "[…] interdependently affect the activities within the social-ecological system. In fact, there might be interactions across scales that make SES`s become more or less robust to internal and external challenges" (Janssen/Ostrom 2006, pp. 1474-1475).

2.4.1. Two key driver within social-ecological systems

By examining the different arrows we have addressed two key drivers to comprehend the complexity of social-ecological systems and to explain the robustness of such systems. The first key driver is *strategic interactions* and the second are *operational rules and collective-choice processes* (cf. Anderies et al. 2004).

Strategic interactions are a core assumption of Rational-Choice Theory. As discussed in the treatment of Ostrom theory, the key question is how collective action and cooperation among actors can be achieved. The framework to analyze robustness of Social-ecological systems tries to create a broader analysis of such interactions, which can be found within all aspects of the SES, for example between the resource user and the resource; between the public infrastructure provider and the public infrastructure; or between the resource user and the public

infrastructure. In the words of Andries et al. (2004): "We must move beyond early work focusing on just the resource users, the incongruence between individual and collective rationality, and the problem of maintaining cooperation. [….] It is important, however, to understand the broad structure of the entities and links in a SES and to begin to show how the strategic interactions within and between entities affect the likelihood of long-term robustness."

Also the second key driver – *operational rules and collective-choice processes* – contains the demand of merging two research aspects. As Andries et al. (cf. 2004) pointed out, several scholars focused their research either on operational rules (e.g. harvesting decisions of resource users) or on collective-choice processes (e.g. investment choices of public infrastructure providers). Whereas analyzes on operational rules focused on exogenously fixed set of rules who produce incentives for actors to avoid free-riding and increase social welfare, the analyzes on collective-choice processes focus on preferences of actors over policies and the expected benefit of voting procedures, which involved the preference structure of the actors. The authors argue, that the separate analysis of this aspects is a wrong way and they call for a broader approach instead, where operational and collective-choice levels analyzed together to evaluate the robustness of social-ecological systems (cf. Andries et. al. 2004).

Why do we need a framework of analyzing the robustness of SESs? First of all, human influence on the environment leads to ecological changes which threaten institutions in several ways. These institutions need to adopt these changes in order to save the robustness of a social-ecological system. Further, the framework provides a useful linkage to the CPR design principles by Elinor Ostrom. Whereas the first three principles provide a good starting point to solve core problems of free-riding and using rights of common-pool resources, the principles four to six represents an important part of the public infrastructure by "[…] invoking and interpreting rules and finding ways of imposing sanctions that increase common knowledge and agreement" (Andries et al. 2004).

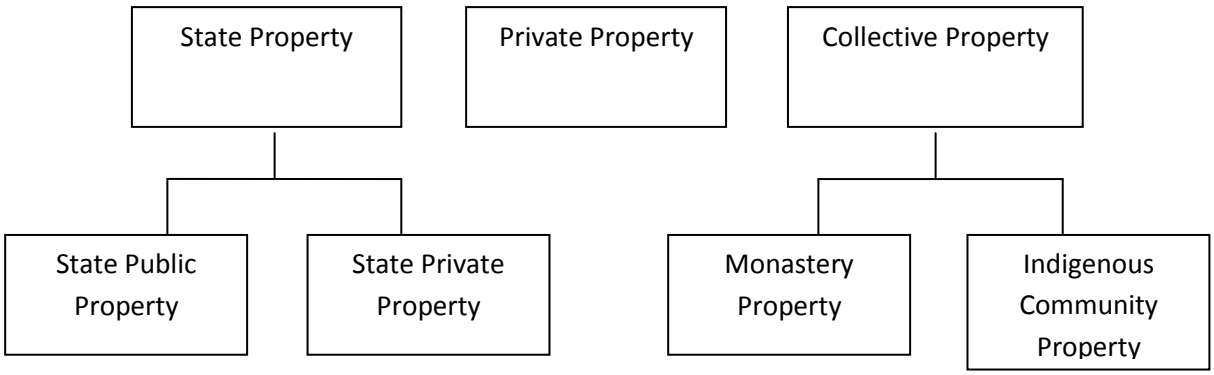
Finally, this framework provides a useful starting point to analyze the internal dynamics of CFs/CPAs in Cambodia**.** Before we can describe different resource management systems in Cambodia, we have to clarify which forms of property rights are at stake in Cambodia.

3. Who owns the land? Forms of land property in Cambodia

As mentioned in the description of Elinor Ostroms design principles, property rights or land and resource tenure plays a significant role within the context of CBNRM, because property rights provide the local resource users with a secure fundament for their investing time and monetary resources on the management of their natural resources.

The legal frameworks which govern land issues in Cambodia have always been a highly contestable policy area. During the Sihanouk regime private property rights were granted in the Constitution of 1956. The Khmer Rouge abolished all forms of private property and the Vietnam backed government which followed the Khmer Rouge transformed all land into fully state property. Another turning point was the withdrawal of the Vietnamese army and the new Constitution of 1989 which renewed the granting of private property rights (cf. Bues 2011 p.6). The actual legal framework is set by the Land Law of 2001 which "[…] is the central legal document on land rights and land occupation in Cambodia. It defines the basic types of property under Cambodian law, […]" (Bues 2011, p. 6) with following the three main classification levels: state, private, and collective. The property levels are outline in Figure 3.

Figure 3. Forms of land property in Cambodia



Source: Lindstrom (2013, p. 15)

Since forestland contains public functions like for example the conservation of biodiversity, soil protection, and watershed protection, it is state property (cf. Diepart 2013). Therefore only the understanding of the two different forms of state property is important for this paper.

State public land contains "[…] any property with natural origins, such as forest, water, lakes or seashore and generally any property that renders public service or is created or used for public interest use, such as roads or schools (Art. 15)" (Bues 2011, p. 6).[13] This means that state public land is the type of land which has a general public use, achieve public benefit or provide public service. The ownership is strictly limited to the state, and any attempt to occupy state public

[13] The article in the quote refers to the Land Law of the Kingdom of Cambodia (2001).

land is a criminal action and would be punished with fines or jail (cf. Kingdom of Cambodia 2001, Art.16, 18, and 259).

The land property that runs under the label of state private land includes "[…] all land that is neither state public land nor legally privately or collectively owned or possessed under the Land Law" (Bues 2011, p. 6). Therefore state private land is a 'catch all' term for land that has now private owner and is not classified land for generally public use (cf. Kingdom of Cambodia 2001, Art.14). Furthermore the law (cf. Kingdom of Cambodia 2001, Art. 17) allows that "[…] state private property may be subject to sale, exchange, distribution or transfer or rights to private individuals or companies […]" (Lindstrom 2013, p. 16). This legal aspect of state private land empowers the state to provide companies with Economic Land Concessions (ELCs) or with Social Land Concessions (SLCs). The Sub-Decree on Economic Land Concessions (cf. Kingdom of Cambodia 2005) stated in Article 3 that ELCs has to generate state revenues through land use fees, taxation and so forth. Furthermore it declares that the land for the ELCs has to be on state private land (cf. Kingdom of Cambodia 2005, Art. 4) and that they have to increase agricultural production, create jobs and promote the living standards of the local people (cf. cf. Kingdom of Cambodia 2005, Art. 5).[14] ELCs have a guaranteed period of 99 years. Therefore, ELCs are clearly granted for economic purposes.

On the opposite, Social Land Concessions are granted for social purposes and specified in the Sub-Decree on Social Land Concessions (cf. Kingdom of Cambodia 2003a). The Sub-Decree provide the legal framework to use state private land for poor families, resettle families who have been displaced resulting from public infrastructure development, disabled soldiers, families suffering from natural disaster and so forth (cf. Kingdom of Cambodia 2003a, Art. 3). Still, "[…] however, few social land concessions have actually been realized and these few have concentrated on allocating land to former military affiliates" (Bues 2011, p. 9). In summary, within in the context of forestland in Cambodia state public and state private land plays an equally important role. State public land cannot be legally possessed or privately transferred and the power to use or to lend the land lies only by the government. State private country is used as an umbrella term. This includes the risk that powerful political and economic interests transform fertile forestland under the guise of ELCs to huge agricultural plantations.

The following section contains description of community-based forms of forest management in Cambodia.

[14] A research paper from the local NGO "NGO Forum" has worked out that the most of the implemented ELCs are far away from fitting all of these criteria (cf. Ngo/ Chan 2012)

4. Forms of Forest Management in Cambodia

As mentioned in the introduction, Cambodia's total land area is 17.65 million ha and 10.06 million ha of them is forestland. This means that Cambodia has one of the largest forest reserves in Southeast Asia. Since the democratic regime was implemented in 1993, the various governments were looking for a useful mechanism to manage this enormous natural capital.

In the early 1990s the Royal Government of Cambodia (RGC) implemented a logging concession system to manage the national forest. The impact of this system was that nearly 7 of the 10 million hectares of forest were licensed to 33 companies (cf. Chandran 2012, p. 1). The system has paid very small contributions to the rural development in Cambodia, and especially to the forest-dependent communities in the rural landscape, the concession system gave little considerations. Apart from this critique, the concession system resulted in a huge increase of forest degradation by uncontrolled logging within the concession areas. The Independent Forest Sector Review (IFSR) conclude in 2004 that large companies do not invest money and time in sustainable long-term forest management "[…] because there are still no real economic incentives and property right security for such investments (IFSR 2004)" (Tol et. al. 2009, p. 126). This logging concession system was suspended in December 2001, because of the less contribution to the rural development and the enormous amount of forest degradation. However, a new concession system was introduced within the new Land Law of 2001. As stated above, since 2001 state land is divided into state public land and state private land and according to the Land Law and the Sub-Decree on Economic Land Concessions, ELCs can only be granted on state private land. In contrast to the old concession system, the 2001 Land Law states that a concession cannot exceed 10.000 ha, and a person or a legal entity cannot hold several concessions with more than 10.000 ha (cf. Kingdom of Cambodia 2001, Art. 59). Further, concessions can be granted for a maximum time scale of 99 years (cf. Kingdom of Cambodia 2001, Art. 61).

During the late 1990s the discussion about resource management and forest management focused on more decentralized approaches like the Community-based natural resource management (CBNRM), in which a community of resource-users is given the right to make rules and regulations to manage their resources by their own. Thus the core rational behind decentralized resource management is to integrate local communities and local political institutions in the protection and sustainable management of the resources. The first attempt to implement CBNRM in Cambodia was in the irrigation sector in 1999, were a "[…] national policy on managing water for irrigation called Participatory Irrigation Management and Development (PIMD) has been implemented nationwide […]. It gives concurrent management responsibilities

to formal user group [sic!], a Farmer Water User Community (FWUC), within specified communities" (Chou 2010, p. 15).

Within the context of forest management, decentralized resource management "[…] has emerged as an umbrella denoting a wide range of activities which link rural people with forest and trees, and the products and benefits to be derived from them" (Tol et. al. 2009, p. 126). According to Jean-Christophe Diepart, research adviser of the local NGO "Learning Institute", (cf. 2013) the term CBNRM in Cambodia is tightly related to the term "co-management", which refers to programs who try to arrange a tight cooperation between the government, the local resource-user, external political actors like NGOs or social society groups, and external economic actors like tourism agencies. The aim of these cooperation arrangements is to share the responsibility and influences within the decision-making process in regard to the management of natural resources. Thus co-management is a method to integrate decentralized local informal or traditional management systems and centralized government management systems and therefore to build a platform for effective power sharing (cf. Frieson 2010, p. 22).

Within this dichotomy of CBNRM and co-management several forms of decentralized forest management are at stake in Cambodia. This is paper focused on Community Forestry and Community Protected Area. But apart from these, there are several other forms which are at least noteworthy: "(1) Community Conservation Forestry in the Forestry Administration administered protected forests, (2) Partnership Forestry for which the management is co-institutionalized between the forestry administration and a commune council and (3) Community Commercial Forestry aiming directly to generate revenue from the commercial (ie timber logging operations), yet sustainable, exploitation of the forest" (Tol et. al. 2009, p. 127). In the following we will discuss the approaches of Community Forestry and Community Protected Areas.

4.2. One resource, two management systems: Community Forestry and Community Protected Areas

With the described Forestry Law of 2001, the Sub-Decree on Community Forestry in 2003 (cf. Kingdom of Cambodia 2003b), and a government declaration (*Praka*) in 2006, the RGC implemented a legal framework for communities to engage Community Forestry in Cambodia. Community Forestry (CF) "[…] is a form of decentralized forest management, where the responsibility of managing a forest area is delegated to a village of local community living in or near it, to ensure Sustainable Forest Management (SFM) by securing tenure of the land and user rights for the local community giving them an incentive to engage in long term (and ecologically sustainable) planning and protection of their forest resources" (Brofeldt et. al. 2009, pp. 103-104). In regard to the huge rural poor segment of the Cambodian population, Community

Forestry is an opportunity to give them "[…] secure access to this resource, under a requirement of sustainable management, that can help reduce poverty and protect the forest at the same time" (Brofeldt et. al. 2009, p. 104). The government claimed, with the National Forest Program in 2010, the target of implementing nearly 1.000 CFs, which covering 2 million ha of forest, with official legal status by 2030 (cf. Kingdom of Cambodia 2010, p. 87).

A Community Forestry can only be implemented on state public land, but with the restrictions that the land is under the rule of the Forest Administration (FA) which operates under the Ministry of Agriculture, Forestry and Fisheries (MAFF). Further, the land has to be classified as a production forest[15] and may not be granted under an ELC (cf. Dahal et. al 2011, p. 16). To initiate and establish a Community Forestry "[…] a group of residents in one or more villages […] who share a common social, cultural, traditional and economic interest and use the natural resources in an area, where the live in or near […]" (Kingdom of Cambodia 2003b, Art. 5 Point 9.) have to cooperate together. In implementing a CF the villagers have to follow seven constitutional steps (for all steps cf. Diepart 2013):

1. Creating awareness about forestry issues and creates a first contact between the Community and the Forest Administration (FA).
2. Establishing a management structure. This step includes that the villagers have to be register as a member of the Community Forest Community (CF Community). An individual can become a member if he or she living within the Community describe above, has the Khmer nationality, and has the minimum age of 18 years (cf. Kingdom of Cambodia 2003b, Art. 9). After that, the CF Community elects a Community Forestry Management Committee (CFMC). This committee has the rights to prepare and adopt by-laws, prepare the CF agreement, seek financial and technical support from the FA and so on (cf. Kingdom of Cambodia 2003b, Art. 21).
3. Since the CFMC is elected, the members of the CFMC have to specify CFMC by-laws in order to manage the internal operations of the CF. Further the CFMC have to adopt and implement Community Forestry Regulations on the use and management of the Community Forest, "[…] including such things as rights of access and duties for Community members and secondary users, user fees, benefit sharing, reporting requirements, fines for violations, etc." (Kingdom of Cambodia 2003b, Art. 5 Point 8).

[15] Forest in Cambodia is divided into three categories: 1) production forest; 2) protection forest; 3) conservation forest. The law describes these three categories as follows: "Production Forest shall be maintained in a manner to allow for the sustainable production of Timber products and, NTFPs, and protection as a secondary priority.[…] Protection Forest shall be maintained primarily for protection of the forest ecosystem and natural resources therein.[...] Conversion Forest for other development purposes is idle land, comprised mainly of secondary vegetation, not yet designated to any sector, that shall be temporarily classified as Permanent Forest Reserve until the RGC designates the land for a specific use and purpose" (Kingdom of Cambodia 2001, Art.10).

4. Demarcating the related forest with visible demarcation signs (e.g. stones, fences, etc.) by the CF Community and in accordance to the forest area given by the FA.
5. The CF Community has to do a forest inventory with the declared forest area, to measure the volume of timber and the richness and diversity of the NTFPs.
6. Preparation of a Community Forest Management Plan by the CF Community. This Plan "[…] detailing the procedure, regulation and measure related to sustainable use and management of the Community Forest" (Kingdom of Cambodia 2003b, Art. 5 Point 5). On the basis of the forest inventory the management plan have to define the extraction rate and harvest preference of each species. The management plan has to be reviewed by the FA every five years (cf. Kingdom of Cambodia 2003b, Art. 30).
7. Arrange a Community Forest Agreement. This is a written agreement between the CF Community and the FA "[…] that grants and protects the CF Community`s rights within any specific area to access, use, manage, protect and benefit from the forest resources in a sustainable manner" (Kingdom of Cambodia 2003b, Art. 5 Point 3). It contains all CFMC by-laws and the CF Regulations and the FA have to sign the agreement. (cf. Kingdom of Cambodia 2003b, Art. 25 & 26).

If these seven steps are done, the CF is officially implemented and has an official timeframe of 15 years. One year prior to the official end of the timeframe, the CFMC is allowed to submit a written request to the FA to renew the CF for a second fifteen years term (cf. Kingdom of Cambodia 2003b, Art. 27).

The key actor respective the key institution within Community Forestry is the Forest Administration. The FA has the right to recognize, reject, and terminate CF Communities; revise and approve Community Forest Agreements; review and approve Community Forest Management Plans and therefore control the harvest rate of the CF (cf. Kingdom of Cambodia 2003b, Art. 24). Furthermore, the CFMC has to request the exploration of timber and to pay revues and taxes to the FA. Finally, the FA has at any time the right to cancel the CF agreement if it thinks that the CF is not performing well, or the rules aren't adopted.

According to the property rights and the sets of right holders mentioned in the theory, the CF contains three different set of right holders (cf. Table 1). First, the rights of the ordinary community members are restricted to the right to withdrawal. That means that they have access to the resource and that they are allowed to harvest and sell NTFPs and to harvest timber for their personal use (e.g. to build a house, fences, or stables for their animals). They are not allowed to exclude other resource user, to sell the land, or to transfer their rights to a third party (cf. Kingdom of Cambodia 2001, Art. 40). Within the theoretical property rights and right holder framework, the ordinary community members can be described as authorized users. Second, the members of the CFMC have the rights to withdrawal and to manage the resource. By using the forest for NTFP and timber for their own use, the members of the CFMC act as normal

resource user. By acting as members of CFMC the committee members have the rights to prepare and adopt CF by-laws, operate in accordance with the community agreement and by-laws as CF authorities and making decisions for the development of the Community Forestry (cf. Kingdom of Cambodia 2003b, Art. 21). Therefore the members of the CFMC must be described as authorized claimants. Third, the ordinary resource users and the members of the CFMC, represent the CF Community. Within that position they have the right to exclude others (non members) from their forest and from the forest products (cf. Tol et. al. 2009, p. 128). Furthermore, the CF Community sets the Community Forestry agreement and acquires the five years Community Forestry Management plan (cf. Kingdom of Cambodia 2003b, Art. 10-12). In addition, the CF Community has to be defined as proprietors. The interesting point here is that the two first groups of right holders merge together in the third group and share the right to exclude. This means, that the third group composed of actors with totally different property rights.

Finally the legal position of the Forest Administration can be defined as the owner position. The FA is the representative of the state and, as we have seen above, as a bundle of powerful rights. Therefore all power within Community Forestry is centralized on the Forest Administration and we can conclude that the CF, were the aim was to decentralize the forest management, is in reality a different way to centralize the power of the government over the forest.

In comparison to the relatively new legal framework of Community Forestry, Protected Areas (PA) have a long history within the Cambodian legal land management. In the year 1993 a Royal Decree established 23 protected areas (cf. Kingdom of Cambodia 1993) which covered 18% of the total Cambodian land mass or 30% of the Cambodian forest (cf. San 2006, p. 14). The international non-government organization “International Union for Conservation of Nature” (IUCN) defines Protected Areas as follows: “A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values” (IUCN 2012, p. 9)

The Royal Decree distinguishes between four different categories of protected areas: Natural Parks; Wildlife Preserves; Protected scenic view areas; Multi purposes areas (cf. Kingdom of Cambodia 1993, Art. 1). In 2008 the Protected Areas Law is determined and defines the framework to “[…] ensure the management, conservation of biodiversity, and sustainable use of natural resources in protected areas” (Kingdom of Cambodia 2008, Art. 1). The law strengthens the role of the Ministry of Environment (MoE) in managing the protected areas. The law allows the ministry to implement the Nature Protection and Conservation Administration (NPCA) as its secretariat in each of the 23 PAs (cf. Kingdom of Cambodia 2008, Art. 4). Through the NPCA the MoE has the rights to patrol and control the protected areas, inspect licenses or permits determined by this law, control harvest and sale of timber and non-timber products, and

participate in the preparation and implementation of Community Protected Areas (CPA) et cetera (cf. Kingdom of Cambodia 2008, Art. 5&6).

To ensure an effective management and planning of the protected areas the Law introduced a new system of zoning. According to Article 11 (Kingdom of Cambodia 2008) all protected areas have to be demarcated into the four following zones:

1. "Core zone: management area(s) of high conservation values containing threatened and critically endangered species, and fragile ecosystems. […]
2. Conservation zone: management area(s) of high conservation values containing natural resources, ecosystems, watershed areas, and natural landscape located adjacent to the core zone. […]
3. Sustainable use zone: management area(s) of high economic values for national economic development and management, and conservation of the protected area(s) itself thus contributing to the local community, and indigenous ethnic minorities' livelihood improvement. […]
4. Community zone: management area(s) for socio-economic development of the local communities and indigenous ethnic minorities and may contain existing residential lands, paddy field and field garden or swidden (Chamkar)."

Within the core and conservation zones it isn't allowed to build a construction or to clear the forest. Within the sustainable use and the community zones, any development projects like building a hut or a street can only take place with the official approval of the MoE (cf. Kingdom of Cambodia 2008, Art. 36). The last zone represents the area where Community Protected Areas can be established.

Community Protected Areas have been established, because mostly all villages which are located in or around Protected Areas depend on the collection of forest products and NTFP for their daily livelihood. The villagers continued the collection of these products even after the implementation of the protected areas in 1993. Furthermore, the large population growth and intensive internal migration exerted great pressure on natural resources because "[i]llegal activities, such as cutting trees for making charcoal in the forest, clearing forest for expansion of farmland, land encroachment and hunting, continued to increase" (San 2006, p. 16). Still, protected areas are mostly extraordinaire geographical zones like mountain forests or mangrove forests and therefore they are poorly accessible and difficult for the government to control and patrol without any local knowledge of the area. To overcome these problems and to involve the local communities who are living in or near the protected areas in managing and patrolling the forest, CPAs were established. Therefore the rationale behind CPAs "[…] is to involve local communities in the planning and decision-making process of PA management" (San 2006, p. 16). Beyond these aspects, it is assumed that the participation of the local people will ensure their

traditional use rights in regard to the natural resources, create awareness of a sustainable usage of these resources, and improve the local community livelihood (cf. Kingdom of Cambodia 2008, Art. 25&28).

The process to implement a CPA is relatively similar to the institutional steps described in the context of Community Forestry. The involved parties are the Ministry of Environment as a representative of the government, the concerned communities and in many cases national or international non-government organizations. In the first stage, the MoE has to evaluate which socio-economic conditions are at stake and what natural resources are present. These findings are helpful tools for the Ministry which has to inform the local communities and create awareness about the concept a Community Protected Area and the expected benefits of managing and protecting the forest (cf. San 2006, p. 16). The following steps are quite similar to the implementation process of a CF. The villagers have to elect a Community Management Committee. It should be noted, that the villagers don't have to be registered as a member like in the case of a CF Community. Since the committee is elected, it has to establish, implement and enforce by-laws to organize the management; the decision-making within the CPA Community; the benefit sharing; the resource usage; the financial management; the controlling and patrolling of the CPA (cf. San 2006, p. 17). Thus, these by-laws regulate the whole organization of the Community Protected Area. Finally, the community has to arrange a five year-renewable management agreement, including a management plan, with the Ministry of Environment which sets out how the community will manage the area in a sustainable way. After negotiating and signing this contract, the MoE has to proclaim the establishment of the CPA in an official public accessible document (cf. San 2006, p. 17). As San describes, there are four different ways to organize CPAs. The first way describes mainly the four zones defined in the law. The three other ways are the following:

> "Second, they can be organized through a participatory land use planning process that divides the area into agricultural land, residential land, community protected areas and conservation land. Third, some forests or fisheries within protected areas are given to the local community to manage and organize. Finally, CPAs can be organized by sustainable livelihood development, where local communities do not need to depend only on using natural resources, but develop alternative sources of income. These approaches have been promoted and facilitated by different projects and organizations working in various protected areas." (San 2006, p. 17)

In addition, there is not yet a standard method to organize CPAs established.

Mostly the local people are not allowed to cut trees for economic benefit within the PA and a CPA. They are allowed to collect non-timber forest products and fuel wood for their private usage. For example in the Chambok Commune, Phnom Sruich district, Kampong Speu province,

the CPA committee has established by-laws which allow the villagers to cut small trees without the help of chainsaws and only for their private use. Furthermore the by-law allows to collect NFTP, but also only for private usage.

Finally, the agreement of the Chambok community states that the community can support one or two poor families per year with a greater amount of timber, but the families have to go to the committee members and have to ask in an official way for support (cf. Morn 2013; Nut 2013). The example of the CPA Chambok leads us to the questions, which property rights and which sets of right holders are at stake if we talk about Community Protected Areas. Basically, in the context of property rights the CPAs are similar to CFs, but fall under the jurisdiction of the MoE and do not allow communities to harvest timber for business.

In contrast to the set of right holders within the context of Community Forestry, in Community Protected Areas exist three types of right holders with different property respectively tenure rights. The first group is represented by the local villagers who have the right to withdrawal a by the CPA by-laws defined amount of resources units. The second right holder group is represented by the committee members who have the right to withdrawal resource units, to manage the resource area, and to exclude actors from the resource area. The third group is represented by the Ministry of Environment and his department the Nature Protection and Conservation Administration, who have the right to exclude communities by suspending the CPA agreement and right to alienate by acting as a representative of the government with the right to manage the state public and state private land. In addition, the first group represents the authorized users, the second group the proprietor, and the third group the owner.

As with CF, the prominent position of the government actor must be called in the context of the CPA. In both concepts the Forest Administration (within CFs) respectively the Ministry of Environment (within CPAs) are the dominant actors, equipped with a far reaching set of legal powers. Despite the aim of decentralization the forest management, which both concepts share, the legal frameworks of CPA and CF provides in a significant extent the way for a more centralized forest management than before. Therefore, both programs can be described as concepts to strengthen centralization through obviously stated decentralization. This process must be seen within a critical point of view and requires ulterior analyses. This observation provides, to some extent, an answer to a question sketched by Agrawal (2001, p. 1656) who raised, in the context of increasing decentralization processes within governmental resource management approaches around the world, the question "[…] about the reasons behind such loosening of control and the effects of differences in organization of authority […]." In the context of Cambodia, we can answer this question with the fact that the decentralization of management systems leads to greater centralization at the ministerial level. Thus, one can describe the process in Cambodia as centralization through decentralization.

The described types of forest management concepts and the related property rights and legal frameworks are summarized in Table 2.

Table 2. Forest management types in Cambodia

	Types of rights transferred to local communities	Type of benefit for local communities	Types of responsibilities transferred	Legal framework
Community Forestry	Withdrawal, management and exclusion in the designated area	NTFPs, timber (amount based on the harvest rules set in the management plan)	Land development, forest protection	The Land Law of 2001 and the Sub Decree of 2003 providing a relatively strong legal basis for tenure security for 15 years, with possible renewal.
Community Protected Areas	Withdrawal (only NTFP and small amounts of timber), management and exclusion in the designated area	NTFPs	Forest management and protection	Strong legal basis under the Royal Decree of 1993 and the Protected Area Law of 2008

Source: modified table from Dahal et al. (2011, p. 25)

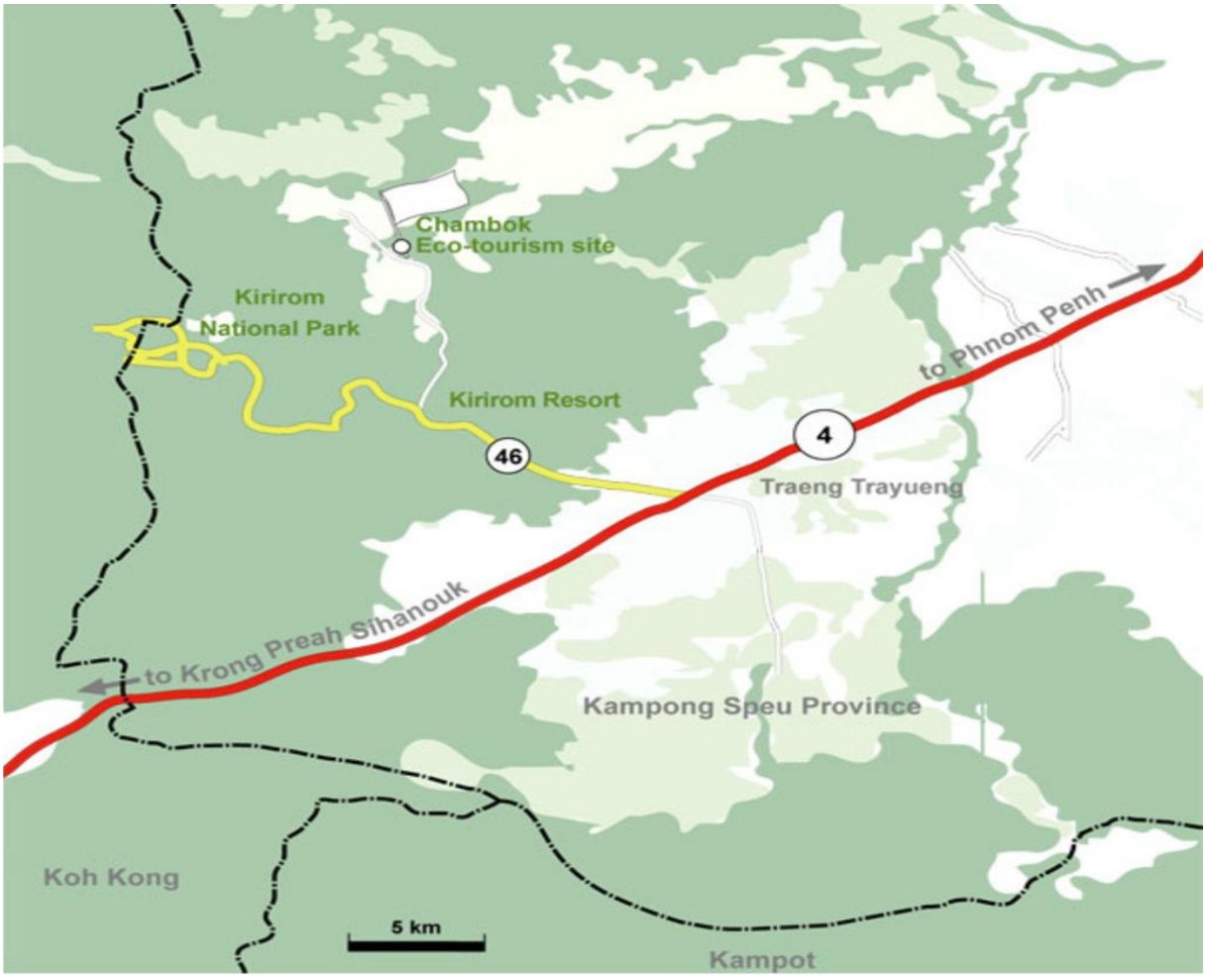
The next section provides an overview of the already mentioned CPA of Chambok. With this example we will show how small-scale common-pool resource systems deal with external and internal influences and how such management systems are able to provide benefits for the daily livelihood.

5. The Chambok Commune and the Community Protected Area

The chosen area to illustrate the mentioned theoretical framework is in Chambok commune, Phnom Sruich district, Kampong Speu province, Cambodia. Chambok is located in the northeastern border of the Kirirom National Park, which is the heart of the Kirirom highland in the southwest of the Cardamom Mountains (cf. Moeurn et al. 2008, p. 6). Figure 4 provides an overview of the exact location.

Chambok is an interesting case because this commune contains a huge variety of different self-governance approaches and a turbulent history in regard to the management of the forest resources. The commune forest is managed by two different management systems. On the one hand, there exist two Community Forestry systems and on the other hand, there is a Community Protected Area (cf. Sophana 2013).

Figure 4. Location of Chambok



Source: Homepage of the CBET/CPA project Chambok [23.07.2012]

This paper focuses on the CPA and the associated community-based eco-tourism (CBET) project, because it entails several interesting aspects of an SES system and the accessibility of the committee was given through the tourism project.

Before the CPA and the two CFs were established, around "[…] 94 per cent of households are engaged in a wide range of forest extraction activities […]" which were mostly uncontrolled and include actions like […] timber cutting, charcoal and fuelwood production, non-timber forestry product collection and wildlife hunting" (cf. Moeurn et al. 2008, p. 4). Thus, the result of these uncontrolled actions was a radical amount of deforestation within the whole area and an increased degradation of natural diversity and wildlife resources. Finally, the degraded forest drives a majority of the local people into poverty and unemployment (cf. Mlup Baitong 2003).

The Community Protected Area in Chambok is under the jurisdiction of the Kirirom National Park whose administration is the legal representative of the Ministry of Environment in this area (cf. Sophana 2013; Morn 2013). The CPA Chambok is a part of the protected area of the Kirirom National Park which covers a total area of 35.000 ha. This means, in regard to the four zones defined by the CPA law (cf. Kingdom of Cambodia 2008, Art. 11), that the CPA Chambok is the Community Zone of the PA Kirirom (cf. Sophana 2013). This community zone covers an area of 1.260 ha (cf. Mlup Baitong 2011). The Chambok commune entails nine villages with around 761 households[16] (cf. Sophana 2013), where most of the people are rice farmers and growing vegetables and some of them have small grocery stores. The forest of Chambok contains three waterfalls and one bat cave. These are the main arguments for the establishment of the community-based eco-tourism site which will be sketched later.

5.2. Establishment, regulations and resource management in the case of the CPA Chambok

To prevent the forest and biodiversity degradation within Chambok commune the MoE and the local environmental NGO Mlup Baitong reacted and started in 2002 to establish two CFs, a CPA, and a Community-based eco-tourism (CBET) in that area(cf. Halley et al. 2007, p. 18). Within the context of this paper it is important that the CPA and the CBET is tightly linked together, which means that the CBET site is located in the area of the CPA and the process of institutionalizing both projects was simultaneous and intertwined.

This establishment process walked along three sequential steps:

1. In 2002 Mlup Baitong started to provide informal trainings for the local community to create awareness for a sustainable use of the forest resources and the usefulness of eco-tourism in this area. Once this was done, the NGO started to train the community in using

[16] An average household in Chambok contains four to five family members (cf. Sophana 2013).

technical tools like computer and provided English teacher. Simultaneously, the NGO built up an organizational structure within the commune, which means that they help the local people to register in an official way as a member of the CPA Community and support them to elect a management committee with 13 members composed among the nine villages, further a sub-committee was implemented in every village (cf. Sophana 2013).

2. In 2003 Mlup Baitong and the Ministry of Environment signed a two-year renewable agreement for a "Community Conservation Area" within the Kirirom National Park to institutionalize the CBET, which opened officially in 2003 (cf. Moeurn et al. 2008, p. 4). During this implementation period Mlup Baitong trained the community in self-organization, financial management and so on. Furthermore the NGO helps to build infrastructure like trails to the waterfalls, an information center, parking slots, a community house and a restaurant. Besides this, one of the most important infrastructure development projects was the construction of two water pipelines from one of the three waterfalls to the villages (cf. Sophana 2013).
3. In 2005 the management committee of the community and the MoE signed a five-year renewable management plan to establish the CPA officially (cf. Halley et al. 2007, p. 18). The plan based on an also five-year renewable forest inventory, which must be conducted by the community and with a help of at least two officials from the Ministry (cf. Mlup Baitong 2011).

The management plan is elaborate by the management committee, the village sub-committees and the Ministry of Environment. It manages especially the sustainable usage of the forest. Every five years the community has to decide which part of the forest should be the 100% protected area, which part they want to keep for reforestation, and finally, in which part and to what scope they want to allow the harvest of a small amount of timber and non-timber forest products (cf. Sophana 2013). As mentioned in the description of the legal framework of CPAs, the ministry has to proclaim the implementation of the CPA with an official and public accessible document and did this in 2005 and 2010.

Beside the management plan, the committee conducts by-laws und internal rules which regulate the behavior of the people on the one hand and on the other hand, helps to implement local-based institutions. These bundles of rules contain a huge variety of different regulations, like for example the regulation of the daily wages of the CBET employees; the ban of driving cars and motorcycles to the waterfalls; the building of a patrolling group, which protects and monitors the forest area in a monthly rotation and is composed of villagers from every village; and finally, the by-laws set clear rules related to the amount of timber and NTFPs that the villagers can withdraw from the forest (cf. Morn 2013). According to the management committee chief of Chambok Mr. Touch Morn, the community by-laws allow every family to cut small trees and to

harvest NTFP, but both only for their daily living and not for business (cf. Morn 2013). If a family needs a greater amount of trees, they have to ask the committee for allowance. But the by-laws set the clear restriction that only two or maximum three families in each village per year get the allowance to cut more than the allowed amount of timber (cf. Morn 2013).

Furthermore, the committee sets a three-step guideline how to deal with rule breakers. First, if the patrolling group caught illegal logger, they report the names to the committee and confiscate the harvest tools like chainsaws. Second, if the perpetrators get caught a second time, the committee makes a signed arrangement with them in which they declare to stop the illegal harvesting. Third, if the same people get caught a third time, the committee reports to the local representative of the MoE with the recommendation to arrest the perpetrators (cf. Morn 2013). The last step is important, because the committee and the CPA Community as a whole didn't have the legal power to arrest rule breakers. Only the officials from the ministry/ the Kirirom national part have the legal power to arrest perpetrators.

The decision-making process within the Chambok CPA involved the key stakeholder, "[…] including villagers, village chiefs, the commune council, district governors, provincial governor, Kirirom national part officers, Provincial Department of Environment and Tourism, and MoE" (Halley et al. 2007, p. 18). Since we have worked out the regulations in regard to the forest management, the next section treats with the community-based ecotourism which is a significant aspect of the functionality of the CPA Chambok.

5.3. The CBET project and its importance for Chambok

The establishment of Community-based ecotourism projects (CBET) in Cambodia started in the late 1990s. CBETs are tools "[…] to provide additional economic activities to local communities in and adjacent to Protected Areas where traditional livelihoods (e.g. [sic!] logging, hunting and swidden farming, etc.) have been condemned as destructive and illegal" (Ol et al. 2009, p. 471). A rationale behind CBET projects is to strengthen local communities in management and self-organization, generate significant benefit for the local livelihood, and create a basis for the active participation in natural resource management programs to secure a sustainable resource usage. Therefore, CBET can be described as one specific form of CBNRM and within the context of resource management in Cambodia it refers to "[….] a diversity of co-management approaches that strive to empower local communities […] to conserve the natural resources and develop their community through tourism" (Ol et al. 2009, p. 476). As described above co-management tries to build up cooperation structures between the government, the communities of local resource users and external actors like NGOs. In the most CBET projects in Cambodia there are two governmental actors at stake, the Ministry of Environment which manages the Protected

Areas and the Ministry of Tourism (MoT) which support the development of local tourism, sometimes the Ministry for Agriculture, Forestry and Fisheries (MAFF) is also invited.[17]

As described, the CBET in Chambok is tightly connected to the CPA Community which means that the Management Committee manages the CBET and the CPA simultaneously. According to Mr. Om Sophana, organizational manager of Mlup Baitong, the implementation of the CBET project was divided into five components (for all components cf.Sophana 2013 or Moeurn et al. 2008, pp. 8-9):

1. Construction or renovation of infrastructure and facilities. These actions include building forest trails to the four waterfalls, small bridges, an entrance gate and fee ticket-sales cottage, a information center, water pipelines from the nearest waterfall to the villages, ox-carts, toilets, home stays, a restaurant, a car parking lot and vending kiosks.
2. Capacity building for MC members and service providers. This means, that the involved people get training in environmental knowledge, project planning, implementation and management.
3. Establishment of income generation systems. This component includes the marketing actions to tourism companies, but also the composition of entrance fee collection, car parking fee collection, tourist attractions like ox-cart riding, guided tours to the waterfalls, bicycle renting, providing of home stays and finally food preparation within the restaurant.
4. Establishment of actions to keep the CBET site environmentally friendly and sustainable. This includes, the above mentioned by-laws, regulations and forest patrolling groups. Further, it includes the education of villagers, service providers and tourists on environmental issues and the installation of garbage bins.
5. Establishment and support of a Women Self-Help Group (WSHG). The rationale here is the empowerment of the local woman and the improvement of livelihood through food preparing and souvenir selling. The WSHG is divided into 22 sub-groups and 337 women are in total involved (cf. Huot 2013).

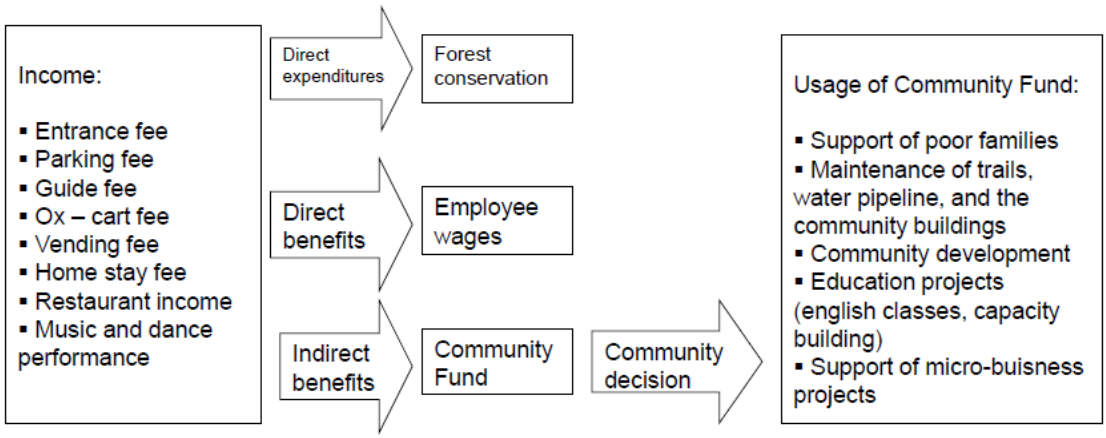
According to Mr. Sophana, the whole CBET project employed around 400 people directly or on a rotational basis and gain a benefit through loans, whereas the whole commune members gain an indirect benefit through a community fund. Within the components list some of the beneficiary groups have already been named. Roughly differentiated, the beneficiary groups can be divided into three groups: the MC member, the service provider, and the community member (cf. Sophana 2013). As mentioned above, the MC is composed of 13 members elected by villagers of all nine villages. They benefit from the project through capacity building campaigns, where the

[17] The involvement of MAFF is at stake when a CBET project covers river areas or areas around the Tonle Sap Lake. A second opportunity is when a CBET project covers a forest area which is not declared as a Protected Area, because this type of forest lies under the management of the Forest Administration (FA) which is a department of the MAFF.

MC member gets trained in order to develop their skills and knowledge in for example English writing and speaking, computer usage, and leadership and management skills. The service provider group is composed of the tour guides, the entrance fee collectors, ox-cart drivers, home stay owners, dancing group members, restaurant workers, and souvenir sellers. The last two employee groups are supervised by the WSHG. The service provider earns a daily wage, which is defined by the community regulations and by-laws. The remaining community member's benefit through a community fund, where the profit from the CBET (deducted wages) paid in.[18]

There are two functions of the money, on the one hand, the community members can borrow money with an interest rate of 200 Riel (cf. Huot 2013), on the other the money get spend on key priorities identified by the whole community during monthly meetings where development initiatives are discussed. More precisely it will be used "[…] to support very poor families, construct and repair infrastructure, and support the WSHG members in creating small business" (Moeurn et al. 2008, p. 13) Further the community member's gains benefit from the better access to NTFP, which are protected, monitored, and managed by the community. Another percentage of the income is designated by the by-laws for conservation activities (cf. Ol et al. 2009, p. 487). Figure 5 present an overview of the benefit sharing system within the CPA/CBET Chambok Community.

Figure 5. Benefit sharing system of CPA/CBET Chambok



Source: own chart

In addition, beside the wages for the employees the community has the full decision-making power in regard to the income. At least eight committee members must agree to make a decision on any expenditure besides the running costs. Each villager can suggest an idea or a concept for

[18] According to Mr. Sophana, in 2013 the CBET Chambok has an estimated income of 39,700$ from total 11,900 visitors (8,900 visitors from Cambodia and 3,009 foreign visitors). From the beginning of the project in 2003 until 2012 the CBET gains an income of 176,200 $ from 126,050 visitors (117,800 visitors from Cambodia and 8,250 foreign visitors)

how the money should be used through their sub-village committee or directly through a member of the management committee. At the beginning of every year, the management committee has to develop a plan which defines clear objectives and aims for spending the money (cf. Halley et al. 2008, p. 18).

The system of sharing the benefit generated by the CBET project has a significant effect on the CPA in Chambok. At first, this project creates awareness for the importance of forest conservation and a sustainable resource usage not only among the villagers, local service providers, and management committee members, but also among the local and international visitors. The raising of environmental awareness and the direct conservation efforts, funded at the beginning by Mlup Baitong and later by the CBET income, have "[…] resulted in the prevention of forest fires and illegal logging and hunting inside the ecotourism site. […] Illegal activities, which often happen in those areas, have largely stopped, with most villagers previously involved in logging or hunting becoming farmers, tour guides or tourism service providers" (Moeurn et al. 2008, p. 12).

Primary, the CBET project provides direct benefit for the villagers which have been employed in tourism service, to improve their livelihood and their food security in a significant way. Furthermore, the CBET project provides the whole commune with the chance to develop by building roads or a commune house and more. Another important aspect is the water pipeline which connects the villages with fresh water from the waterfalls (cf. Ngil 2013/ Mum 2013/ Ros 2013). This construction has a huge impact on the one hand, for the food security of the whole commune since water is flowing also during the dry season, and on the other hand, for the living standard of the commune members which now have fresh water to wash without spending a lot of time to collect the water from the river. During recorded and non-recorded interviews with the villagers it became clear, that especially this pipeline improve the livelihood of the villagers in a significant way (cf. Ngil 2013/ Mum 2013/ Ros 2013/ Sophana 2013).

But besides these aspects and most importantly, the CBET project is able to create a future perspective for the youth, through for example the provision of English lessons and the chance to get employed within the ecotourism site. The result of this is a very low emigration rate, in comparison to the internal migration rate of the whole country[19], of young villagers from Chambok to the cities (cf. Sophana 2013 and Morn 2013). Nevertheless, to get employed by the CBET project requires a basic level of education. To achieve this basic level is a huge problem for the young people of the commune, because the next upper grade school is located in the next big village 20km away (cf. Sat 2013). That means that the most families aren't able to finance the education for their children. The result is, that only a few young people achieve the required education and especially the required English level to get employed in the future (cf. Sat 2013).

[19] The Cambodian Demographic Census of 2008 pointed out, that 27.53% of the total 3,457,228 internal migrants are migrated from rural areas to the cities.

In addition, the CBET project creates environmental awareness, helps to conserve the forest, has positive impact on food security and living standards of the local people and finally, "[…] the project has enabled a number of people to change their jobs to more environmentally sustainable occupations, giving the forest and wildlife a chance to regenerate" (Moeurn et al. 2008, p. 14).

In the next section we will try to transfer the theory of the commons and the framework of robustness in Social-ecological systems on the CPA/CBET Chambok. The aim of this section is to illustrate how this special case deals with internal and external influences and which aspects can be identified as strengths or weaknesses.

6. Combining Theory and Practice – Chambok as an robust CPR system

Three key questions were formulized within the theoretical derivation of the framework of robustness in social-ecological systems: "(1) What is the relevant system? (2) What are the desired system characteristics? and (3) When does the collapse of one part of a SES imply that the entire system loses its robustness?" (Andries et al. 2004) The first two questions refer directly to the design principles of Ostrom (cf. 1990, p. 90) and therefore task of examine CPR systems. The third question covers the problem of how we can define a strong or a weak system. In the following the first two questions will be answered by transferring the seven design principles on the case of Chambok. Afterwards, the last question will be answered by transferring the CPR system of Chambok into the framework of robustness of SES.

As we will see, the case study of Chambok covers all important design principles. The area has a clear demarcation, marked by demarcation stones and it contains in total 1260 hectare (design principle 1). According to the MC Chief Mr. Touch Morn, a forest inventory defines every five years the forest boundaries and provides the community as well as the MoE with an overview of the forest and animal diversity in this area (cf. Morn 2013).[20] The management plan as well as the by-laws and internal regulations of the CPA Community set clear appropriation and provision rules in regard of the withdrawal of timber and NTFPs. Small- scale harvesting of small trees and NTFP are allowed in a zone, which is clearly defined by the management plan. Further, if a local resource user wants to withdrawal a greater amount of timber or NFTP, he or she has to ask the sub-committee in his or her village for allowance (cf. Cham 2013). The usage of chainsaws and motorized vehicles are only allowed, when the user apply for permission by the MC (cf. Morn 2013). Therefore, defined appropriation and provision rules are in congruence

[20] The last inventory was conducted by the community and two officials from the Ministry in 2011 (cf. Mlup Baitong 2011).

with the local conditions of the terrain (which is characterized by mostly impenetrable jungle and steeps) (design principle 2).

As described above the CPA Community of Chambok has clear defined internal regulations, by-laws and a management plan with the MoE, which are all in a collective-action process acquired and implemented. Every villager has the right to participate within the sub-committee and the management committee and the right to suggest what the community should do with the profit from the CBET (design principle 3). According to the community agreements, the CPA Community has to create a patrolling group to monitor the forest and therefore also monitor the resource user. Every sub-committee has to send one or two villager to join the patrolling group, which monitor the forest in a monthly rotation (cf. Cham 2013). Furthermore, the inventory of the forest is a tool to monitor the forest diversity and the harvest actions from the villager (design principle 4). If the patrolling group caught a rule breaker, the MC has implemented a graduate sanctioning system which is separated into three steps. First, the patrolling group reports the rule breaking to the committee and confiscate the harvest tools like chainsaws. Second, if the perpetrators get caught a second time, the committee makes a signed arrangement with them in which they declare to stop harvesting. Third, if the same people get caught a third time, the committee report to the local representative of the MoE with the recommendation to arrest the perpetrators (cf. Morn 2013) (design principle 5).

According to Mr. Touch Morn, if conflicts arise within the Community the MC has to evaluate which scale the conflict has and according to this scale the MC utilize different solving concepts (cf. Morn 2013). Small-scale conflicts within a village get solved with private meetings between the conflict parties and some committee members. Mid-scale conflicts between the villages get solved with a discussion-meeting of the whole commune in the commune house or the CBET community house. In both cases, the conflict parties discuss and solve the conflict collectively, with the help of the committee member. Large-scale conflicts between the CPA Community and the local or the province government are not in the sphere of influence of the community and therefore not solvable for them. Nevertheless, the Community has for small- and mid-scale conflicts effective conflict solving mechanisms (design principle 6).

This discussion of the design principles as well as the description of the collective-actions within the Chambok CPA mentioned above, exhibits that the Community has at least a minimal recognition of rights to organize (design principle 7). The legal framework of the CPA provides the Community with the right to organize. Combined with the received benefit from the CBET project the Community has gained discretionary to a certain degree. The right to organize is finally every five years at stake, when the Community has to conduct a new management plan as a collective of community members. Nevertheless the Ministry of Environment has the absolute power to withdraw the CPA status, which means that the right to organize is finally dependent on the will of the MoE (cf. Morn 2013). The discussion of the design principles indicate, that the

case of Chambok fits clearly into the theory claimed by Ostrom. Therefore it is possible and necessary to define the CPA as a common-pool resource management system and thus as a social-ecological system.

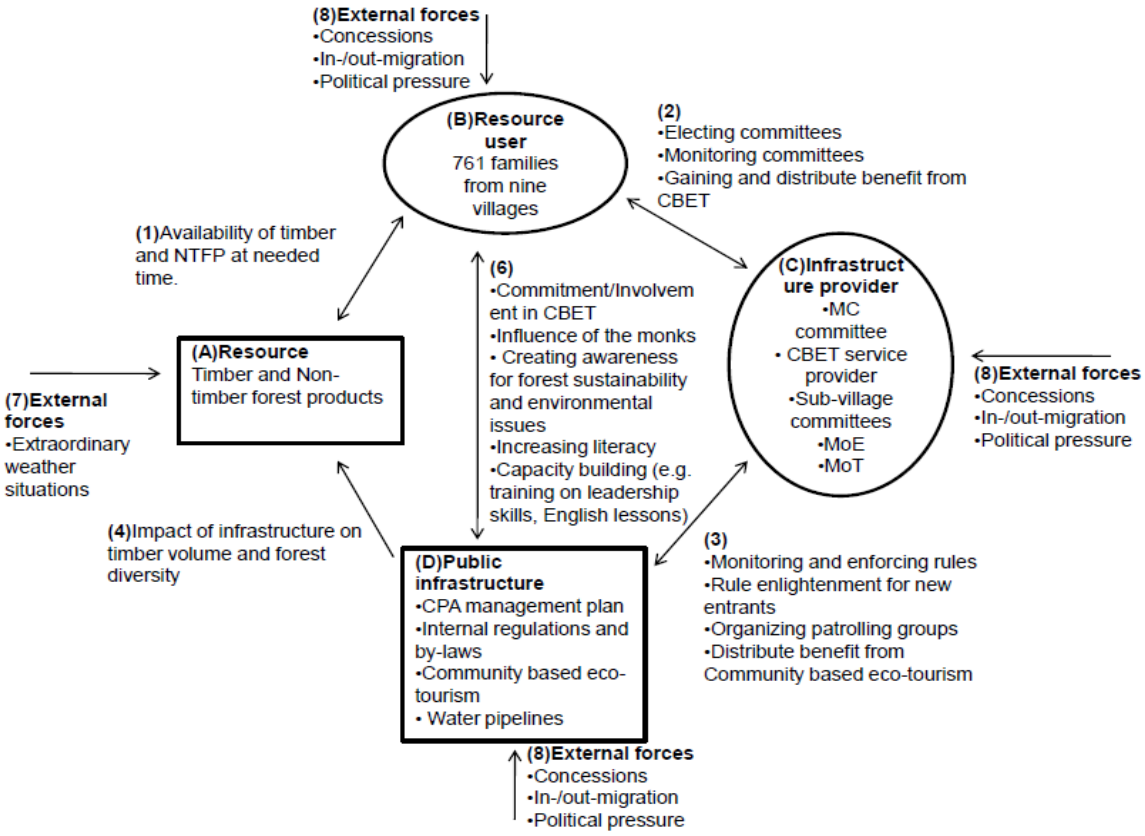
Since the first two questions were answered, we have to focus on the last and most important question of the robustness of Chambok as a social-ecological system. To keep that in mind, an SES composed of four components (A: Resource; B: Resource User; C: Public Infrastructure Providers; D: Public Infrastructure) which are internally linked together in several different ways (arrow 1-6). These internal links represent the dynamics of the cooperation between the involved two types of actors (arrow 2), between the resource and the public infrastructure (arrow 4), or between the actors and the infrastructure or the resource (arrow 1, 6 and 3). The robustness of an SES is contested through selfish actions of the actors and also cooperation between the actors. Thus internal fluctuations occur mostly whenever human actors doing strategic interactions. Other aspects which contest the robustness of such systems are external disturbances, like ecological shocks (arrow 7) or socio-economic shocks (arrow 8). In the context of the public infrastructure (D), the theory distinguishes between physical and social capital, whereas the first includes engineered works like water pipelines and the latter includes formal and informal rules and regulations to manage the resource system. It is important to note this aspect, because in the case of Chambok the public infrastructure includes both types of capital. But since the water pipeline was build and managed by Mlup Baitong and not by the villagers (cf. Sophana 2013), this paper focuses more on the social capital aspects of the CPA/CBET Chambok.

It is assumed that factors like in- and out-migration in the context of major economic transformations, pressure from political actors, the literacy rate of the population, economic interest of the involved actors, and different levels of political access of the actors influence an social-ecological system like Chambok. Figure 6 illustrates the case of the CPA/CBET Chambok within the theoretical framework of social-ecological systems.

As we have pointed out, in the five year-renewable management plan the management committee defines which zone of the forest should be the full protected, which area should be kept for reforestation and in which zone of the forest the villager can harvest the allowed amount of timber and non-timber forest products. This specific aspect of the management plan includes two important things. At first, the clear definition of harvest zones provides the community with direct availability of the needed resources (arrow 1). Further, the fact that the community has to conduct a new management plan every five years include, that every five years the zones changed. The impact of that rotation system is that the forest zone which is declared as a harvest zone in the first plan can regenerate during the next ten years. The result of this rotation system is an increased natural diversity within the whole protected area (cf. Sophana 2013; Moeurn 2008). In addition, the local people can see the benefit from this system

and are willing to accept the regulations. Therefore, the management plan and the whole set of by-laws and regulations has a positive impact on the resource (arrow 4).

Figure 6. Social-ecological system of Chambok



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The interactions between the villagers and the management committee members multi-layered and both actor groups overlap in recent ways (arrow 2). The villagers elect the sub-committee and management committee members, which themselves are local villagers, and also have the right to candidate for a committee position. Through monthly officially published reports (cf. Halley et al. 2007, p. 18) and regularly held community meetings (cf. Moeurn et. al 2008, p. 11), the villagers and the stakeholders get informed about the process and the problem of the CPA/CBET and during the meetings they have the chance to discuss the management approaches of the committee. Furthermore, estimated 400 villagers are employed directly by the CBET project and gain benefit through loans from the tourism site. As mentioned above a large portion of the earned CBET income gets distributed through development/infrastructure projects within the villages. This whole interdependent system can be characterized as a system with permeable boundaries between villagers and committee, where the non-committee village members monitor the management staff. This permeable system allows that the earned income get shared in a transparent manner.

The interaction between the infrastructure and the infrastructure provider (arrow 3) is characterized by the rules and regulations given by the community, which represent the social capital aspect of the infrastructure. The committee members monitor and enforce the self-given rules, regulations and by-laws and they are able the change the rules. The management plan has to be renewed every five years, which means that the nature of the internal legal framework can be characterized as flexible. The MC organizes the patrolling groups which patrol the CPA/CBET area and are set up from villagers of every village (cf. Cham 2013).

The most important interaction within this social-ecological system is the link between the villagers and the CPA/CBET project (arrow 6). This compound is therefore the most important because the CPA/CBET project involves the villagers in a highly fashion. Through this project the villagers create awareness for the environment, the natural resources and the sustainable use of these resources. This in fact influences the natural diversity of the whole area. Additionally the people get involved in the project, which provides them with a perspective to stay in the village to get an income. During trainings on computer, micro-management and leadership skills, and English lessons appropriated by Mlup Baitong the community strengthen their literacy and self-determination. The young commune members also benefit from the CPA/CBET project, because they get involved into the forest protection through the youth club, which was established by the management committee (cf. Morn 2013; Cham 2013). During non-recorded talks with young villagers, they described that they have the opportunity to get trained to get a guide or to start a micro-project within the WSHGs. But as noted above, only few families are able to provide sufficient education for their children (cf. Sat 2013). In addition, this means that also only a few young people come in touch with the CPA/CBET project as an opportunity for an employment in the future. Furthermore, Mlup Baitong offered young people from Chambok, which are active within the CPA/CBET project, the possibility to study in Phnom Penh (cf. Sophana 2013). In addition, the project has enabled a huge number of villagers to improve their livelihood and provide them with a secure future within the commune.

But beside all these positive aspects, the community faces also strong internal constraints. Especially the poor households within the community must be mentioned. First of all, only the villagers with a sufficient amount of space (to build a home stay), time and family backup are able to participate in the CPA/CBET project. As mentioned in the introduction, particularly the rural poor households in Cambodia depend on natural resources for their daily living. This is also the case in Chambok, but the management plan regulates the withdrawal of timber and NTFP. These strict harvest regulations lead sometimes to rule deviations on the part of poor community members. According to Mr. Cham, in cases where members of the Chambok commune are caught as rule breakers the rules are very difficult to enforce because of the personal affiliation between the involved actors (cf. Cham 2013). Another future internal problem is the actual committee chief Mr. Touch Morn, which is the focal person within the

CPA/CBET community and head of the committee since the beginning. The question here is whether or not the Community is able to replace him. Because of the overreliance on him, the project will face serious consequences for the effectiveness of the management if the committee chief decides to rejects (cf. Mouern et al. 2008, p. 17).

As mentioned, external disturbances affect the robustness of an SES. Within the circumstances of Chambok the major external disturbances and constraints are in- and out-migration, political pressure from higher political level and, associated therewith economic land concessions (arrow 8) (cf. Morn 2013; Sophana 2013). The community has faced in 2002 political pressure from an economic actor, which wants to clear the protected area and establish an economic land concession. According to Mr. Touch Morn, the committee was able to mobilize the local villagers and educate them that they depend on the forest as main source for their livelihood. The committee was capable to convince the villagers to protect the area, with the result that the attempt of establishing an economic land concession was not successful (cf. Morn 2013). After this incident no further attempt was made to establish a concession on the community area. As noted in the description of the legal framework of Community Protected Areas, the Ministry of Environment has a powerful position within every Protected Area. Also the CPA/CBET Community of Chambok relies heavily on the Ministry, especially during process of developing and implementing the new management plan the Ministry has the power to reject the right of being a Community Protected Area (cf. Diepart 2013; Morn 2013). Although this possible external factor has not affected Chambok yet, but it is not possible to exclude it for the future. This means that we have to characterize the influence of the Ministry as potentially debilitating and permanently. On the top of that, the community is totally helpless when political actors above the provincial level[21] try to exert influence on the CPA/CBET Community. According to the management committee chief, the community is, in such cases, totally dependent on the willingness of the MoE or the government to help them (cf. Morn 2013). As in the case of the scope of influence of the Ministry, this potential external constrain must always be kept in mind and regarded as potentially dangerous for the SES Chambok.

The last type of external influences with which the CPA/CBET Community of Chambok has to deal with, is the strong internal migration within Cambodia. Internal migration can be divided into in-migration, which means that people from other parts of the country settle within the boundaries of the Chambok commune, and out-migration, which means that people from Chambok move away to live in another part of the country (cf. Diepart 2013). Among other

[21] The legal structure of Cambodia is divided into two different levels with several sub-levels. On the one hand, there is the Capital (Phnom Penh), which second level are the *Khans* (districts) and third level are the *Sangkats* (quarters). On the other hand, there is the Province/*Khet* (without Phnom Penh, 23 Provinces) which has also two levels with several other levels. At first there are the *Krung* (municipality) which second level are the *Sangkats*. Second, there are the *Srok* (districts) which second level are the *kum* (communes) and third level are the villages and fourth level are the sub-villages.

aspects, several scholars have figured out especially the in-migration as a main driver of external pressure on CPR management systems (cf. Adler et al. 2009/ Van Acker 2003/ Diepart 2010/ Weingart/Kirk 2008). Particularly Van Acker pointed out that new entrants "[…] cannot be understood to have the functional knowledge evolved over time by long-established users of the resource (a learned degree of scarcity), nor can it be assumed that they care as much about it as those that depend on the resource for their survival" (Van Acker 2003, p. 14). In the case of out-migrations, researcher estimated that it has a huge negative impact on resource management because "[…] youth migrating out of the villages, adult males seeking paid work outside of the natural resource sector and woman left as the primary users of the community forest" (Borany et al. 2010, p. 60). This process leads automatically to the questions: "What happens when these young people do not return to rural areas to manage community natural resources?" (Frieson/Sithan 2010, p. 35) or "How will the demographic trends towards urbanization impact on the community management of forests?" (Borany et al. 2010, p. 63) The problems of internal migration within the context of Cambodia are very striking, but a deeper analysis of them would go beyond the scope of this paper. However, the quoted papers of Borany et al. and Frieson/Sithan provide a good starting point for these issues.

Within the context of internal migration, the case of the Chambok commune is bipolar. According to the statements of Mr. Sophana (cf. 2013) and Mr. Morn (cf. 2013), the commune do not face this problems in a significant way. Out-migration is happening in really few cases, which can be explained with the described opportunities for the local people offered by the CPA/CBET project (cf. Huot 2013). But, as also mentioned above, not all young people can receive the needed educational level to be active within the project. They have the will to participate but they aren't able to do so, this results in an out-migration of the uneducated youth (cf. Sat 2013). Therefore, the project provides only a future prospect within the commune for that part of the community, who has the needed time and also the needed education level. The young people whose parents are not able to finance their education and therefore who cannot be employed in the project don't have that kind of positive future prospect. This resulting in a two-tier commune, with families who participate in the CPA/CBET project on the one hand, and poor families with children who migrate to other parts of the country to work in factories on the other hand. In cases of in-migration, the committee has established strict rules to regulate the behavior of the new entrants in regard to the protected forest area. According to Mr. Cham, the committee members explain the rules of the CBET/CPA community to the new entrants directly after they settled in the commune. But during the first two years they are not allowed to participate within the community (cf. Cham 2013). This means that they can't receive any benefit from the CBET project and that it is forbidden for them to withdrawal resources within the CPA.

These strict regulations for the new entrants defuse the above assumed impacts of in-migration on natural resource systems, because during the first two years new entrants in Chambok have the opportunity to implement the rules of the community and therefore to learn to behave in regard to them. But it is obvious that these rules create a new form of internal constraints, because new entrants don`t receive neither a benefit from the forest nor from the eco-tourism project. During the timescale of two years they can get disappointed and try to revive benefit from the forest through illegal logging. But if that would be the case, the regulations and by-laws provides the committee with useful tools to deal with rule breakers.

However, we have pointed out all relevant aspects which can play an influential role for the robustness of the social-ecological system of Chambok. According to these findings it must be concluded, that the CPA/CBET Community of Chambok is able to deal with most of these internal and external constraints. Unfortunately the community is helpless in regard to exertion of influence from higher political levels; further the rules for new entrants can create new internal threats. Furthermore, we have to conclude that the project is potentially the reason for a socially divided two-tier community, with families who get a significant benefit from the project and families who don`t benefit from the project at all. Nevertheless, the CPA/CBET Community is backed up with a strong legal framework and also with a strong support of the MoE, which has identified Chambok as an ideal example for a strong and self-organized commune (cf. Mouern et al. 2008; Sophana 2013). The described internal and external constraints, as well as the strength and opportunities of Chambok are summarized in Box 3.

In the following chapter we will conclude our findings and try to back them up with a broader sight of resource management in developing countries.

Box 3. Strengths, Opportunities and Weaknesses in Chambok Community

Strengths • The community has developed a forest protection regulation and eco-tourism arrangement, including benefit sharing mechanisms from the tourism and the small-scale harvest use. • Local people are willing to accept the forest regulations and cooperate within the CBET. • Forest is near the community so all villagers can monitor activities related to forest. Although the local tour guides during the tours monitor the forest as well as the monthly active patrolling groups. • The Community is able to provide English lessons for the youth and create awareness for a sustainable use of the natural resources during these lessons. • The CBET binds a part the youth active in the community (e.g. dance group, youth club) so it is possible that some young people see a future within the community.	*Opportunities* • The Community Protected Area and the Community-based eco-tourism are underpinned by a strong legal framework. • The provincial government (e.g. MoE represented by the Kirirom National Park) supports the community.
Internal Constraints • It is difficult for poor households in the community to participate in forest protection and development of the eco-tourism. Only villagers with a sufficient amount of space (to build a home stays), time, and family backup are able to participate. • Poor households have to harvest timber and NTFP in the forest for their livelihood. But the community is only able to support a few households with money from the community fund. • New entrants aren't able to participate within the Community during the first two years, therefore they don`t receive neither a benefit from the forest or the eco-tourism project. During this timescale they can be get disappointed and trying to revive benefit from the forest through illegal logging. • The committee chief is a focal person within Chambok community. He is the head of the committee since the beginning. The question here is whether or not the Community is able to replace him. Because of the overreliance on him, the project will face serious consequences for the effectiveness of the management if the committee chief decides to rejects. • Internal conflicts with several villages involved are difficult to handle for the community.	*External Constraints* • There is also no legal document which gives the committee the right to fine rule breakers within the community and from outside. They confiscate the harvest instruments by their own but without a legal backup. • Every five years the community has to do a forest inventory. If the results are not positive, the MoE is able to reject the protected area at any time. • Every five years the community has to create a management plan for the forest. This process is time consuming and has to deal with several constraints from the MoE. • External conflicts between the community and representatives from the central government or ministries cannot be solved by the community. In such cases the community heavily depends on the help of other high ranking government or ministry officials.

Source: own chart

7. Conclusion

The management of common-pool resources contains a huge variety of complexities and the effectiveness or ineffectiveness of these systems depends on several external and internal conditions, like for example the character and history of the community in which the CPR system is embedded and the nature of the government which defines the rules to behave through formal and informal norms, practices and institutions (cf. Agrawal 2001; 2003). But according to Chou (cf. 2010, p. 15) the question at stake is: How will these conditions affect the management of CPRs in Cambodia:

> "[…] a country that some scholars describe as having no real forms of community (Ovesen et al. 1996), a country whose people have undergone more than three decades of civil wars and traumas (Chandler 2000), whose adaption of democracy and decentralization is still recent and incomplete (Rusten et al. 2004) and whose governance structure is overridden by patrimonial political practices (Horng &Craig 2008; Eng & Craig 2008; Pak Craig 2008)?"[22]

This question is also crucial in the present, especially after the elections in 2013, which faces several election frauds (cf. Neou/Willemyns 2013; Lewis 2013; Boyle 2013) and where the Prime Minister Hun Sen warns the opposition openly that if they do not accept the election result violence will occur (cf. Hui/Henderson 2013; Kuch 2013). Thus, the present circumstances in Cambodia can be characterized by government institutions which putting pressure on the property rights of the rural people (cf. Hornung/Vize 2013), forced evictions in rural areas as well as in urban areas[23] associated with human rights injuries (cf. ADHOC 2013). Despite the moratorium on large-scale logging announced by Prime Minister Hun Sen[24] in 2001, the natural resources in Cambodia are still disappearing in an alarming rate. According to the NGO ADHOC, ELCs affect forest areas around Cambodia in a questionable amount and if "[…] the current problems are not addressed as a matter of priority, social stability may be at stake" (ADHOC 2013, p. 21).

Environmental regulations like the described Forestry Law, the Royal-decree on Protected Areas, the Land Law, or the different Sub-degrees on Land Concessions are not properly implemented in Cambodia and furthermore, they do not "[...] guarantee protection of Cambodian

[22] To provide a better access to further information's the author has added the mentioned literature in the quote to the bibliography of this paper.

[23] One of the most prominent cases of forced evictions in urban areas in Cambodia is the Boeung Kak Lake in Phnom Penh where around 3,000 families forcibly evicted after the city leased the land to a Cambodian company in 2007 (cf. Aun/Zsombor 2013). For further information's see the homepages of NGO's LICADHO or ADHOC.

[24] In the wake of the moratorium, Hun Sen declares that "[…] losing vast tracts of the country's forest was his "biggest mistake" of the past decade" (Zsombor 2012).

citizens' rights to food, water, and to an adequate standard of living" (ADHOC 2013, p. 20). Although, the Cambodian government tries to transfer resource management rights to local users through co-management approaches, but as pointed out in the section about CPAs and CFs, the overall management of resources like forests still remains in the hand of the state or more precisely in the hand of the Forest Administration in the case of Community Forestry's and in the hand of the Ministry of Environment in the case of Community Protected Areas. Thus, the drive to decentralization through co-management increases de facto the power of the government within the circumstances of natural resource management. This finding correlates with the theoretical assumption of Agrawal (2003, p. 245), who conclude that many co-management approaches "[…] delegate only very limited authority and often communities gain only limited shares." With this in mind, some scholars demanded that the government has to hand over full power to manage natural resources to local users, but it is necessary to note that this task cannot "[…] accomplished overnight in a country that is ridden by mistrust, forced settlement in the villages, and a long period of interrupting the development of social cohesion and capital" (Weingart/Kirk 2008, p. 28). Finally the process of transferring power from government institutions to local users should be done slowly and step by step, whereas the first step should be characterized by a redefinition of the governmental tasks from managing natural resources to cooperating and supporting the local resource users in managing these resources.

In a certain sense, this case study on the CPA/CBET Community Chambok provides some answers to these problems and the CPA/CBET Community itself can be described as a good example for the new role of the government within the circumstances of natural resource management. The study is divided into three main parts. The first part gives a theoretical overview of the theory of the commons, the importance of property rights and the description of the different sets of right holder, and finally the framework of robustness in social-ecological systems. In the second part of the paper, the legal framework of property rights in Cambodia and the different forms of forest management with a focus on the specific approaches of CPA and CF was at stake. The final third part contains a description of the Chambok community and the specific resource management approach, further this part has tried to transfer the described theories on the case of Chambok.

The questions this paper throws up are three. First, are the institutional arrangements like the described Community Protected Areas able to deliver a community benefit? Second, how robust are these schemes? Third, which impacts weaken or strengthen the resource management schemes?

First of all, the question if the CPA approach alone can deliver a community benefit is doubtful. It is assumed that the establishment of Community Protected Areas can help to improve both, the natural diversity in the designated area and the livelihood of the local residents in that area. But in contrast to the legal framework of Community Forestry, which allows the local resource user

a sustainable usage of timber and non-timber forest products, the Royal-degree in Protected Areas restrict the withdrawal rights of the local user to private use. That implies that the local users don`t have any incentive to implement a CPA in their area rather than to follow the strict rules for CPAs enforced by the Ministry of Environment. Therefore, it is inadvisable to answer the first question separately for both projects. First of all, the CPA provides only in connection with the CBET the described benefit to the community of Chambok. Only because of the CBET project it was able to create awareness of a sustainable use of natural resources within the Chambok commune. The project provides the villagers with an opportunity to increase their daily income apart from logging or selling of NTFPs. Since the local users have this opportunity they define their forest rather as their homeland which should be protected and less as a source of income (cf. Morn 2013). In the circumstances of natural resource management systems in Cambodia, this result implies the effectiveness of the connection between a resource management system and a community-based tourism system, which is able to secure the sustainability of the usage of the natural resources and increase the livelihood and food security of the local people in a equal way. Therefore we can answer the question, if management systems like CPAs are able to deliver benefit for the local community, with yes and no. Yes, if they are connected with other community-based approaches like the CBET. No, if they are established without such a secondary system. Nevertheless, it was clearly demonstrated that the CPA/CBET Chambok fits perfectly with the theoretical design principles sketched by Ostrom and outlined in the first part of this paper. That implies that the case of Chambok can be described as a small-scale common-pool resource management system.

The identification of the CPA/CBET Chambok as a CPR system implies the question whether or not this system is robust, which covers the second and third question of this paper. Like in the case of benefit providing, it is also impossible to talk about the robustness of the CPA in Chambok without mentioning the CBET. Both systems are connected very close to each other and therefore a weakness of the tourism system is automatically a potential threat for the resource management system and vice versa. However, this paper tries to transfer the framework of robustness in social-ecological systems, outlined in the first part, on both the CPA and CBET Chambok. Basically, this dual system of community-based forest management and community-based eco-tourism can be described as highly robust. The community is able to compensate nearly all assumed internal and external disturbances like in- and out-migration, internal conflicts, rule violations, and external economic pressure. As described the behavior rules for new entrants are strict and according the Mr. Cham also strictly enforced (cf. Cham 2013). Nevertheless, it is important to note that these rules for new entrants create new internal threats, like the incentive of illegal withdrawal of forest resources by the new entrants, which can be weaken the whole system. In such a case, it must be assumed that the relatively strong by-laws and regulations for rule breakers engage. Another important point is the observation

that the CBET/CPA projects divided the commune into a socially two-tier commune. This could also be a potential factor in the future which can weaken the system. If the CPA/CBET Community is not able to find a solution and to provide sufficient education for the young people, the community could be threatening a huge amount of enviousness. Furthermore, it has been shown that the community is able to deal with internal conflicts to a certain scale. Only when the level of conflict reached a scale in which higher-level political actors are involved, the community is helpless and the whole system can be characterized as weak. Otherwise, it is important in this context that on the one hand the entire project enjoys great support within the MoE (cf. Morn 2013; Mouren et al. 2008, p. 17), and that on the other Mr. Touch Morn must be characterized as a politically well-connected and strong actor (cf. Mouern et al. 2008, p. 17). In addition, this paper is able to show that the CPA/CBET Chambok is a long running and internally as well as externally robust small-scale CPR system and therefore can be described as a best case scenario.

Finally it must be concluded that the combination of Community Protected Areas and Community-based eco-tourism provides first, the space for communities to have a greater say in formulating and implementing local regulations; second, significant amount of possible employments within the CBET system; third, strong opportunities to stay in the commune with positive future prospects, but only for that part of the commune population who have the needed amount of time, space, and education; fourth, strong opportunities for the villagers to improve their livelihood through the increased forest diversity because of the CPA and through the income and community fund of the CBET; fifth, a strong legal backup and therefore tenure security through the Royal-degree on Protected Areas and the support of the Ministry of Environment.

The approach of nested community-based management systems between resource management and eco-tourism provides a useful system within the dichotomy between state and local user. Nevertheless, it is important that the local users must stay informed and be aware of their own rights and most importantly they have to invest time and resources to organize themselves and to keep the management system stable. On the other side, the state has to redefine its role in a way to more coordinative and cooperative approaches between the government actors and the local users, to build a new capacity to articulate and represent local demands. This means, that the government, the ministries and especially the ministry departments have to step back from the strong top-down system and must implement a more bottom-up centered approach to cooperate with local communities. This means that the process, described in part 4.2., of centralization through decentralization have to be transferred into a real process of decentralization. We will see, if the new formed government after the 2013 elections will try to go that way to improve rural development.

8. Bibliography

ADHOC (2013): A Turning Point? Land, Housing and Natural Resources Rights in Cambodia in 2012, Phnom Penh.

Adler, Daniel/ Ironside, Jeremy/ Ratanak, Mean (2009): Mapping and Tenure Security in Cambodia's Indigenous Communities, Discussion Paper 2009, Phnom Penh; http://www.kh.boell.org/downloads/Mapping_and_Tenure_Security_in_Cambodias_Indigenous_Communities_final.pdf [02.08.2013].

Agrawal, Arun (2001): Common Property Institutions and Sustainable Governance of Resources, in: World Development, 29(10), pp. 1649-1672.

Agrawal, Arun (2003): Sustainable Governance of Common-Pool Resources: Context, Methods, and Politics, in: Annu. Rev. Anthropol., 32, pp. 243-262

Agrawal, Arun/ Ostrom, Elinor (2001): Collective Action, Property Rights, and Decentralization in Resource Use in India and Nepal, in: Politics & Society 29(4), pp. 485-514.

Anderies, John M./ Janssen, Marco A./ Ostrom, Elinor (2004): A Framework to Analyze the Robustness of Social-ecological Systems from an Institutional Perspective, in: Ecology and Society 9(1):18.

Aun, Pheap/ Zsombor Peter (2013): Rainsy Says Those Behind Boeng Kak Deserve Jail, in: The Cambodia Daily, 6.August 2013; http://www.cambodiadaily.com/elections/rainsy-says-those-behind-boeng-kak-deserve-jail-38399/ [06.08.2013].

Baromey, Neth/ Ol, Sam Rith/ Pellini, Arnaldo (2012): Social Capital Definitions, Characteristics and the Relevance for CBNRM in Cambodia, in: Pellini, Arnaldo (ed.): Engaging for the Environment. The Contribution of Social Capital to Community-based Natural Resource Management in Cambodia, Phnom Penh, pp. 14-40.

Boyle, David (2013): Giving more than 100%, in: The Phnom Penh Post, 24 July 2013; http://www.phnompenhpost.com/national/giving-more-100 [05.08.2013].

Heng, Borany/ Vuthy, Ma/ Frieson, Kate Grace (2010): Voices from the community forests: Gender, geography and generations, in: Rural Livelihoods and Natural Resources Development Research Programme (2010): Social Landscapes and Rural Livelihoods: Cambodian Communities in Transition, Phnom Penh, pp. 58-78.

Brennan, Geoffrey/ Hamlin, Alan (2000): Democratic Devices and Desires, Cambridge.

Brofeldt, Soren/ Han, Keam/ Piseth, Ken (2009): Inventory in Cummunity Forestry in Cambodia. Reviewing MAFF Prakas. 219, in: in: CBNRM Learning Institute (2009): Emerging Trends, Challenges and Innovations for CBNRM in Cambodia (CBNRM 2nd ed), Phnom Penh, pp. 103-124.

Bues, Andrea (2011): Increasing Pressure for Land - Implications for Rural Livelihoods: A Case Study in Cambodia; http://www.welthungerhilfe.de/fileadmin/user_upload/Mediathek/Mediathek_int/HIntergrundmaterial/cambodia-increasing-pressure-welthungerhilfe.pdf [05.07.2013].

Carlson, Jean/ Doyle, John (2002): Complexity and robustness, in: Proceedings of the National Academy of Science 99, pp. 2538-2545.

Cham, Nut (2013): Interview by Philipp Meyer with Mr. CHAM Nut, village member and local forest guide in Chambok, held on 29.06.2013, Chambok commune, Phnom Sruich district, Kampong Speu province.

Chandler, David (1991): The Tragedy of Cambodian History: Politics, War, and Revolution Since 1945, New Haven.

Chandler, David (2000): A history of Cambodia, Boulder.

Chandran, Prabha (2012): Voices of the forest: building partnerships for community forestry in Cambodia; http://www.recoftc.org/site/uploads/content/pdf/building%20partnerships%20for%20CF%20in%20Cambodia%20UNFF_206.pdf [21.06.2013].

Chirstiano, Thomas (2004): Is Normative Rational Choice Theory Self-Defeating?, in: Ethics 115(1), pp. 122-141.

Chou, Chea (2010): The Local Governance of Common Pool Resources: The Case of Irrigation Water in Cambodia, CDRI Working Paper Series No. 47, Phnom Penh.

Dahal, Ganga Ram/ Atkinson, Julian/ Bampton, James (2011): Forest Tenure in Asia: Status and Trends, Kuala Lumpur.

Diepart, Jean-Christoph (2013): Interview by Philipp Meyer with Dr. Jean-Christophe Diepart, Research Advisor from the NGO Learning Institute, held on 25.06.2013, Phnom Penh.

Eng, Netra/ Craig, David (2008): Accountability and Human Resource Management in Decentralised Cambodia, in: CIDRI Working Paper Series No. 40, Phnom Penh.

Fitzgerald, Ingrid/ So, Sovannarith (2007): Moving Out of Poverty? Trends in Community Wellbeing and Household Mobility in Nine Cambodian Villages, Cambodian Development Resource Institute, Phnom Penh.

Frieson, Kate Grace (2010): Introduction, in: Rural Livelihoods and Natural Resources Development Research Programme (2010): Social Landscapes and Rural Livelihoods: Cambodian Communities in Transition, Phnom Penh, pp. 19-29.

Frieson, Kate Grace/ Pech, Sithan (2010): Social landscape and rural livelihoods in transition, in: Rural Livelihoods and Natural Resources Development Research Programme (2010): Social

Landscapes and Rural Livelihoods: Cambodian Communities in Transition, Phnom Penh, pp. 31-44.

Grimsditch, Mark (2012): 3S Rivers under threat: Understanding New Threats and Challenges from Hydropower Development to Biodiversity and Community Rights in the 3S River Basin, 3S Rivers Protection Network and International Rivers, Banlung Town.

Halley, Merril/ Boravuth, Kong/ Phaktra, Pet/ Somany, Phay/ Thearith, Prak (2007): Report of a national-level workshop, Kratie, Cambodia, in: Mahanty, Sango/ Burslem, Kenneth/ Lee, Erica (ed.): A Fair Share? Experiences in Benefit Sharing from Community-managed Resources in Asia; http://www.recoftc.org/site/uploads/content/pdf/A_Fair_Share_85.pdf [24.07.2013], pp. 13-26.

Hardin, Garrett (1968): The Tragedy of the Commons, in: Science 162, pp. 1243-1248.

Hardin, Garrett (1998): Extensions of "The Tragedy of the Commons", in Science 280, pp. 682-683.

Horng, Vuthy/ Craig David (2008): Accountability and Planning in Decentralised Cambodia, in: CDRI Working Paper Series No. 39, Phnom Penh.

Hornung, Manfred/ Vize, Jeff (2013): Indigenous Peoples And Land Titling in Cambodia: A Study of Six Villages, Paper prepared for presentation at the "Annual World Bank Conference on Land and Poverty", The World Bank – Washington DC, April 8-11, 2013.

Hughes, Caroline/ Un, Kheang (2011): Cambodia`s Economic Transformation: Historical and Theoretical Frameworks, in: Hughes, Caroline/ Un, Kheang (ed.): Cambodia`s Economic Transformation, Copenhagen, pp. 1-26.

Hui, Reaksmey/ Henderson, Simon K (2013) Listeners Wary as Hun Sen Changes His Tone, in: The Cambodia Daily, 5. August 2013; http://www.cambodiadaily.com/elections/listeners-wary-as-hun-sen-changes-his-tone-38273/ [05.08.2013].

Huot, Khem (2013): Interview by Philipp Meyer with Mrs. HUOT Khem, WSHG Chief of Chambok, held on 07.08.2013, Chambok commune, Phnom Sruich district, Kampong Speu province.

IFSR (2004): Independent Forest Sector Review: the Forest sector in Cambodia: Part 1. Policy Choices, issues and options.

IUCN (2012): Guidelines for applying the IUCN Protected Area Management Categories to Marine Protected Areas, Gland.

Janssen, Marco A./ Ostrom, Elinor (2006): Governing Social-Ecological Systems, in: Tesfatsion, Leigh/ Kenneth, Judd L. (ed.): Handbook of Computational Economics, Volume 2, Amsterdam, pp. 1466-1509.

Kiernan, Ben (1996): The Pol Pot Regime. Race, Power, and Genocide in Cambodia under the Khmer Rouge, 1975-79, New Haven.

Kiernan, Ben (2002): Introduction: Conflict in Cambodia, 1945-2002, in: Critical Asian Studies 34(4), pp. 483-495.

Kingdom of Cambodia (1993): Royal Decree on the Protection of Natural Areas.

Kingdom of Cambodia (2001): Land Law.

Kingdom of Cambodia (2003a): Sub-Decree No19 on Social Land Concessions.

Kingdom of Cambodia (2003b): Sub-Decree No79 on Community Forestry Management.

Kingdom of Cambodia (2005): Sub-Decree No146 on Economic Land Concessions.

Kingdom of Cambodia (2008): Protected Area Law.

Kingdom of Cambodia (2010): National Forest Program 2010-2029; http://www.twgfe.org/Docs/Plans/NFP%20Strategic%20and%20Implementation%20English.pdf [10.07.2013].

Kuch, Naren (2013): Hun Sen Says CPP Could Get CNRP's Seats, in: The Cambodia Daily, 3. August 2013; http://www.cambodiadaily.com/news/hun-sen-says-cpp-could-get-cnrps-seats-38263/ [04.08.2013].

Lessig, Lawrence (2001): The Future of Ideas. The Fate of the Commons in a Connected World. Random House.

Lewis, Simon (2013): US Ambassador Calls for Election Investigation, NEC Reform, in: The Cambodia Daily, 5. August 2013; http://www.cambodiadaily.com/elections/us-ambassador-calls-for-election-investigation-nec-reform-38282/ [05.08.2013].

Lindstrom, Nora (2013): Policy for the Poor? Phnom Penh, Tenure Security & Circular 03, the Urban Initiative, Phnom Penh.

Meinzen-Dick, Ruth/ Pradhan, Rajendra/ Di Gregorio, Monica (2004): Understanding Property Rights, in: Meinzen-Dick, Ruth/ Di Gregorio, Monica (ed.): Collective Action and Property Rights For Sustainable Development, International Food Policy Research Institute, Brief 3.

Meinzen-Dick, Ruth/ Mwangi, Esther/ Dohrn, Stephan (2006): Securing the Commons, in: CAPRi – Policy Brief Number 4.

Mlup Baitong (2011): Community prepares inventory for Community Protected Area(CPA); http://www.mlup-baitong.org/news.php?id=17 [12.08.2013].

Mlup Baitong (2003): Mlup Baitong 2003, Report on Natural Resource Utilization and Food Security, Phnom Penh.

Moeurn, Va/ Khim, Lay/ Sovanny, Chhum (2008): Good Practice in the Chambok Community-Based Ecotourism Project in Cambodia, in: Steele, Paul/ Fernando, Neil/ Weddikkara, Maneka (ed.): Poverty Reduction that works: Experience of Scaling up Development Success, Colombo.

Morn, Touch (2013): Interview by Philipp Meyer with Mr. MORN Touch, CPA/CBET Community Chief of Chambok, held on 28.06.2013, Chambok commune, Phnom Sruich district, Kampong Speu province.

Mum, Youch (2013): Interview by Philipp Meyer with Mr. MUM Youch, shop keeper in Chambok, held on 07.08.2013, Chambok commune, Phnom Sruich district, Kampong Speu province.

Neou, Vannarin/ Willemyns, Alex (2013): Investigation Committee Nixed 1 Day After Creation, in: The Cambodia Daily, 5. August 2013; http://www.cambodiadaily.com/elections/investigation-committee-nixed-1-day-after-creation-38277/ [05.08.2013].

Ngil, Yh (2013): Interview by Philipp Meyer with Mr. NGIL Yh, farmer and home stay owner in Chambok, held on 07.08.2013, Chambok commune, Phnom Sruich district, Kampong Speu province.

Ngo, Sothath/ Chan, Sophal (2012): Economic Land Concessions and Local Communities, Phnom Penh.

Ol, Rith Sam/ William, Peter W./ Baromey, Neth (2009): Communtiy-Based Ecotourism and Rural Livelihood Diversification: Reframing the Approach, in: CBNRM Learning Institute (2009): Emerging Trends, Challenges and Innovations for CBNRM in Cambodia (CBNRM 2nd ed), Phnom Penh, pp. 471-492.

Olson, Mancur Jr. (1965): The Logic of Collective Action, Cambridge.

Ostrom, Elinor (1990): Governing the Commons. The Evolution of Institutions for Collective Action, Cambridge University Press, Cambridge.

Ostrom, Elinor/ Burger, Joanna/ Field, Christopher B./ Norgaard, Richard B./ Policansky, David (1999): Revisiting the Commons: Local Lessons, Global Challenges, in: Science 283, pp. 278-282.

Ostrom, Elinor (2004): Understanding Collective Action, in: Meinzen-Dick, Ruth/ Di Gregorio, Monica (ed.): Collective Action and Property Rights For Sustainable Development, International Food Policy Research Institute, Brief 2.

Ostrom, Elinor (2010): Beyond Markets and States: Polycentric Governance of Complex Economic Systems, in: American Economic Review 100, pp. 641-672.

Ovesen, Jan/ Trankell, Ing-Britt/ Öjendal, Joakim (1996): When Every Household is An Island: Social Organization and Power Structures in Rural Cambodia, Stockholm.

Pak, Kimchoeun/ Craig David (2008): Accountability and Public Expenditure Management in Decentralised Cambodia, in: CIDRI Working Papers No. 38, Phnom Penh.

Pheap, Aun (2013): Authorities Deny Claims Ex-Minister's Sister Buying Jarai Land, in: Cambodia Daily 16.10.2013; http://www.cambodiadaily.com/news/authorities-deny-claims-ex-ministers-sister-buying-jarai-land-45224/ [16.10.2013].

Pierre, John/ Peters, Guy (2000): Governance, Politics and the State (Palgrave Macmillan).

Place, Frank/ Otsuka, Keijiro/ Scherr, Sara (2004): Property Rights, Collective Action, and Agroforestry, in: Meinzen-Dick, Ruth/ Di Gregorio, Monica (ed.): Collective Action and Property Rights For Sustainable Development, International Food Policy Research Institute, Brief 5.

Ratner, Blake D. (2011): Common-Pool Resources, Livelihoods, and Resilience: Critical Challenges for Governance in Cambodia, in: IFPRI Discussion Paper 01149.

Ros, Saron (2013): Interview by Philipp Meyer with Mr. ROS Saron, farmer in Chambok commune, held on 07.08.2013, Chambok commune, Phnom Sruich district, Kampong Speu province.

Rusten, Caroline/ Sedara, Kim/ Netra, Eng/ Kimchoeun, Pak (2004): The Challenges of Decentralisation Design in Cambodia, Phnom Penh.

Samuelson, Paul A. (1954): The Pure Theory of Public Expenditure, in: Review of Economics and Statistics 36(4), pp. 387-389.

San, Leakhena Socheat (2006): Indicating Success: Evaluation of Community Protected Areas in Cambodia, in: Mahanty, Sango/ Fox, Jefferson/ Nurse, Michael/ Stephen, Peter/ McLees, Leslie (ed.): Hanging in the Balance: Equity in Community-Based Natural Resource Management in Asia, Bangkok, pp. 14-27.

Sat, Sreytouch (2013): Interview by Philipp Meyer with Mrs. SAT Sreytouch, forest guide and ticket seller in Chambok, held on 07.08.2013, Chambok commune, Phnom Sruich district, Kampong Speu province.

Shiva, Vandana (2002): Water Wars: Privatization, Pollution and Profit, London.

Smith, Robert J. (1981): Resolving the Tragedy of the Commons by Creating Private Property Rights in Wildlife, in: CATO Journal 1, pp. 439-468.

Sophana, Om (2013): Interview by Philipp Meyer with Mr SOPHANA Om, Organizational Manager of the NGO Mlup Baitong, held on 18.07.2013, Phnom Penh.

Tol, Sokchea/ Srey, Marona/ Diepart, Jean-Christophe (2009): Local-Level Monitoring in Decentralized Forest Management: Exploring the Spaces for Community Participation, in:

CBNRM Learning Institute (2009): Emerging Trends, Challenges and Innovations for CBNRM in Cambodia (CBNRM 2nd ed), Phnom Penh, pp. 125-147.

UNDP Online: United Nations Development Programme Cambodia, Poverty Reduction; http://www.un.org.kh/undp/what-we-do/poverty-reduction/poverty-reduction [20.06.2013].

Van Acker, Frank (2010): Free Riders and Social Fences: Common Property, Collective Action and Decentralized Natural Resource Management in Cambodia, Phnom Penh.

Van Acker, Frank (2003): Cambodia`s commons: Changing governance, shifting entitlements?, in: CAS Discussion paper No 42, October 2003.

Vickery, Michael (1989): Cambodia (Kampuchea): History, Tragedy, and Uncertain Future, in: Bulletin of concerned Asian scholars 21(2-4), pp. 35-58.

Volz, Karl-Reinhard (2001): Wem gehört eigentlich der Wald? Waldeigentum im Spannungsfeld von privatem und allgemeinem Interesse, in: Bürger im Staat 51/1, pp. 51-58.

Wade, Robert (1987): The Management of CPR: Collective Action as an Alternative to Privatisation or State Regulation, in: Cambridge Journal of Economics 11, pp. 95-116.

Weingart, Anne/ Kirk, Michael (2008): Escaping poverty traps? Collective Action and Property Rights in Post-War Rural Cambodia, in: CAPRI Working Paper No. 89.

World Bank (2013): Cambodia at a Glance; http://devdata.worldbank.org/AAG/khm_aag.pdf [20.06.2013].

WWF (2013): Ecosystems in the Greater Mekong: Past trends, current status, possible futures; http://awsassets.panda.org/downloads/greater_mekong_ecosystems_report_020513.pdf [06.06.2013].

Zsombor, Peter (2012): Past Bodes Poorly for Future of Land Concession Freeze, in: The Cambodia Daily, 9. May 2012; http://www.cambodiadaily.com/archive/past-bodes-poorly-for-future-of-land-concession-freeze-571/ [05.08.2013].