



# THE NATURE OF WATER AND LAND IN K'AM SAMNAR

A case study of hydro social lifeworlds in the Leuk Daek district in  
Kandal province



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## Abstract

Water is the lifeblood of every living being on earth. In Cambodia water is abundantly available, but not always accessible. The Mekong river is an important vein in the life of many rural households in Cambodia. People in K'am Samnar commune govern and cultivate their food and water which is highly dependent on the flow of the river. Their hydro social lifeworld(s) focuses on dealing with common water resources.

Most previous research that focussed on water as a common good around the Tonle Sap and the Mekong river delta looked primarily from the vantage point of national interests. This research focusses on comparing local practices with the way other entities such as state agencies govern the water from the Mekong river. Eight semi-structured interviews with farmers, a pump owner, local chiefs, and a spiritual elder, as well as a survey with 45 participants, an in-depth interview with ECOLAND, field notes and day reports about common land and water practices in K'am Samnar were analyzed. The analysis has an ontological view as well as an ecological lens.

Little is known about the water and land practices of the inhabitants of K'am Samnar which is a border commune with Vietnam in the Leuk Daek district. Insight is given about the way rural livelihoods are shaped in K'am Samnar. Looking at, for example, the main source of income, food security, governance of land and water, development changes, and water, land and spirit practices. Furthermore, the management system used for common pool resources was closely examined as well as how this effect relations between people in this research area.

Finally, multi-scalar water related issues are addressed from a local lens to show multiple power relations within processes of water governance; looking at different ontologies centred around the Prek(s). Within these Prek systems, the political scales and scalar power dynamics are visible in traditional and modern ways of dealing with water. Elements in the possible lifeworld(s) and local water ontologies can be suppressed by the more dominant development frameworks which may have effects on development outcomes.

**Key words:** Cambodia, common pool resources, water governance, politics of scale, food security, multiple ontologies

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## **List of Abbreviations**

<b>Doubt</b>	Deltas dealing with Uncertainties
<b>ECOLAND</b>	Ecosystem Services and Land Use Research Center
<b>ELC</b>	Economic Land Concessions
<b>FAO</b>	Food and Agriculture Organization
<b>FWUC</b>	Farmer Water User Committee
<b>MAFF</b>	Ministry of Agriculture, Forestry and Fisheries
<b>MoWRAM</b>	Ministry of Water Resources and Meteorology
<b>MRC</b>	Mekong River Council
<b>NGO</b>	Non-Governmental Organization
<b>PUC</b>	Prek Water User Committee
<b>RUA</b>	Royal University of Agriculture
<b>SDG</b>	Sustainable Development Goal

# 1. Introduction

For every living, breathing, growing and existing being on earth, water is the driving force in nature and can there for be seen as the blood of the earth to sustain life. Thus, the water can be seen as the lifeblood (Yates, Harris & Wilson, 2017) for millions of people and it is directly associated with their lifeworlds. The Mekong river is called ‘The Mother of Waters’ and refers to giving life and soul to all that lives (Cambodia travel, 2022).

Fresh water is abundantly available in Cambodia. The main resources are the Mekong river and the Tonle Sap Lake both contributing to the upper Mekong delta (see figure 1). The Mekong river flows from China to Laos into Cambodia to end in Vietnam. People in Cambodia must deal with a scarcity of water in the dry season and an excess amount of water in the wet season. According to Sithirith (2017) this poses a threat to the long-term development of the state. The governance of water is an inherent part of the future development of Cambodia.

Figure 1 Map of Cambodia



Ontheworldmap, 2012-2020

Food security is to a certain extent seasonal matter due to floods and droughts, although in some villages in Cambodia it tends to have chronic deficits. A combination of high population pressure, low human capital and low employability, shrinking job opportunities,

favourable market integration and lack of physical and market infrastructure all contribute to this situation (Mund, 2011; Sedara, Sophal, & Acharya, 2002).

This study looks at the province of Kandal and more specifically K'am Samnar commune in the Leuk Daek district. Cambodia has a large agricultural sector due to the economic reforms during and especially after the Khmer Pol Pot regime in 1979. The agricultural sector employs more than half of the country's total labour force (Yu & Diao, 2011). The most important crops are rice, maize, lemongrass and mangos. Most of the farmers use a middleman to sell their products even though there are local markets for the farmers to sell their products themselves. The majority of the farmers living in Kandal cultivate these products, but little coordination exists and almost no diversification takes place in cultivating other crops. Smaller farmers can insufficiently benefit from their agricultural production since they deal with a wide array of challenges. Examples are uneconomically small plots of land, insufficient irrigation installations, poor market integration and expensive credit (Mund, 2011; Chhorvira & Simaraks, 2018).

## **1.1 Problem statement**

As Yates, Harris and Wilson (2017) mention, water is seen as the lifeblood of all life in Cambodia. Monsoon rain, seasonal floods, wetlands and sediment release created an ecosystem in the Mekong river which gives access to food resources, water, economic opportunities and has created life itself around it (Pearse-Smith, 2012, Rab, Navy, Ahmed, Seng & Viner, 2006, Shkara, 2018). Water practices from the Mekong river have different purposes for different actors which can coexist but also coincide with each other. The government of Cambodia has built several hydropower dams for the growing demand for electricity in the Mekong region. This type of infrastructural development has been met with resistance from different stakeholders (Non Governmental Organizations (NGOs) and environmental groups). The presence of the hydropower dams has the possibility to block seasonal variations in river flow and hinder fish migrations. Also, reduction of sediment deposition, damage of ecosystems and negative impact on the livelihoods of the population living around the Mekong river are examples of negative hydropower consequences (Suhardiman, Wichelns, Lebel & Sellamuttu, 2014).

Moreover, tensions within or among communities and other entities could also arise over the purpose, function or meaning of the river. As stated above, people living around the Mekong river, and especially the Kandal province, rely heavily on agriculture and fishery. The

use of the river by the population faces challenges. The way people think about and live with water from the Mekong river, can overlap and contradict. De jure and de facto land or water rights and open access situations are degrading the environment and affecting the ecosystem of the region (Werthmann, Weingart & Kirk, 2010). The communities living in Leuk Daek district in the Kandal province, rely heavily on the resources of the river. Therefore, they govern and cultivate their food in a certain way, which is highly dependent on the flow of the river. Also, by comparing this with the way the government governs the water of the Mekong river, a multitude of ontologies related to water can exist at the same time (Hirsch, 2016 and Krause, 2018). The local ontology of villages in Cambodia have had (and are still) embedded with spirit practices (Beban & Work, 2018). These elements can suppress the possible lifeworld(s) and local water ontologies are at risk because of more dominant developmental frameworks.

More so, according to the Worldbank, Cambodia is experiencing a shorter, more intense wet season and prolonged, hotter dry season. The impact of environmental change on the livelihoods of farmers can be widespread. Higher temperatures, intensified storms, increase in pests and insects and decline in fish are examples of consequences. Especially impacts on the livelihood and food security of farmers can create adaptation strategies such as changing or additional jobs, raising additional livestock, changing agricultural techniques or temporal adjustments to homes or plots of land (Southall, Chandore & Ordam, 2019).

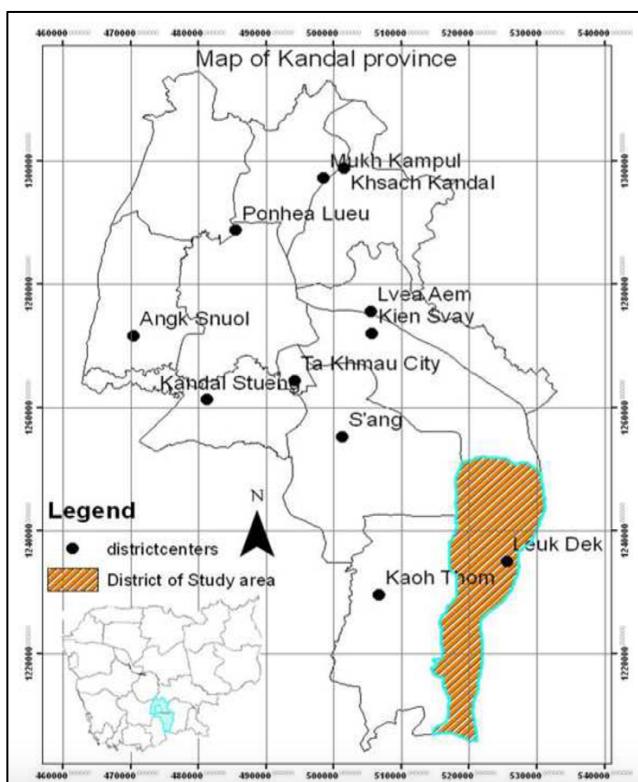
The Leuk Daek district (see figure 2) has an extra influential due to the close interactions with Vietnam. Especially the commune in which the research is being conducted, K'am Samnar, can be seen as a border region. Internationally and on national level, the relationship between Cambodia and Vietnam is difficult due to the interventions of Vietnam in the past. However, on regional and local level many interactions exist between these two countries. Without going too much in depth in this concept of border regions, its influence on land and water governance can create opportunities but also challenges of for example in- and exclusion and inequalities in for example job opportunities and land access among local Cambodians.

Lastly, food security has been an issue for decades in Cambodia. After the ousting of the Khmer Rouge in 1987 and the de-collectivization of land in 1989 the distribution of land was rather egalitarian. Each household received small plots of land between one and two hectares. However, by the late 1990s trends of concentration of larger pieces of land in the hands of the few and related landlessness were emerging. In Cambodia, where the majority are subsistence farmers, this situation creates conditions of joblessness and subsequently food insecurity. On top of that, factors of population growth and the capitalization of the market can

affect food security in multiple ways (Sedara, Sophal & Acharya, 2002). Also, support from family or community can help farmers in their livelihood, ‘Prova’ / ‘Provas Dai’ (which is voluntary mutual help within a community in exchange for a percentage of the yield) (Uimonen, 1996) or remittances from family members can provide more income (Haas, 2005). However, this is not used anymore since the implementation of agricultural machinery.

To analyze the aforementioned challenges and processes this research will focus on getting new and improved understandings of the (changing) situation and their coping or adaptation strategies.

Figure 2 Research area Leuk Daek district in the Kandal province



Pheakdey, 2014

## 1.2 Academic relevance

This research focuses on the local level of two communes in the Leuk Daek district in the Kandal province. This district is adjacent to the Mekong river is neglected in general academic research and is therefore very interesting. Learning more about the hydro social lifeworlds on this local level can add nuances to the dominant framework for governing the Mekong river. Local governance structures are often entangled with government policy while coexisting, whilst both local and national actors might not be aware of each other’s policies. Furthermore, insights in other hydro social lifeworlds can show worlds that are a) neglected and b) can



possibly exceed a developmentalist way of thinking. Therefore, the intention of this research is to unfold a local way of governing and living with water, not only as a resource but maybe more as 'a way of life'. This 'way of life' can be seen as underdeveloped by the current dominant framework of the government of Cambodia and 'the West', in part because of the practices which can be related to spirits and being close to nature. However, as Beban and Work (2018) argue, the entanglement with practices might also produce conflict.

Moreover, the way in which water is governed in the Kandal province has consequences for the Mekong river, mainly other areas in Vietnam downstream. Just as the governance and regulation of water in China and Laos has consequences for Cambodia. Existence of multiple hydro social lifeworlds and ontologies make water governance a complex and important subject to study. Insight in these concepts and subjects can make coordination and collaboration easier.

### **1.3 Development relevance**

Sustainable development of the well-being of humans and nature for now and in the future, is imperative for people living in relation with water. However, food security, water security and sustainable common resources cannot be achieved for everyone. Therefore, it is imperative to closely research who is left out and who benefits from certain developmental projects, initiatives, etcetera even though the best intentions may be in place. A first step to improve the situation of the majority of people cannot be achieved by only one dominant framework of sustainable development. There is a need to consider an integration of frameworks which includes local and indigenous knowledge and practices. In this way, the Mekong river in the Kandal province cannot only be seen as a resource, but also as a way of life and existence for many communities in this region. Hence water as lifeblood according to Yates, Harris and Wilson (2017). This ontology leads to propositions of not only rights, but also responsibilities to this water and its ecosystem through which it flows according to Foster, Bonanno, Kumar, Lear, Basilio & German (2018). However, many of the current water interests are at odds with this latter view of sustainable development. Since water can be seen as a common pool resource (Krause, 2018), the management and governance of this pool is important so that interests of different actors are taken into account.

Furthermore, using a gender lens to look at the different roles men and women have (and even elderly, children, single women, etcetera), can gain insight in order to address and identify problems and solutions occurring around water practices. Successful implementation and intervention of policies and programmes regarding water management, depend on the

recognition and insight in the roles of men and women in a given community. Lack of recognition can lead to failure of implementations and interventions by Non Governmental Organizations (NGOs) or government programmes, which could ultimately lead to the failure of progress in sustainable development (in achieving the Sustainable Development Goals (SDGs)) (IUCN and Oxfam, 2018).

To unfold how the local water practices and conflicting water interests are shaped in Kandal the following research question has been formulated:

*“How are changing land and water practices influencing livelihoods and common relations in the K’am Samnar District?”*

#### **1.4 Thesis outline**

The outline of this thesis is structured in a way to answer the research questions and to keep oversight of the goals and aims. The second chapter will discuss the theoretical framework of this research. These concepts will be displayed and integrated in a conceptual model at the end. In the third chapter the research question is further elaborated, and the sub questions supporting the research question are presented and explained. Chapter four addresses the methods that are used to conduct the research and the collaboration with the interpreter. Chapter five is a literature analysis of historical water management in Cambodia. Chapter six elaborates the context of the region around and in the research area of K’am Samnar. The collaboration and co-creation with ECOLAND (Ecosystem Services and Land Use Research Center) are illuminated in chapter seven. The eighth chapter shows the daily life of villagers and the influence of water and land practices on common pool resources and relations. The research is completed with a conclusion in chapter nine and a discussion where the implications, limitations and recommendations of this research are discussed.

## 2. Theoretical framework

In this theoretical framework, I will present and discuss the literature that deals with the concepts of hydro-sociality, politics of scale, common pool resources, multiple ontologies and water and food security. These are derived from the introductory problem statement and linked in the conceptual model in chapter three. The aim is to give depth and clarity to the research. In this way it also becomes clear how this research is embedded in the existing academic literature, and it is made clear which knowledge is already available and what is still missing.

The concepts in this framework support and are imbedded in a political ecology approach. Th field of political ecology sheds light on the complex relations between nature and factors (social, political, and economic) in society. Analyzing the forms of control and access over resources has implications for livelihoods and the environmental health (Watts, 2000). In the following chapter the concepts are coherently put together in a conceptual model.

### 2.1 Hydro sociality

The hydro social lifeworlds of the commune K'am Samnar in Cambodia in the Kandal province is at the centre of this research. The emphasis is therefore on how different situated villages, communities and individuals participate in dealing with common pool resources specifically water and land.

Territories are often considered natural, but are historically produced and actively constructed through an interface between technology, society and nature. They are the result of *“human imagination, social practices, and related knowledge systems that create content, assumed boundaries, and connections between nature and society”* (Boelens, Hoogesteger, Swyngedouw, Vos & Wester, 2016, p. 1). The processes of territorialization are linked to the power of water governance systems. This means that these territories are constituted spaces, created by the interactions between *“human practices, water flows, hydraulic technologies, biophysical elements, socio-economic structures and cultural-political institutions”* (ibid, p. 1).

Boelens, et al. (2016) use the following concept for a hydro social territory:

*“The contested imaginary and socio-environmental materialization of a spatially bound multi-scalar network in which humans, water flows, ecological relations, hydraulic infrastructure, financial means, legal-administrative arrangements and cultural institutions and practices are interactively defined, aligned and mobilized through epistemological belief systems, political hierarchies and naturalizing discourses”* (p. 2)

Hence, these territories are constantly contested, imagined, and recreated, which creates conflict. Especially in water governance systems and river management strategies, like those of the Mekong and Bassac river, this is very well demonstrated. According to Boelens et al. (2016) a plurality of territories exists in space which is a social construct. Therefore, multiple hydro social lifeworlds can overlap in the same space or area and is partly scale dependent. Water and social relations create each other, which shapes their relation towards each other (Boelens, et al., 2016). As Krause states, social relations, places, spaces and cultural practices create water flows and therefore water flows (and thus hydro social territories or lifeworlds) are never neutral (Krause, 2018).

The way in which policies and regulations over water are practiced, formulated and even the way people think about water can be transformed with the concept of hydro social lifeworlds (Swyngedouw, 2009), because they are constructs of their time and place. This means they are actively and historically constructed by social and physical-environmental processes. Changes by technological interventions or social processes like organization of labour or capital relations produce social and environmental conditions which can be disabling and enabling to the lifeworld of a particular group. As a consequence, an inequality in the access to and usage of the water resources can be seen. While some environmental quality can be improved in a certain place and for certain people within this place, a deterioration of this resource can take place elsewhere or for other people even in the same place. Processes of in- and exclusion, marginalization and development and just distribution of burdens and benefits affect spaces, places, communities and individuals in distinct ways (Boelens, et al., 2016, Massey, 1991 & Swyngedouw, 2009). Class, gender, ethnicity or other social power relations can mobilize strategies and inform discourses and arguments for redistributive justice (Palmer, 2015).

In the study area, “*the spatial configuration of people, institutions, water flows, hydraulic technology and the biophysical environment revolving around the control of water*” (Boelens, et al., 2016, p. 1) are influenced by the close interactions with Vietnam. Since the geographical area of this research is situated near the border of Vietnam, the concept of cross border regions seems appropriate (Perkmann & Sum, 2002). Both countries participate in dealing with common pool resources. This is where a border can be hard, but it can also be soft. It is hard when Vietnam decide to build large dikes and the water cannot flow as easily through as before. Cambodia farmers then have to deal with consequences such as longer high water levels on their fields. But the border can be soft when there are economic aspects to it, like moving and trading mangos to Vietnamese brokers and markets.

A political ecological perspective on water advocates an interconnectedness between the transformations of and within the hydro-social territories (Linton & Budds, 2014), like the border region with commune K'am Samnar in it. Not only at the local, regional, national and global levels but also in relations of the social, political, economic and cultural dimensions (Swyngedouw, 2009).

## **2.2 Political ecology and politics of scale**

The lens of political ecology helps me to understand the complex relations between nature and society by analyzing the forms of control and access over resources and the consequences for sustainable livelihoods and environmental health (Watts, 2000). Important in this approach is the idea of scalar politics. According to Lebel, Garden, and Imamura (2005), issues of scale arise when different actors create, constrain and shift scales and levels in accordance with their own interests. They argue that: “*Actors can change power and authority by working at different spatial levels. They can alter access to resources, and the decision-making processes with respect to those resources. Scale choices can be a means of inclusion or exclusion*” (p. 1).

According to Östrom (2008) a common pool resource can be described as resources that are large enough, so it makes it hard (but not impossible) to exclude users. Also, the individual use of such resources subtracts benefits for others. This is for example in the case of rivers, irrigation systems, forests, fisheries and groundwater basins. The governing of common pool resources can be conducted by a variety of institution regimes which Östrom divides in three groups: private, public or communal actors/properties. Since the Mekong river crosses different countries, many people depend on what the river can give them. Many developmental programmes were and are active to guarantee the flow of water (Hirsch, 2006), because water is seen as a common good.

Transboundary rivers, such as the Mekong, are managed by a specific number of states within the context of their specific political relationships. However, just like the global commons, managing water as a common good across and within borders raises some significant scale issues (Hirsch, 2006). However, Hirsch (2006) argues that over time this common has eroded in the process of development. And Ratner (2003) sees that local communities do not benefit from these development programmes perse.

Since this particular river crosses boundaries, the management by the states involves political relations. In order to represent ‘all’, a transboundary river basin management is meant to overcome differences. The interconnectedness of the river system is reinforcing the commonality nature of this shared resource. However, issues of scale rise, when this water is

managed across and within borders by different actors on different scales. In many cases enclosure can create neglect of the local commons of their tenure and management (Hirsch, 2006). Also, the presence of regional river management authorities does not ensure effective conciliation of conflicting interests between every party who depend and act upon the river (Ratner, 2003).

A threat to managing the local commons is (1) bureaucratization of the process and (2) the (absence of) representation of localities. In practice this means that decisions in the name of development can have large (mostly negative) consequences for local communities. For example, the installment of the Yali Falls Dam (a branch of the Mekong originating in the Vietnamese highlands) has damaged lives and livelihoods by destroying fisheries, livestock and riverside gardens because of floods in downstream Cambodia (Hirsch & Wyatt, 2004 and Hirsch, 2006).

A last, but not unimportant part is the concept of ‘participatory development’. The relative power of actors at any scale or category (household, state and community, gender, etcetera) is important to acknowledge because it can hinder or promote perceived goals to empower marginalized actors and produce better development outcomes. As Sneddon and Fox (2007, p. 2164) state: *“practice of ‘participatory development’ actually sustains power discrepancies between state officials and marginal social groups and facilitates decidedly disempowering approaches to development”*.

## **2.2 Multiple ontologies**

While researching hydro social lifeworlds, I consider the presence of multiple ontologies. For example, the meaning of objects can differ per person and scale. Smith (2012) argues that *“an ontology, in the broader sense in philosophy, refers to the study of what might exist”* (p. 115). Ontology deals with the structure and nature of ‘reality’, i.e. *“the study of attributes that belong to things because of their very nature”* (Guarino, Oberle & Staab, 2009, p. 1). Venot and Jensen (2021) specifically study the practical side of this philosophical concept. In their study they look at how these practical ontologies are created, how they change over time and how they interfere with each other. Disproportionality in these worlds is created and sustained due to power imbalances and as actors keep this relation stable. Yates, Harris and Wilson (2017) argue that other kinds of understanding of water might result in a different reality, i.e. ontologies create realities.

Rivers are objects which have powerful metaphors, created by symbolism, linkages, connectivity and the flow of water. They are associated with the region by their names and with the physical and spiritual power. Creating and sustaining these different metaphors, linkages and associations of the Mekong river as an object lead to different ontologies. A multiplicity of 'Mekong ontologies' thus exist, from a more geographically metaphoric territory to an area with porous borders of people trafficking, narcotics and diseases. On a conceptual level the Mekong is an arena of contested development (Hirsch, 2016). The river can be seen as a whole, connecting countries or as a common, a delta or an important supply for *Preks*. A river controlled by China, as a river part of the East-Asian region or one of the villages living their own lifeworlds separately and differently from each other (Sithirith & Gillen, 2017). Refusal of the acknowledgement of ontologies can create conflicts over what an object (river) is. To understand the power dynamics which are made in the encounter between a dominant (modern) ontology and a local (indigenous) ontology, it is important, so suggest Yater, Harris & Wilson (2017), to study these kinds of situations and how these are incorporated in concrete practices.

The authors mention spirit practices, which are and have been very common in Cambodian lifeworlds and shape particular ontologies (of water). Their characteristics are covered and often unrecognizable, but they punctuate even the strictest applications of texts and laws. Work (2018) has researched the relation between (spiritual) religion, governance, development and the state. She argues that "*elements (other-than-human objects) are often understood in the register of an owner, or ruler that holds sway over the activities of human and non-human subjects within the space*" (p. 53). This means that (sometimes each and) every area, forest, water body and other natural elements have a spiritual owner which is protected by these spirits. Reprisal measures will be taken by the spirits if people do not take proper care of their territory. The most common reprisal when being disrespectful (for example depletion of resources), is disease, but also accidents, droughts, floods, bad harvests and poor or blocked access to fish are linked to this. Practically, when taking resources, people ask permission, they avoid particular places and take care of others. In return for their requests and access, they give offerings or parties (Work, 2018). In Cambodia people also acknowledge ancestors and *manuss moel min coeñ* (people we cannot see). The most important one is the owner and master of the water and land, who is referred to as *neak ta* or *lok ta*.

According to Work (2018) both the state with development methods and the spiritual owner have the common goal or promise of “*access to territory and resources, the provision, protection, and punishments*” (p. 54) and of avoiding “*poverty and hunger, as well as the means for education, for good health, and sustainability (provision and protection)*” (p. 58). However, the methods of both actors do not align and create conflict. The ecological damage to the environment made by the state in the name of development, is a form of violence against the religion of spiritual owner(s) protecting their territory. An important critique to this ‘spiritual violence’ is “*the best way to unmask a myth or an ideology is to show that it does not do what it says it does*” (p. 55). This strengthens the sovereign and legitimate position of the state. However, the promises (rising GDP, bridges, roads, etcetera) of the state by using these methods are false according to Beban and Work (2018).

Textbox 1, spirit practices

In this research practice of both the farmers in K’am Samnar and the Cambodian government are central. Spirit practices and modern practices (in their own ontology) can be intertwined. However, knowing how they are intertwined, and which elements coincide or are being harmoniously interconnected can give more insight in the hydro social lifeworld(s) of villagers in K’am Samnar.

### **2.3 Food and water security**

The surge in global food prices in 2007 and 2008 produced underlying systemic issues that still exist today. Underlying economic, socio-political and ecological issues include unpredictable crop growing conditions due to droughts and changes in rainfall, rapid urbanization, systematic soil degradation, water scarcity, decrease of the quality of river ecosystems, loss of biodiversity, competition of land use and a decline in arable land, and so on (Marzęda-Młynarska, 2017; Belensky, 2014). The role of small holders in the light of politics of scale is therefore important to highlight. As mentioned before, looking at power dynamics gives a clearer image of the downstream and localized consequences of decisions taken in the case of the Mekong river as a whole. There are shortcomings in the current arrangements for deciding on river basin development plans with significant transboundary effects, according to Ratner (2003). He argues that regional governance should not focus on one institution such as the Mekong River Council (MRC), “*but the full network of social and political relationships that determine whose*



*interests are represented in such decisions, how power is distributed among these groups, and what mechanisms of accountability constrain the exercise of this power”* (p. 68-69).

The Food and Agriculture Organization of the United Nations (FAO, 2014) defines food security in accordance with four pillars: availability, access, utilization and stability. Firstly, availability of food is essential to ensure a sustainable food security system (Aborisada & Bach, 2014). Secondly, access to available food on both individual and household level should be taken into consideration when assessing food security. Factors such as price, age, gender play an important role in determining access to food (Aborisada & Bach, 2014). Also, inequality between men, women and children exists (Choudhary & Parthasarthy, 2007). Gender inequalities exacerbate food security according to the World Food Program (WFP). Knowledge of the unique requirements (practical and strategic), priorities, and limitations that apply to men and women in food security and agriculture can be provided by using a gender lens during research (Phirun & Chhong, 2014).

Thirdly, the utilization explains the nutritional value of the available and accessible food and the ability of the human body to absorb these (Barrett, 2011). Lastly, a stable situation in which people can access food at all times is considered the essential element by Kannan, Dev, Mahendra and Sharma (2000). Factors such as international market stability, culture and education, biodiversity, ecological intensification and economic policy, play important roles in stability to ensure food security (Aborisada & Bach, 2014).

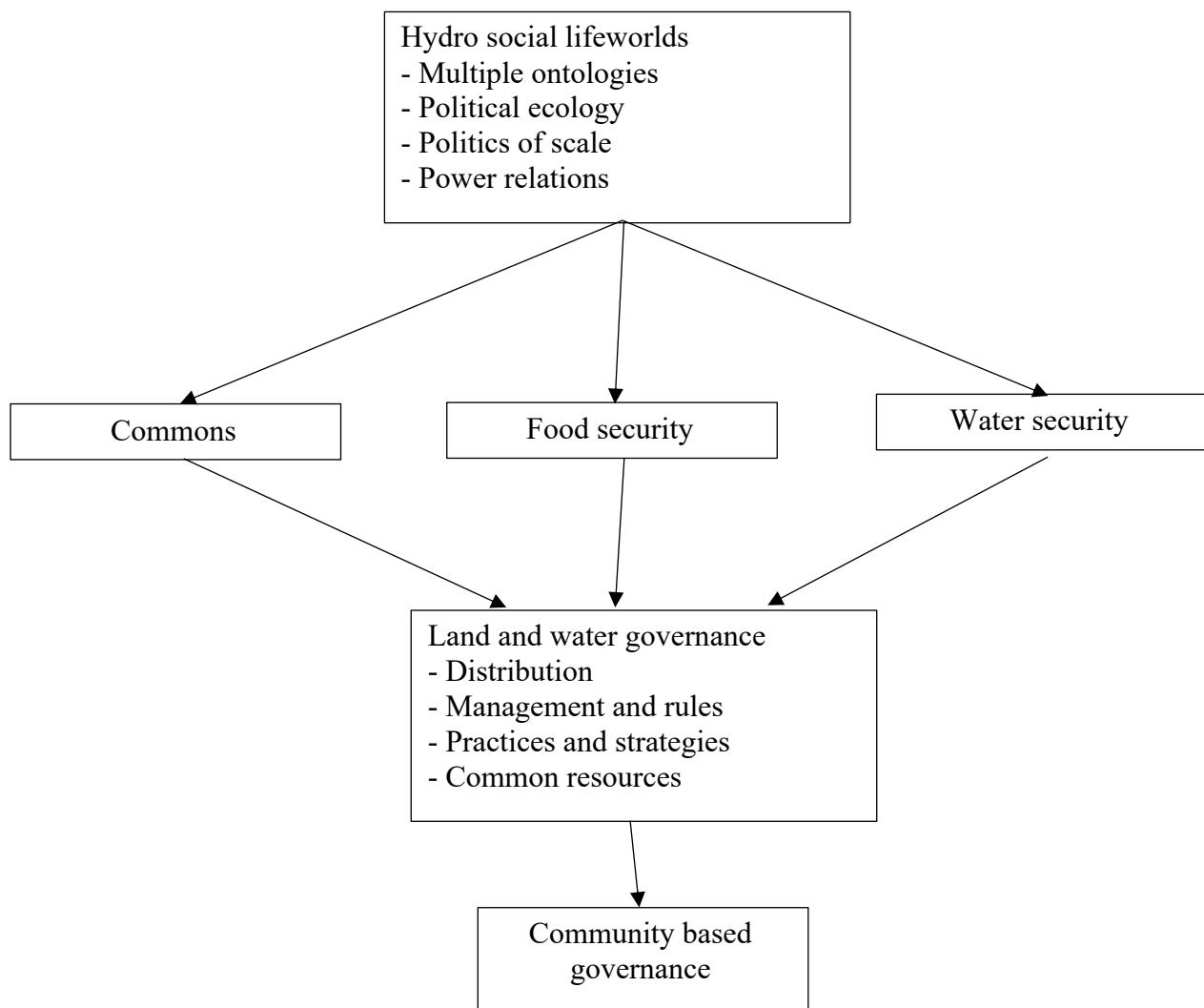
Most of the times, the most vulnerable people in a region or locality (like small-scale farmers and landless rural labourers) encounter the biggest disadvantages from food insecurity (Belensky, 2014). According to Pahl-Wostl (2019), the increasing interconnectedness of domains and scales (from small-scale farmers to international governance interests) and environmental and developmental concerns characterizes the concept of food security. However, food security is highly intertwined with water and specifically water security. One could bluntly say: ‘no water no food’. The concept of water security has multiple dimensions and aspects. An essential condition for sustainable development is the respect of the principles of equity and fairness and not harming the environment when assuring the security of water as well as food and energy (Pahl-Wostl, 2019).

The United Nations (UN) (UN-Water, 2013, p. 1) maintains the following definition of water security: *“the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability”*.

However, there is no widely accepted definition guiding its application in water governance and policy. According to Pahl-Wostl (2019) it is important to exchange and learn from different discourses regarding water security. Otherwise, diversity in approaches to water security may lead to a scattered landscape with conflicting interpretations. However, abundant examples are available when it comes to impacts of governance on different scales regarding water security and the Mekong river. One of these examples is the water level in the Mekong river after China holding back water in 2020 during severe drought periods in countries below stream. Direct influences were crop failures and drastically lower fishing stocks in lower communities in Thailand, Cambodia, Laos and southern Vietnam (Mongabay, 2020). United Nations Environment Programme (UNEP) argues that not only plastic pollution, but also infrastructural developments such as dams, climate change and Organic and chemical pollutants from agriculture are also a problem (UNEP, 2021).

## 2.4 Conceptual model

The conceptual model presented below, combines the relationship between the different theoretical elements that are important for the research. This framework is an important step in operationalizing the research questions outlined in the previous chapter. In this study a hydro social lifeworld approach is used to look at the three main concepts: Multiple ontologies, commons and food security. Each main concept contains multiple subject which are appropriate for the case study in the community in the Kandal province in Cambodia.



### 3. Research questions

The main objective of this research is to explore land and water practices of farmers and their influence on local livelihoods. It looks into how these livelihoods have changed over the years, and how common relations in this commune are affected. The practices of the farmers in K'am Samnar are central to this research.

As mentioned in the introduction and the theoretical framework, the interests in water use and management and the water lifeworlds of people can create conflicting situations among different kind of stakeholders like the farmers, villagers and provincial stakeholder and even Vietnamese people. This research will focus on the lifeworld(s) of farmers in the K S commune in the Kandal province in Cambodia which leads to the following research question:

*“How are changing land and water practices influencing livelihoods and common relations in the K'am Samnar District?”*

To answer the main research question, various sub-questions are created. The first question regarding food cultivation is drafted to look at the contemporary food & water security of this particular community. The second question concerns the water governance of farmers. Subsequently, the water governance of the Cambodian government and the concept of commons regarding water and land are addressed. Lastly, the entanglement of both categories of stakeholders are analysed.

Sub-questions:

*1. How are rural water and land shaped by and shaping farmer livelihoods in the K'am Samnar?*

- a. How do farmers in K'am Samnar cultivate food?
  - i. What are the challenges with availability, access, utilization and stability?
  - ii. How do people in the community secure food for their livelihood?
- b. How do farmers secure and use the water and land?

2. *What are the local water and land practices performed in K'am Samnar commune?*

- a. How do people govern land and water as a common pool resource?
- b. How are water and land being contested?
- c. what factors cause change in water and land practices?

3. *How are common relations shaped and entangled in K'am Samnar?*

- a. Which actors are involved in the common pool resources and what is their relationship?
- b. How are relations entangled in K'am Samnar as a border region?

## 4. Methodology

In order to answer the research question an ethnographic approach seems most suited. By combining two qualitative methods, observations, and interviews, “*different perspectives on issues and particular settings will situate the behaviour within a larger social or physical setting*” (Hennink, Hutter & Bailey, 2011, p. 172). The social and physical setting costs of the K’am Samnar commune in the Leuk Daek district. The selection of a specific community has been made in collaboration with ECOLAND (Ecosystem Services and Land Use Research Center). The communities were selected with minimal information about areas in the Kandal province and limited contacts with chiefs of communities, the gatekeepers. Also, if permission is granted, I will participate in fieldworks of farmers to observe and participate in their governance and practices. In this chapter the methodology used in this research, will be carefully explained.

### 4.1 Selection of village and sampling

The selection of a village in the Kandal province has been conducted in collaboration with ECOLAND. During an appointment with researchers from this organization my aim and purpose of this research gives a basic understanding of my intention. I studied a lowland, primarily mango and maybe rice cultivating Khmer village. Based on existing literature (not yet described in this proposal) about villages in the Kandal province where mango is cultivated (Norng, Chay & Tan, 2012) the community needs to have the following features: (1) a population of no more than several hundred inhabitants, (2) a position close to a main road or easily accessible by public transport and (3) inhabitants who are willing to participate in this research (Ebihara, 2018).

Using a community gatekeeper (Hennink, Hutter & Bailey, 2011) recruitment of participants for this research were sought out. Communications with gatekeeper will be conducted by the interpreter. This gatekeeper can already provide valuable information about the characteristics of the community and certain individuals. Also, they can influence and mobilize the community members to participate in the research which can determine the success of the outcomes. However, there is little alternative as an outside researcher wanting to do local research in a Khmer village.

Both a location-oriented and snowball sampling (Baarda, 2013) will be used at the beginning of the research. ECOLAND has suggested the Leuk Daek district as a research area.

With the help of the interpreter Chhengven the chief of the district will be used as a gatekeeper to other village chiefs. Subsequently, the village chiefs will be used as gatekeepers to the villages and the inhabitants.

## 4.2 Participant observation

Observation is a research method that enables a systematical way of observing and recording the behaviour, actions and interactions of people. The socio-cultural context in which people live can therefore be situated to obtain a detailed description of their social setting and practices. In other words, a detailed description of people's situated lives and realities. Hennink, Hutter and Bailey (2011) argue that observation methods in social science involve "*the systematic, detailed observation of behavior and talk: watching and recording what people do and say*" (p. 170), also including descriptions of the materialities and practices. Using the method of observation, an understanding of a culture can be obtained, not by chasing after universal laws, but by looking for meaning and interpretations of the given context (ibid). Also, the other senses like, hearing, smelling and feelings are be described.

When entering a research community for the first time, more distant observation will be conducted. Observing a community from an outsider's perspective (i.e. ethic perspective), it allows the researcher to gain a broader view and to observe, listen and take field notes more freely. However, there is still a risk of the 'Hawthorne effect'. Which means, the researcher is likely to influence the situation by his or her presence or actions (Hennink, Hutter & Bailey, 2011). On the other hand, it should be taken into account that the role of 'complete observer' is not entirely feasible as the audience (in this case the community) knows they will be observed. For this research this is not a bad thing should happen.

Someone could offer a drink or something to eat which can also be a form of acceptance of my presence. According to Bernard (2011) there are two main strategies for direct observation. For this research setting, the *reactive observation strategy* is chosen. In this case, people know that they are being watched and they might alter their behaviour accordingly. The data could become eventually what the people want the observer to see. As this strategy is not the main research method, complementary methods will be used (see later in this chapter). As an initial approach, this non-participant observation can give insight in a new situation and the new context of the research topic for this research.

After the initial engagement with the community and using the reactive observation strategy, the method has been switched to participant observation of activities or specific people

related to the research method (Hennink, Hutter & Bailey, 2011). Using this method, the researcher aims at observing people acting as naturally as possible. This requires practice from the researcher and might improve during the research period. Participant observation entails requiring the experience of the (everyday) lives of the people living in the research community. In order to get data which is influenced as little as possible by the appearance and presence of the researcher, he or she needs to learn how to act around this specific group of people, in their context and their culture. It involves the immersion in a culture and also knowing how to distance yourself in order to contextualize and put the observations into perspective. Then, the systematically observed data from the fieldwork can be analyzed (Bernard, 2011).

Bernard (2011) also mentioned that the first impression is important. How you present yourself and how you will introduce yourself to the attendees will have an effect on the quality of the observation since this will determine whether you are accepted or not. Also, no matter how good an introduction may be, negative reactions after the introduction may occur and will have to be taken into account.

While conducting observations I will focus on the practices of individuals and groups. According to Bueger (2013) focusing on practice might lead to advantages like getting closer to everyday activities and finding new concepts in the case of the farmers' practices. During the appointments with the government agency a detailed description of the layout of a space can give a first impression and later contextual information. During observation the speech, actions and usage of objects in bodily movement and artefacts are the most important element before the interpretation of the data (ibid).

### **4.3 Field notes**

Recording and afterwards analyzing the observations require clear and detailed fieldnotes (appendix H). Not all the notes may seem important at that time, but the importance can become clear(er) at a later stage in the analysis. For this research writing the notes on a small notepad will be more suitable because a laptop may distract people in the social setting. The strategy of the fieldnotes in the village will be as follows: (1) label every fieldnote page with date, time and place, (2) make sketches or drawings of the social setting and make a description of it, (3) find a place to observe and take notes 'quietly' and write about where you are seated in the social setting, (4) include notes on people, activities and the physical environment, (5) count the number of people present and describe their characteristics (gender, clothes, attributes, etcetera) and (6) focus on how people move around.



A detailed description of a situation is very important. Words which are subjective to perceptions can be added as a code. The interactions between people are very interesting, like body language of speakers and listeners, who are speaking and who are listening. They may reveal differences in power dynamics between participants. Since I cannot understand and speak the language of the community, pre-fieldwork discussions and explanations with the interpreter will be needed. The interpreter is also present during the participation observations to help me understand the social setting since he is already with me in the research area (Hennink, Hutter & Bailey, 2011).

Observation of events require more detailed notes with step-by-step documentation. According to Hennink, Hutter and Bailey (2011) events are “*sequences of activities that are usually limited to a certain geographical area and in many cases are time-dependent*” (p. 196). They can occur on a regular basis (e.g. daily, weekly, monthly). Notes of what happens in which sequence, allocation and length of events, and what happens at what time will be described. After the description of the event the researcher can verify the data with local community member(s) to find out what the meaning of e.g. time, situations etcetera is. By describing the actual event itself, interpretations are left out. Interpretations can lead to a biased judgement from the researcher. Thoughts and interpretations can be included in a field diary (ibid).

The agricultural agenda of Cambodia shows when the harvest period(s) begin and when certain traditional practices and cultural rituals take place. During this research period rice will be harvested and planted from February until May and Mango crops in March and April. Corn is planted in February and March. First, the activity will be observed, then participatory observation will be conducted during these activities (both harvesting and planting). The non-participant observation will take place in the third week of the research programme as an introduction for the scheduled interviews. Participant observations will be conducted throughout the entire period until a saturation of data is gathered. This is the point at which the collected data starts to repeat itself during the research period. After this point no new variation and context of participant experience is found (Hennink, Hutter & Bailey, 2011).

The strategy of the field notes during visits to the government agency will consist of: (1) label every fieldnote page with date, time and place, (2) make sketches or drawings of the social setting and make a description of it, (3) include notes on people, activities and the physical environment, (4) count the number of people present and describe their characteristics (gender, clothes, attributes and roles), (5) focus on how people move around and (6) how people respond to seniority or act in a hierarchical environment.

#### 4.4 In-depth interview

For this specific research a cross-language qualitative method is needed. In-depth interviews (appendix I) can be described as a conversation with a specific purpose. The purpose of this specific research is to gain insight in the changes in food cultivation, how water is governed in this specific community and relations are entangled in these aspects of the community. Hennink, Hutter and Bailey (2011) describe in-depth interviews as “*a meaning-making partnership between interviewers and the respondents, which indicates that these interviews are a knowledge-producing conversation*” (p. 109). During these interviews an interpreter will ask the questions to the participant and will translate them to the researcher. Probes (follow-up questions) from the researcher will also be translated to the participant. Also, with the participant’s permission, the interview will be recorded. All data will, self-evidently, be anonymous and not shared with other parties other than the interpreter and the researcher. The role of the interpreter will be discussed in the next paragraph.

In-depth interviews are conducted by using a semi-structured interview guide (appendix D). The aim is to cultivate a relationship based on trust between the three-fold of the participant, researcher, and interpreter. The emphasis will be on probes in order to find out the underlying meaning of the answers of the participant. The guide is used as a guideline but can thus be deviated from. Probing effectively, i.e. stimulating a respondent to give more information, is important for the interview. However, too much interaction into the interview can create a bias in the data from the researcher (Bernard, 2011).

In the fourth week of the research programme in Cambodia, interviews began. The aim was to conduct a minimum of 30 in-depth interviews. A number of two to three interviews have been conducted per day. The number of days which should have been needed to conduct interviews was approximately 12-15 days. These are not consecutive since I need to transcribe the part of what the interpreter translated during the interviews and the weeks were alternated between me and the other student. During this research period and the time frame in which the interview took place, most farmers were in the field to harvest or plant (depending on the crop they have). Therefore, the interviews took place in the morning between approximately 08:00-10:00 AM and the evening between 05:00-08:00 PM. When staying in a guest house near or within the community, informal conversation took place when the interpreter is present. From these conversation separate field notes were taken in the journal. Since I stayed with the interpreter in the same guesthouse, reflections took place after the field day. These conversations have been collected in the day reports.

## **Covid**

Due to the Covid pandemic, the field research had to be ended prematurely due to alleged health risks and on the request of the University of Utrecht. Therefore, the amount of data required in the field was insufficient for this research. In cooperation with Andres Verzijl and the researcher at ECOLAND, more data has been required. This consisted of fieldwork by the translator in the research area. The output consists of a survey, interviews, pictures, and maps.

Firstly, the survey (appendix E) has been designed by me and adjusted with the help of ECOLAND during an online meeting. The data from the survey (appendix J) will be used to make a statistical analysis and can therefore be seen as quantitative data. The questions will relate to the theories used have been adjusted with experience gained by the researchers from ECOLAND. Under normal circumstances, during the survey, the number of people asked, refusals and participants and the location in the region has been tracked to ultimately be able to justify the results. And the completed surveys will normally be collected in an overview. However, since the data gathered in Cambodia has not been conducted by me so this has not been feasible. This means that there is a higher risk of misinterpretation of and gaps in the data. On the other hand, since the researchers of ECOLAND are Cambodian, the participants might be more honest towards answering the questions and less prone to make socially desirable answers. At the same time, social differences between Cambodians can create barriers other than language, skin colour and facial appearances. With this in mind, it is still by far the best option to proceed with this research this way. According to Baarda, et al. (2012) survey research is conducted without any interference in the situation and limited to gathering data of a larger number of participants. To not interfere in a situation as a researcher is very difficult as explained in paragraph 5.2.

Secondly, the interviews conducted after my departure from Cambodia have been carried out by ECOLAND (appendix G). These interviews are followed up after the initial data of the first series of in-depth interviews and the preliminary results of the survey were analyzed. A new interview guideline (appendix D) has been discussed with the head of ECOLAND and Mr. Raksmeay. During this session every question has been discussed and already partially answered because of their gained experiences in the field. The data from this session has also been used for the results. The interviews conducted by Mr. Raksmeay are not the same in-depth interviews as the ones that were conducted earlier. The method used by ECOLAND differs from the methods I used. Firstly, ECOLAND does not transcribe the interviews. Rather, the gathered data is summarized in a single, more general report in which every participant is added. This means that this report should be seen as an analysis instead of just raw data. So, using this

data means that there are consequences for the liability and validity of the outcomes in this research. The perspectives and experiences are ((un)intentionally) interwoven with the analysis, which are difficult to find, if at all. These remarks will be added in the analysis.

And thirdly, the pictures taken by Mr. Raksmei (ECOLAND) and the map with the names of the Preks in the commune are created by translator Mono during their field visit in K'am Samnar. This was on my request and will give a more vivid image of the research area.

#### **4.5 Collaboration with an interpreter**

During this research, interviews and observations will be conducted using an interpreter. Mr. Chhengven will work with me from February to March but has been proven to be insufficient with his language skills. Therefore, a new interpreter (provided by ECOLAND) has been selected. Mr. Rothmono has good English language skills and will assist me during the entire research period. It is essential for this research that there is a good relationship between the interpreter and me to establish conclusive results. If this is not the case, I would have consulted with ECOLAND to request another interpreter.

Cross-language research is a complex and challenging way of conducting research. During the research I did not share the same language as the participants which meant I have had to use an interpreter to collect the data. This collaboration has been a challenge, not just for generating data and the logistics and procedures that are involved, but also to ascertain the validity of the data. Especially in the beginning with the first interpreter, the quality of the translations have been questionable. This can of course ultimately influence the outcomes of the research. Therefore, it has been important to explain the strategies, procedures and questionnaire in great detail with the interpreter. Also, assessing and reflecting the influence of the interpreter on the research process and the validity and quality of the data is important to comprehend beforehand (Williamson, et al., 2011). Also, being involved in selecting an interpreter has proven very helpful since it is the researcher who knows which qualities are important to the research.

Internal validity of the data is achieved when there is evidence of the statements and descriptions which are retrieved from the data by the researcher. The data is then linked to the sources and exemplified by quotations. This data is gathered through interviews and with that captured the expressed reality of the interviewee. Finding truth and authenticity in the findings depends on the representation of this reality. The expressed reality in one language is not always the expressed reality in the other language, even though it is the assumed reality of the

interviewee and the translation is word for word. The role of an interpreter is crucial to the interview situation and the outcome of the interview itself. Body language, facial expressions by both the researcher and interpreter are important. Therefore, the researcher and interpreter should be well attuned to each other (Kapborg & Berterö, 2002).

To achieve the alignment between interpreter and researcher, communication is imperative in order to gain meaningful and accurate data. The interpreter should be aware and comprehend the culture, experiences of participants and their language. Through communication the researcher can understand the translation process and the meaning of the data gathered in order to gain conceptual equivalence. Comprehending the right interpretation of the data is crucial in this cross-cultural qualitative research. Maintaining strictness in data collection, open and ongoing communication with the interpreter is crucial (Choi, Kushner, Mill & Lai, 2012).

During the first two weeks in Cambodia intensive meetings with the interpreter took place. During these sessions the entire interview guide has been discussed, and the meaning of the questions elaborated. In doing so, the intention, aim and content of this research have been made clear for the interpreter. Any inaudibility has been communicated to avoid miscommunications and misconceptions. Also, after the first interview the entire process (the translation, role of interpreter, role of researcher, body language and facial expressions of both the researcher and interpreter and the actual questions of the interview guide) has been evaluated. After this, alteration to the interview guide and translation process were made. Brief evaluations occurred during the entire research. This has been a highly interactive process in which both the researcher and the interpreter gave comments to each other. Not only for the in-depth interviews but also for the observation of cultural comprehension this has proven to be important since the cultural gap between me as a researcher and the participant is bigger than between them and the interpreter. The activities and practices can be explained by the interpreter. Since the language is not understandable for me, the interpreter assisted in finding the right locations, to observe and to explain our presence. The interpreter always introduced me in the community and to the gatekeeper.

#### **4.6 Analysis**

The main subject of analysis are the farmers in the given community. Most of the interviews will take place in this community and therefore most of the time will be spent there. The Ministry of Water Resources and Meteorology (MoWRAM) is the main government agency

responsible for water management in the country (Sithirith, 2017). The organization is placed in the capital city Phnom Penh. Additionally, the provincial department of this institution will be contacted. The members of this government body have been approached by ECOLAND. They provided an official letter to adhere to this request. However, unfortunately there has been no response.

Properly analyzing the data has been very important to establish conclusive results. The analysis process of the observations and interviews are conducted in four phases (Baarda, 2013). Firstly, the field notes are already partially analyzed in the elaborated day reports. During the making of a day report (see appendix H), certain links and connections between interviews and observations can be made. For example the division of land after the Khmer Rouge period. The interviews, fieldnotes and day reports will be read several times to establish categories for the coding. Using the literature from the theoretical framework and preliminary results from the fieldwork will already give codes by deductive coding. Also, while reading the data new codes may arise. The codes will be labelled manually; in other words, the texts will be analysed by using open coding (or inductive coding). The codes will correspond with the concepts in the conceptual model, hydro social lifeworlds, commons and food security (e.g. drought, floods, land titles, etcetera).

The data (transcripts, field notes and day reports) will be stored on my personal computer.

#### **4.7 Ethics and practical constraints**

Four ethical requirements will be valid during this research. Informed consent, transparency, anonymity and no adverse effects ('doing no harm'). Participating in the research will be entirely voluntary and can be conducted anonymously on request (which will also be asked beforehand). Consent will be requested in advance to the chief of the community. Before conducting observations the consent of the attendees and individuals participating in the in-depth interviews is needed (appendix C). In addition, transparency is crucial for the validity of the data. Also, participating in this research should not have a negative effect on the participants (Miller, Birch, Mauthner & Jessop, 2012).

The benefits of and beneficial (target group) from this research will be focused on the selected research community. The research findings will be shared with ECOLAND and feedback will be provided to the gate keeper of the community (by ECOLAND), who can then communicate this with the rest of the community.

During the fieldwork I was seen as a foreigner even though I tried to be polite and accommodate myself with the culture by, for example, greeting someone with the word ‘*Sampeah*’ and not touching people (especially on the head). However, I verified the norms and values of Cambodians, particularly those in the village of research, because these can differ per village or community. Cultural habits, norms and values has been discussed with the interpreter before going into the field. This has proven to be important to completely understand the Cambodian culture and to adjust to the cultural differences. Also, learning some words in the local language ‘breaks the ice’ and made me more accessible and accepted as a person. Moreover, I brought ‘stroomwafels’ and liquorish with me to share with people with whom I closely collaborated.

Collecting the data by collaborating with an interpreter has (as mentioned before) its own practical limitations. Even for the interpreter, translating non-existing words in English from Khmer can be challenging. The interpreter may not give meaning to these words, since this can be an interpretation of the meaning of the participant. When the interpreter is aware of this, he can let the participant explain this.

Moreover, another practical constraint can be found in national and ritual holidays. During this field work there are six national holidays. On top of this certain Khmer villages may even have more rituals or ceremonies which can interfere with the time frame of this research. These practices will, of course, be respected. The already known national holiday will be taken into account in the time planning (appendix F).

Lastly, cultural differences bring some practical constraint. Since I was not yet adjusted to the culture, I could not foresee all the limitations this brings with it. One limitation is the notion of time. Time may not be seen as linear, but dependent on the weather, seasons, tasks that need to be performed, etcetera. This meant that appointments were delayed since it was too cold outside to carry out their tasks at the normal time or chores were not done yet.

## 5. Historical water management Cambodia

The Mekong delta is known for being the birthplace of one of Southeast Asia's first civilizations. By the third century A.D., the lower Mekong Delta had at least two urban centres: OC Eo in modern-day Vietnam and Angkor Borei in Cambodia, which were dubbed "Funan" by Chinese diplomats. The Mekong Delta's position creates a paradox when it comes to comprehending human colonization of the region. The delta is a harsh environment to live in. When the river floods, residents are compelled to live in their homes and on their boats for four to five months a year. The natural vegetation, such as freshwater mangroves and riverine forests, is dense and difficult to regulate. Also, drinking water is scarce during the dry season. The annual deposition of silt thrown down by retreating floods, however, makes this same area extremely fruitful (Fox & Ledgerwood, 1999). The hydrology of the Mekong river is characterized by a large average annual discharge which is concentrated in a seasonal peak. This results in annual floodings which influenced the landscape in Cambodia and specifically cultural sites such as Ankor Bei (Adamson, Rutherford, Peel, & Conlan, 2009). Therefore, the history of water and its management in Cambodia is rich and long.

In the first centuries AD small and minimal water management was already visible in the Cambodia landscape. Even though minimal, the settlements in this period were located in areas with broad multi-channelled riverine lowlands, based on the analysis of former drainage patterns and multiple long and deep cuts through alleged canals or moats. Even though these settlements existed in the Iron Age, the communities showed concentrated social wealth, an increasing population, specialized production and a growing and widespread exchange network, according to Higham and Thosarat (2000).

For most of this delta region history, the region was relatively sparsely inhabited. For a period of a 1000 years (from 700 CE) the delta region was a sparse settlers' coastal frontier of the Khmer empire with the capitals upstream at Phnom Penh (only later) and Angkor Wat (Ovesen, Trankell, Öjendal, 1996). According to Biggs, Miller, Hoanh and Molle (2009) early modern water management arose simultaneously with the expansion of ethnic Chinese and Vietnamese settlers in the delta region. This resulted in a decrease in Khmer interest, because a part of the region fell under Vietnamese authority by the year 1800. The historic Khmer settlements further separated from the more developing region of Vietnam from a weakened kingdom at Phnom Penh.



A lesser known but very important site is often overlooked when looking at historical water management in Cambodia. The early site Angkor Borei, South of Phnom Penh, has been one of the most important alleged pre-Khmer settlement during the Funan period with a developed form of water management. Fox and Ledgerwood (1999) have used an interdisciplinary approach to analyze the water management in this specific area. Angkor Borei is geographically closer to K'am Samnar and therefore more relevant to the research area. The Angkor Borei region is thought to be the earliest site in Cambodia that many Khmer history literature define as the capital of the 'Chenla or *Zhenla* of the Water', which is one of the names of at least two early kingdoms in present-day Cambodia. The other site (south of Laos) has presumably been called 'Chenla or *Zhenla* of the land'. Both names are not Moreover, many scholars think this has been the foundation of Angkor Wat which is Siem Reap today (Bong, 2003). The Tonle Bassac (Bassac River) floodwaters rise and spread out throughout the landscape. With the help of the low-lying Angkor Borei basin, the impact of the flood on any location reduces. The Angkor Borei basin is a natural soil fertility renewal mechanism like its counterpart to the north, Tonle Sap (the great lake) (Fox & Ledgerwood, 1999).

The site was surrounded by brick walls with a variety of paleochannels (side rivers) outside these walls. Several studies suggest that some of these are ancient canals (Bishop, Penny, Start & Scott, 2003). These canals linked Angkor Borei with the city Oc Eo (Vietnam) and were possibly connected to Ba Phnom (Prey Veng, Cambodia) (Bong, 2003). There are at least four canals (named as Paris canals after the discoverer) identified. Also, many reservoirs are scattered throughout the city and adjacent areas. The inhabitants of Funan in Angkor Borei used several ponds and tanks to surround their homes and temples. This included artificial ponds, natural water features and large reservoirs named *baray*; which are rectangular tanks made up from earthen walls. It is unclear whether this, typical water management feature associated with the Angkorian period, was added later or copied from the Angkor Borei site (Bishop, Penny, Start & Scott, 2003).

The local religion and ritual practices during the Funan period in Angkor Borei have a natural focus, such as "*the worship of supernatural beings as spirits of the land, rice, water, mountain, forest and ancestors*" (Bong, 2003, p. 69). To irrigate their agricultural land, the population of Funan and Angkor used the spirit or symbol *Naga* (a semi-divine reptilian creature who, according to the belief, gave rise to the Cambodian people). Also, hierarchically, the social structure had many chiefs. Such as the chiefs of *Travan* (water tank) and chiefs of rice. The economy was strongly dependent on agriculture and particularly flooded recession rice agriculture. Making them highly dependable on the accessibility and availability of water

(Bong, 2003). The flood recession system, which dates back thousands of years and is extremely effective and sustainable, makes use of the fertile alluvium that floods deposit (Fox & Ledgerwood, 1999).

Liere (1980) conducted earlier research about the traditional water management in the lower Mekong basin. This particular research helps to understand the practical historical completion in this area and the methods of water management which were used. According to Liere (1980) there were two main areas in the entire Mekong Basin which have been settled by farmers who were “*growing broadcast rice watered by natural flooding*” (p. 267), namely the Mekong delta and the Mun-Chi river sub-basin in Thailand. Choosing a site for agriculture had three dominant factors: Gentle flood pattern, availability of year-round usable water and the ease of making the land available for agriculture. Both Liere (1980) and Higham and Thosarat (2000) argue that these farmers tried to avoid difficult and hard labour. However, the abundance of water caused a dense vegetation and underground root system and thus made the availability of agricultural land difficult to claim. This is why the first cultivation of rice was almost exclusively in floodlands (Liere, 1980), since little trees grow on the floodlands.

It is only later, during the eighth century and onwards, that a gradual change occurred in land cultivation and preparation. This was not a shift, but an addition to make more land usable for agriculture. Rice grown on banded fields is however much more labour intensive. Firstly, because the rice needs to be transplanted from nursery beds or paddy. This is necessary due to irregular rainfall and consequently insecure (seasonal) water availability on the lowlands. Secondly, it requires a form of water control. This control was executed at the farm level, but Liere (1980) argues that it was done as a cooperative action on the village level also. The control of water consisted out of dams which could hold water longer (local flood retardation devices) in small streams or bigger dams which could alter the flow of water of a much bigger stream (Liere, 1980).

A more sophisticated type of agriculture was developed around the Tonle Sap Lake. The so-called 'receding-flood' agriculture was practiced. This particular type has found its way towards many regions which have large rivers with an abundant amount of water year-round (Liere, 1980). However, transporting the water to the fields can be difficult because the fields (closer to the Mekong river) are situated higher than the Preks. Also, infrastructure for water access, distribution, irrigation, and storage is insufficient for the purpose of agriculture (LandLink, 2011). That is why not all types of rice can grow in every area. In order to more easily get water from the decks into the fields, dry season rice is typically produced in small,

low fields. Where floodwaters are no deeper than five meters and where farmers lack the labor to pump water from reservoirs onto rice fields, floating rice is probably crucial (Liere, 1980).

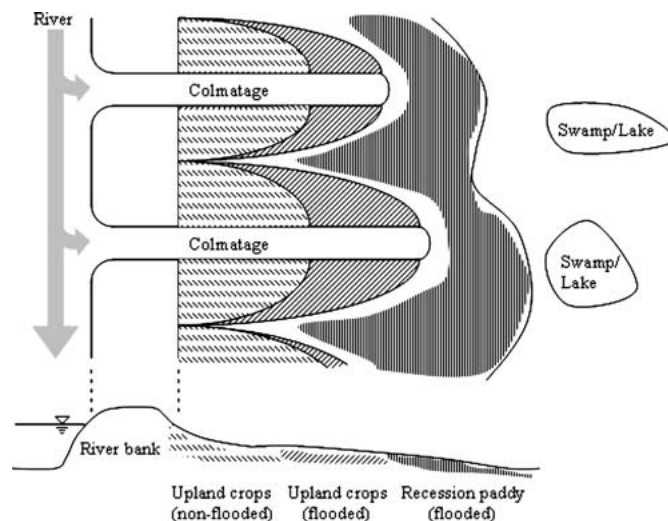
The backflow of the Mekong joins the floodwaters of tributaries, largely in man-made ditches. The flood rise comes gradually but the water is receding rapidly. The higher levels alongside the rivers are commonly not flooded (Liere, 1980). This is also the case in the region of Kandal. However, the water is controlled from the river and not the Tonle Sap Lake. From May to October (during the wet season) the water in the Mekong river floods and causes the water to flow back into the Tonle Sap River, reversing the flow.

Water is available for one irrigation after the flood has receded. The young rice plants need water in the first two to three weeks to prevent damage due to rapidly drying soil. Liere (1980, p. 272) adds “*villagers know that it is less risky to grow paddy on the lower land, below the depressions, since in many years there may not be sufficient water to irrigate the higher land*”. In these days, farmers used primitive water lifting devices. To spread the water a myriad of small and easily blocked ditches was dug. When necessary these ditches could be changed or removed according to the need. These early techniques and the quantity of canals have been some form of artificial delta. However, this form of water control is highly depending on the seasonal floods. Because otherwise there would not be enough water in these canals. In order to store water, simple earth works (*tnub*) would keep the water stored when flood retreats. However, the amount of water is not enough to irrigate the lowlands. So, crops were cultivated inside these *tnub* (Liere, 1980). An interesting note from Liere (1980) shows a remarkable change from the 12<sup>th</sup> century onwards. An ambassador of the imperial court named Chou Ta Kuan, pointed out that even though there was a variety in crops, the fields were not extra fertilized by humans. Dung was considered as impure.

During the French colonial period in Cambodia (1887-1953), new efforts were made to increase the agricultural productivity. With the colmatage systems (figure 3), canals were dug from the rivers inland to allow flood waters to penetrate larger areas to intensify agriculture. These floods contained silt which in turn created new arable land. Along the canals upland crops are cultivated in both wet and dry season whereas paddy rice is grown in the lowlands (or hinterland) in the wet season. The colmatage were also used as navigation (Shimizu, Masumoto & Pham, 2006). However, these systems also deteriorated due to lack in maintenance. Farmers were forced to use the traditional irrigation methods (Ovesen, Trankell & Öjendal, 1996). Farmers described three traditional systems in the research of Fox and Ledgerwood (1999) for farming-waterwheels (*rahat*), bucket swings (*snach*), and a balanced scoop (*thleng*).

Remarkably, these constructions are still very important nowadays, because these are the Preks. These sedimentation canals are now used for multiple sources. However, Davidson (2006) argues that these colmatage (the spelling is different in this article and he speaks of a practice rather than a system) were traditionally built by families or communities and managed on a collective basis. He states that the function of this practice is to make sure the water reaches the cultivation fields. According to Oketani, Haruyama and Sieng (2007, p. 196) “*many artificial dikes have been constructed for irrigation systems called "colmatages" along the Bassac River. Colmatages have a ditch which irrigates the soil from the main channel to its back marsh during high discharge. Therefore, the deposition induced by irrigation accumulates like small mounds*”. Here it seems that it is unclear whether it is a canal dug out, because they only mention the dikes.

Figure 3 Outline of a Colmatage system



Shimizu, Masumoto & Pham, 2006

During the Pol Pot regime in 1975 until 1979 a large irrigation project realized major canals which were dug out in a grid system throughout the country. These were thought to irrigate the entire agricultural land of the country. However, necessary sufficient population density or the awareness of the importance of seasonal flooding, was lacking (Ovesen, Trankell & Öjendal, 1996). The overall image of the constructions during the Pol Pot regime is that these were carried out from a top-down approach and with little awareness of the local conditions.

Even though, scholars and authors write about historical large projects in Cambodia regarding the water management and culture, the magnitude and quality cannot be compared to neighbouring countries. Sher (2003) criticizes the research of Groslier because he was attributing too much importance to the achievements made during the Angkor period.

Especially compared to the achievements of China during the twentieth century (large dam constructions, channels and canals, etcetera). Indications of collective or a community way of life during the Angkor era were minimal to say the least. In other words, the constructions did not create significant structural changes in the performances of the agricultural sector in Cambodia.

On the one hand, the area presents a challenging environment for human habitation. Water steadily builds up during the rainy season, covering the area in many meters of water, while the environment turns arid during the dry season. There is little dry land during the rainy season, and there is not enough drinking water during the dry season. Dikes, levees, and reservoirs, which require a lot of labour to build and maintain, appear to be necessary for the habitation of the population and the production of rice (Fox & Ledgerwood, 1999). So, people in Kandal still rely heavily on the rhythms of the river for their agricultural activities and it shapes their way of life.

## 6. Regional context

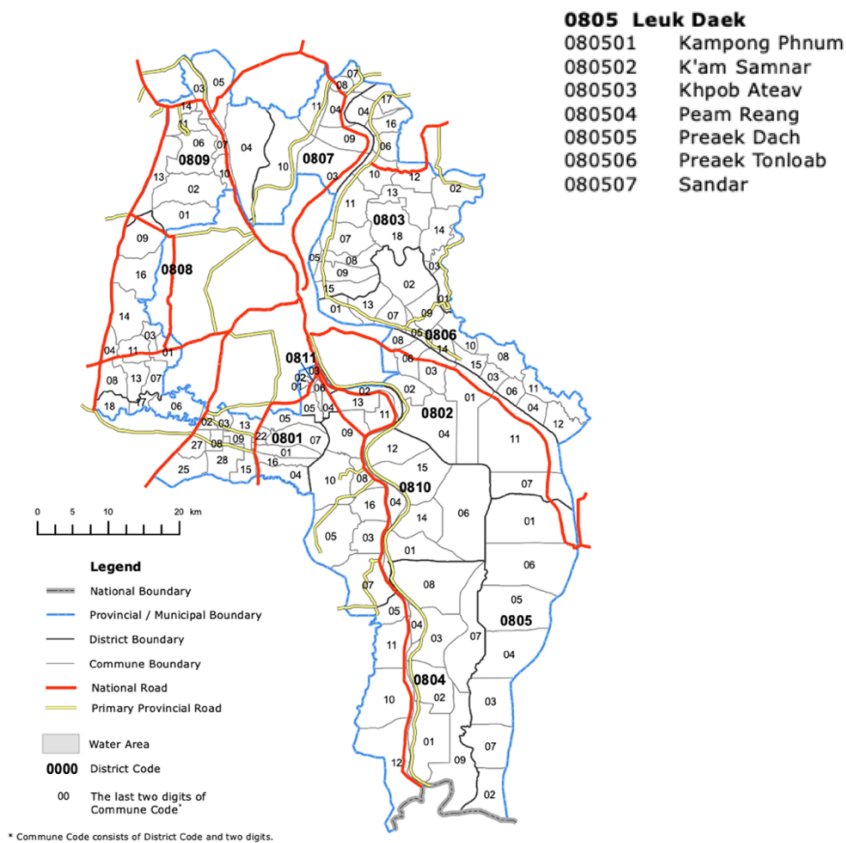
The regional context of Cambodia is of importance because it is a large country with regional differences. This study took place during the dry season, which automatically means that I will not experience the floods and I can only ask people about this period. Nonetheless, floods are crucial to the hydro social lifeworld(s) of the inhabitant in the research area.

Cambodia is a country which has abundant water resources. Especially during the wet season, but less so in the dry season. Some areas experience severe droughts are becoming worse by the year. According to Sithirith (2017) *”the current water governance practice is still too weak and fragmented to address the water security issues affecting the country, and thus, reorganization of the current structure and system of the governance framework would be required to address long-term security issues”* (p. 1). So, ineffective water governance practices, challenges and constraints can prevent certain areas to share their natural commons effectively.

The Kandal province is located south in Cambodia and circumvents the capital Phnom Penh (see figure 4). The south road is connecting Phnom Penh to the Vietnamese border and is the accessible public road to connect the delta districts. Therefore, this road is an important infrastructure for transport. Geographically, the Mekong river and the Bassac river split in this province. Kandal is divided in 11 districts.

Leuk Daek (see number 0805 in figure 4) is the district in the south of the province Kandal adjacent to the Mekong river and the Vietnamese border. This district contains seven communes and various villages. Two communes, Sandar (number seven or 080507 in figure 4) and K’am Samnar (number two or 080502 in figure 4), are the most southern communes in the district. Little is known about governance of commons in this area and their hydro social lifeworlds alongside the Mekong river – or so observed ECOLAND, the organization that hosted me. Therefore, and in consultation with ECOLAND, this research focused on this area. I will discuss the co-creation plan with ECOLAND next, but first I will elaborate on the regional context.

Figure 4 Provincial map Kandal province with districts and communes



Stat, 2011

## 6.1 Commons

Natural resources are high on the agenda of different organizations, academics, media and world leaders. For the Mekong Basin, a common discourse is that these resources need to be protected because of the associated biodiversity and fragility of the ecosystem and the image of “one of the last almost untamed great rivers on the planet” (p. 655). Development purposes are exploited and lost their ‘true’ purpose. Plans and perspectives clash which result in tensions and conflicts (Kittikhouna & Staubli, 2018) on a multitude of levels and dimensions.

Agriculture and fishing are very important for people living in the Mekong Delta. Due to this in combination with a low effectiveness of governance, sustainable resource management faces severe challenges. In Cambodia different land laws are in place, like traditional versus modern land rights may overlap or de jure and de facto rights on resources may be at odds with one another. As a consequence, property rights are seldomly defined and therefore enforceable. Furthermore, large parts of agricultural land can have open access situations especially in the wet season. Resources degrade rapidly, affecting the ecosystem, contribute to rural poverty and impair the income of users of the land. To prevent open access,

land users tend to excessively use their resource for their own benefit. Due to the dramatic negative experiences of Khmer Rouge with harsh command and control over the population and to attempt reduce expensive bureaucracy, policy makers handed over more and more responsibility to local user committees to govern their resources in order to hope to gain a more sustainable governance of the resources (Werthmann & Kirk, 2010). One of these committees is called Farmer Water User Committees (FWUC), established by the Provincial Department of Water Resources and Meteorology (PDOWRAM) of the Kandal province (Venot, 2017).

## **6.2 Land and water governance**

Water governance in Kandal, and Cambodia more broadly, is of increasing concern because of the interconnectedness of the Mekong river. Not just on a local level but also internationally. The need for water for human use and the maintenance of healthy ecological and cultural landscapes creates the necessity of a common responsibility for it (Suhardiman, Wichelns, Lebel & Sellamuttu, 2014).

Factors such as impunity, corruption and malefaction remain the norm due to a lack of an accessible and trustworthy legal system in Cambodia. According to Catherine Morris (2016), these factors are at the foundation of the accumulation of poverty, environmental degradation, land conflicts and landlessness in Cambodia. She argues that the main mechanism for the legitimization of this ‘violent accumulation’ of land and resources by powerful elites, is created by the law itself which in turn is created by elites and supported by neo-liberal economic reforms. These laws are created and used by the very elites themselves to expropriate people of their land, livelihoods and other entitlements. This deepens inequality, inverts justice and creates structural violence.

There is a second discrepancy about neoliberal developments in Cambodia. Creating more agricultural space and building roads are generally seen as progress and necessity for more wealth. According to Beban and Work (2018), *lok ta* caused the deaths of people due to development projects like road building. People were hindered to perform their annual *lok ta* ceremony at the temple. The way in which water and land is governed can have implications for the perception of people towards for example the government and NGOs, but also the support base for the state and its legitimacy. Because for *lok ta* their area was violated by this development, due to the reprisals a detriment to the legitimacy of the state may be caused. On the other hand, the state will use the discourse that nature needs adaptation since the current



state is not optimal for (e.g.) an increase in the yield. This strengthens the legitimacy of the state.

The Mekong floodplain has a multitude of roles such as sediment deposition, change in water quality, air and water temperature modification and life support to the aquatic ecosystem (Fuji, Grasdahl, Ward, Ishii, Morishita & Boivin, 2003).

One can see how the theory of the “Tragedy of the Commons” echoes the situation in Cambodia. The management of land and water resources does not seem to stop the current over-exploitation. Specifically, conserving aquifer water is, according to Castree (2000), not regulated to ensure sustainable exploitation. As discussed later in this chapter, the aquifer has only become a “resource” in the last 20 years when pumps/tube-wells were installed in Kandal to avoid contaminated surface water. Also, farmers who could afford a pump were not depending on the shared pump station at the head of Preks. Although the farmers do not rely solely on aquifers, the depletion of these resources did cause health problems due to over-exploitation caused arsenic contamination (Frenken, 2012).

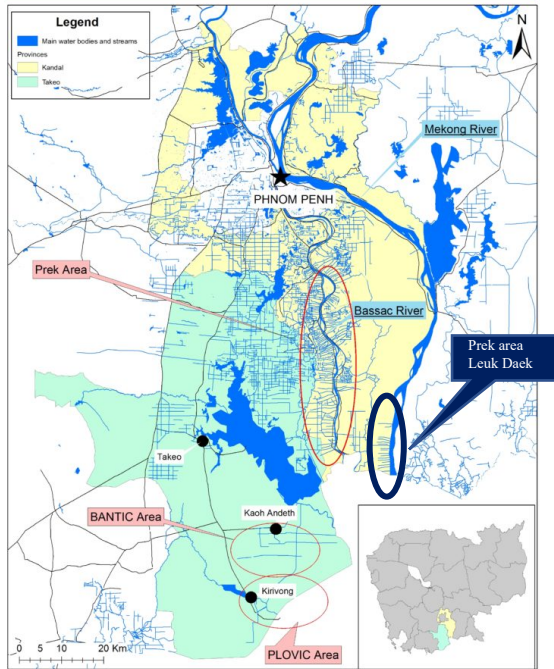
## **Preks**

Hydrologically, the Kandal province is characterized by a variety of *Preks* (see the yellow colour in the map in figure 5) which are earthen canals that date back to the late 19<sup>th</sup> century. In Khmer Prek means a connection between ‘things’ according to Venot and Jensen, 2021. What this meaning is depends on the ontological view of an individual, community, village, province, state and what connection in particular is looked at, etcetera. Venot and Jensen (2021) state that “*Prek(s) are enacted as ontologically different: as irrigation infrastructure, as pathway to rice intensification, as device for Cambodian state-making, and as climate-friendly agricultural development*” (p. 1).

Indeed, in the last 150 years, the practice of the Preks has been omnifarious by their multitude of use. For example navigation channels, flood management, fishing ground and collection of sedimentation. At the same time the seasonal flood plains of the Basac and Mekong rivers (for four months every year) witness large scale infrastructural development implemented by the government and particularly by the Ministry of Water Resources and Meteorology (MoWRAM) (Pratx, 2017). Figure 5 shows a map made by or in collaboration with Australian aid (which I found in the police office during my fieldwork) of the commune K’am Samnar and the Preks present in this area. During the fieldwork I took a closer look at the Preks in the last two communes, which showed that this map is accurate. The hydrological

functioning of these Prek systems and local perceptions of risks, uncertainties and opportunities are one of the focuses in this research.

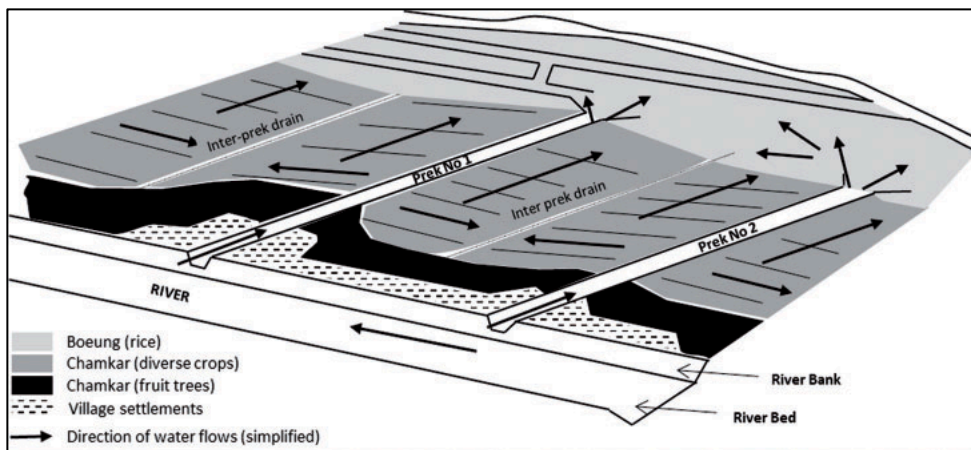
Figure 5 Preks areas in Kandal and Takeo provinces



Pratx, 2017

Preks are located on a higher geographical level and gradually descend in width and length (see figure 6). Although the schematic in figure 6 shows the Bassac river, the same can be applied to Preks connected to the Mekong river. This area is divided in three sublevels and which each level there are different kind of possibilities in the cultivation of crops. Typical cropping patterns are appropriated according to the topography and the risk of flooding. The land closest to the Mekong river is called the high level on which fruit tree can grow. Going land inward, the middle land non-rice crop such as maize, long bean and sugar cane is cultivated; and on the low or flooded area, only rice is cultivated. In some cases, an intake gate or pumping system allows controlling the inflow of water while in other cases there is also a drainage gate at the end of this Prek system.

Figure 6 Scheme Preks and Bassac river



Jensen and Venot, 2021

## 6.4 Border region

Commune K'am Samnar, is (as stated earlier) geographically situated at the Vietnamese border. Many ecological changes have occurred in this border area, such as the drainage and clearing of the forests which are also called the leeves and 'wild' lowland areas according to Beban and Gorman (2016). This, however started before the arrival of the Vietnamese. In the surrounding provinces Takeo and Kampot, elites took advantage of the European Union sponsored canal development. Buying up land to prepare it for rice or shrimp production meant clearing the area of trees. Vietnamese smallholders cross the border in search of new land due to economic pressures. In both provinces, the Vietnamese then continued to restructure the environment by clearing trees, levelling land and more importantly, bringing in new rice agricultural techniques, new technological and chemical inputs and new systems of aquaculture production. Data and information about these events are not available for the Kandal province. The re-shaping of this borderland is biologically and ecologically connected to the Vietnamese Mekong delta, but also by the exchange of commodities. Commodities such as hybrid rice harvest, fertilizers and pesticides cross the border every day, both for the domestic consumption in Vietnam and the export and import (Beban & Gorman, 2016).

According to interviews from the Beban and Gorman (2016) research in Kampot and Takeo, Vietnamese appear to have pioneered a new high-productivity dry-season rice production system. They use pumped irrigation, high-yielding varieties with short growth cycles, non-organic fertilizers and pesticides and mechanically harvesting and planting. This results into a double amount of yield in comparison to the traditional Cambodian agricultural systems, on the one hand. On the other hand, this progress can be explained by the benefits of

exposure from years of Vietnamese state-fund extension programmes to improve varieties in cultivation. In Cambodia this exposure has been minimal.

Pheakday (2014) argues that potential agriculture value chains' expansion in bordering provinces, specifically the increase in cross-border trade with Vietnam, is promising and substantial when seen in a supply and demand perspective. An improved value chain for smallholder farmers can contribute to an increase in income, poverty reduction, a rise in employment and in achieving food security at the household level. Small farmers in the Leuk Daek district do, however, currently have limited access to market information. These farmers need to sell their harvest immediately after harvesting due to the need to repay the loans they made, expenses in their subsistence and other financial obligations such as field preparation costs for the upcoming planting period, despite low market prices. This results in the situation that 100 percent of the total market volume has been sold within the three months after the harvest in order to avoid diseases, quality degradation and pest infestations. If this occurs, then these factors are consequences from inappropriate post-harvest handling techniques and lack of facilities. Lastly, there are constraints in terms of cross-border checkpoint procedures and transportation means (ibid) which can limit a successful value chain.

The topography of this area is relatively flat with a variety of channels creating opportunities for cross border (invisible) trade (Van Tinh, 2020). For millennia, trading networks already existed in South-East Asia (Mahanty, 2019). Through rapid growth and acceleration of resource extraction and commodification the markets have intensified (Rasmussen & Lund, 2018). Not all trajectories of frontier market formation are uniform (Hudson, 2016). Local engagement in and with global markets has had consequences like dispossession of the many and benefits the already well-connected elites who already have many resources to their disposal (Harvey, 2018; Mahanty, 2019). Even though trends, such as outmigration from rural areas to urban areas due to income diversification occur in border regions of Cambodia, migration from the more populous provinces continues to encourage small-scale agriculture, according to Mahanty (2019). However, migrants from Vietnam to Cambodia bring capital and farming skills, but they have a small or lacking social network, an ambiguous legal status and are missing the experiences of entry conditions in Cambodia. This makes them vulnerable to exclusion and a dependency on local brokers to mediate their possibilities and interactions with authorities and landowners (Gorman & Beban, 2016).

The consequences of the interactions come with challenges and opportunities for both Cambodian and Vietnamese residents in the Leuk Daek district. This is an interesting dimension upon the hydro social lifeworlds and their elements of water and food security, which, for Cambodia more in general, I will introduce next.

## 6.5 Water security

In Cambodia, more than 100,000 family-based wells are used for drinking water. Arsenic contamination has been found in high level in the Kandal province and specifically between the Bassac and Mekong river. The reductive breakdown of metal oxides is most likely what is responsible for the release of arsenic from Holocene sediments between the rivers, according to Bushmann, Berg, Stengel and Sampson (2007), due to the sinking of aquifer water. Although surface water (out of the Mekong and Preks) is still used as drinking water in some areas, during the last 20 years tube-wells have become very popular (ibid). Due to bacterial diseases and consequently a high infant mortality, about 1 million people have stopped using surface water. Wells were considered safer (Luu, Sthiannopkao & Kim, 2009). However, according to Iman, Yusop, Yusoff, Salmiati and Saadon (2014, p. 2):

*“In Cambodia, nearly 40% of rural people still have no access to safe drinking water. Untreated water and poor sanitation result in about 10 million cases of diarrhea and 10,000 deaths per year in Cambodia, mainly affecting children in rural areas. Although Cambodia has abundant water resources with plenty of surface water, a large number of people consume groundwater for drinking since the microbial quality of surface water is unreliable. Dependency on groundwater for drinking has increased the risk of arsenic exposure among rural communities.”*

Arsenic is a natural compound which can be found abundantly in the earth's crust and therefore also in groundwater due to erosion of rocks and soils. In aquatic ecosystems (such as the Mekong and Bassac river) the presence of arsenic is an inorganic compound according to Lenntech (2020, p. 1). In these areas, the cause of diseases can usually be traced back to contaminated drinking water with arsenic. Arsenic does not have to be dangerous per se as long as the total amount does not exceed 15 milligrams in a human body. Chronic poisoning has symptoms like depression, headaches and sleep disorders and in the long term develop different forms of cancer, a low birth rate and spontaneous abortion. Contaminated drinking water can

cause this chronic poisoning. Removing arsenic from water is not technically difficult, but still expensive. People in rural areas are unfamiliar with ion exchangers, iron and aluminium coagulation or membrane filtration. Boiling the water or using a simple carbon filter is insufficient (ibid).

Irrigation for intensive agriculture is a large consumer of groundwater (previously mentioned as aquifer water). Shallow groundwater reserves exist around the Mekong and Bassac rivers. These reserves are constantly replenished from the rivers. However, the rate is too slow and thus insufficient for the intensive irrigation demand. This groundwater is based in the shallow aquifers. These are a body of permeable rock which can contain or transmit groundwater. The water level is believed to have dropped due to both abstractions and the extensive surface drainage system built in the 1990s. The Bassac and Mekong rivers, as well as the river island that Leuk Deak is a part of, are the only two significant sites in the Mekong Delta that utilise groundwater for agricultural cultivation. Although the retreat is significant during the dry season, the shallow aquifers are charged by flooding during the wet season and directly from the river in the dry season. However, the lower or deeper lying aquifers (400 metre of depth and almost 3000 years old) are not recharged by rainfall which means there is a risk of overexploitation (Frenken, 2012). According to Richards, et al. (2019) however, large-scale groundwater abstraction in the area is very limited.

Several *Beoung* or wetlands, areas which hold water for a longer time in the dry season (more inland away from the large rivers), are used as a source for irrigation in dry periods. These date back from the Khmer rouge period and are basically marshes during the wet season. However, these reservoirs also dry up in longer periods of drought. They are also undergoing rehabilitation efforts by deepening them, construction of sluice gates and extending and deepening canals (or Preks) from the Bassac river into the marshes in order to delay water retraction and therefor prevent the drying of the reservoirs (Green, et al., 2019). This with the purpose to extend and prolong the rice cultivation in the lower areas.

According to Green, et al. (2019), healthy watersheds are essential to wetland ecosystems. Where river basins have been degraded, for example through deforestation or mining, wetlands and river systems are also declining. For example, deforestation show floods with shorter duration but are more extreme in quantity and dry periods are longer and the temperature is higher. This leads to a loss of biodiversity, loss in crops and environmental damage of river basins. River basin degradation also affects irrigation and other downstream infrastructure. Due to more suspended sediment which silts up irrigation channels and the reduction the life expectancy of dams and reservoirs, lead to costly interventions such as

dismantling or other maintenance. More extreme flood can also contribute to loss of life and property and damage to infrastructure. Sustainable development to protect and improve watersheds can therefore include forest conservation and reforestation (ibid). Also, a sustainable and diverse water security development is essential for food security.

## **6.6 Food security**

As stated in the introduction, in 1989 when Cambodia de-collectivized land, the distribution of agricultural land has been rather egalitarian among farmers and villagers. Every household who was engaged in agriculture in that period received small plots of land with the size of one to two acres depending on the household size, and availability of land. In the early 1990s little was known about the agrarian situation and distribution of land. However, according to Sedara, Sophal and Acharya (2002), by the late 1990s their indications became apparent in that there were concentrations of land in the hands of a few which were accompanied by a rise in landlessness situations. In an economy where the majority of the people are subsistence farmers, this trend can create joblessness and subsequently food insecurity. Furthermore, factors such as population growth and the evermore interconnected role of the international market system, can affect food security in multiple ways.

Root causes of food insecurity and food poverty in Cambodia, according to Boonyabanha, Kerr, Joshi and Tacoli (2019), appear to be low and irregular incomes combined with high food costs. However, these are also factors which can cause indirect additional pressure on already stretched households and individuals. Simultaneously, creativity and solidarity in poor families and communities exist as adaptation strategies on which even the poorest rely on in order to ensure food intake (ibid).

These authors (2019) also mention that the indirect factors that can cause food insecurity are diverse. Firstly, reduced food intake and nutrient deficiency due to the lack of consuming a diversity of food intake and the quality quantity of food affect physical and mental performances and increases the incidence of diseases. This in turn have substantial consequences for e.g. a nutritious diet, earnings and create a cycle of food insecurity and poverty. Secondly, there are insufficient public welfare safety nets. The national programme of the 'Poor ID-card' gives a limited number of people free access of deducted medical care. Also, transportation costs to a medical facility cannot be afforded nor the missing working time. A vicious circle may be created when links are ignored between health and nutrition since the most vulnerable (children and elderly) are more likely to have ill health. Third, the impacts of

natural and human-made disasters are becoming more severe and happening more frequently. People need to make adjustments to their homes, ability to earning money drops, food prices rise, and water-borne illnesses can spread more easily (Boonyabancha, Kerr, Joshi & Tacoli, 2019). However, farmers in Cambodia also need the floods (as explained earlier) for their agricultural practices (Fuji, Grasdahl, Ward, Ishii, Morishita & Boivin, 2003). Lastly, the consequences of debts. In the research from Boonyabancha, Kerr, Joshi and Tacoli (2019) shows that the repaying debts from different credit sources (like informal money lenders, community savings groups and microfinance businesses) makes it very difficult to escape from these debts.

Sharing is a crucial strategy for poor to access food. However, this is not without burdens for those who invite or receive visits. This system of reciprocity is important to share the food that is available (Boonyabancha, Kerr, Joshi & Tacoli, 2019).

There are, according to Phaloeun, Basnayake, Ngoy, Cukai, and Sarom (2003) four aspects which can limit an increase in agricultural productivity: (1) Variabilities in climate, (2) Restrictions in labour, land (especially in the southern provinces) or market access, (3) Soil fertility, impenetrable soil layers and flooding and (4) Shallow root zones and flooding result in constraints for crop diversification. Especially in border regions of Cambodia, increasing trade and accessibility through consolidation of exchange makes inputs like pesticides and fertilizers more available, not cheaper per se. Institutional and credit insecurity make people rely on traditional patronage structures. Avoiding risks is an integral part within Cambodian communities and the social relations. According to Pillot, money lenders are still the main credit institutions because there tends to be a lack of trust in the community as a whole (2008).

According to Ovesen, Trankell and Öjendal (1996) argue that “*land concentration is small, but indebtedness is high*” (p. 21) due to the discrepancy between the market price of rice and the price of rice for the end consumer. Due to irregular rainfall and rudimentary water management, indebtedness is not uncommon. Local small-scale farmers are not able to support their family in years of drought and low harvest. The relative limited availability of land and thus high process makes it difficult for farmers to improve their livelihood. It is therefore difficult to imagine any rural prosperity or even food security without controlled water management. The combination of high dependency on rice as a staple crop and the chronically unreliable rainfall are maybe at the core of this vicious circle in which many farmers in Cambodia seem to be trapped.

There seems to be an overwhelming emphasis on rice cultivation on multiple levels such as economically, socially and symbolically. Other activities seem to be side-lined, but are



maybe equally important to the food security and thus livelihood of not only farmers but rural communities as a whole. The rice cultivation system should not be seen as a mono crop which has but only one way of cultivation. Of course, production in rice cultivation systems varies. Planting patterns, irrigation and water management, rice varieties and environmental factors play a role in the different outcomes in yield, need of nutrients, length of maturation time, resistance to pests and diseases and their tolerance for variations in climate factors (Ovesen, Trankell & Öjendal, 1996).

Another cultivation system is the *chamkar* system. The term *chamkar* means that there is another form of cultivation than wet rice. Conventionally, fruits and vegetable on the banks of the Mekong and Bassac rivers are cultivated in the *chamkar*. In other words, *chamkar* can be seen as a polyculture with a large variety of crops in contrast to the monoculture of rice cultivation (Ovesen, Trankell & Öjendal, 1996). This means that the lower end of the Prek is mostly only suitable for rice cultivation and thus monoculture. The middle and upper areas of the Prek are of polyculture due to the cultivation of multiple crops such as maize, mango and vegetables. This area is continuously in use and harvested two to three times per year. Combinations in different cultivation schemes is achieved by varying in the use of space (height and distance from Prek) according to shifts in water levels. This is beneficial for prolonging and extending the growth cycle of the crops so that it lasts for parts in the dry season as well, according to Ovesen, Trankell, and Öjendal (1996).

Even though rice is the main cultivated crop and part of the diet of the average Cambodian, a substantial addition to the daily diet is derived from gathering uncultivated items. Vegetables, reptiles, frogs and of course fish are gathered in and around the village and the agricultural area. As Ovesen, Trankell, and Öjendal (1996, p. 26) state:

*“In the villages, women are passing every morning, carrying long stems of lotuses which will end up in the soup bowl, and in the rainy season, both children and adults are busy catching fish (with nets or hooks) in the flooded rice fields. The importance of gathering and non-timber forest produce is often underestimated in wet rice cultures, because these activities are performed as a side-line, so to speak, and because of the overwhelming symbolic emphasis on the cultivation of rice.”*

The *Chamkar* system originated when Chinese settlers arrived in Cambodia. During the 18<sup>th</sup> and the mid-19<sup>th</sup> century these Chinese settlers were only allowed to rent land on the slopes of the rivers in order to cultivate rice fields. They were not allowed to have rice fields of their

own. To acquire enough rice, they exchanged their garden products such as betel and cotton. This introduction of gardens created multiple crops which had not been cultivated in Cambodia before. Tobacco, soy, the Kapok tree and a tree version of cotton are now common crops cultivated in the *chamkar* as of today. Later, ethnic groups, such as the Vietnamese and Cham, imitated these cultivation patterns (Ovesen, Trankell & Öjendal, 1996).

As mentioned earlier, owning land plays a substantial role in gaining food security. However, this is not as common as it may seem in an agricultural society in Cambodia. The next section will discuss land distribution and how land ownership is managed in this research area.

## **6.7 Land distribution**

The policy and coordination of land administration and registration is the primary responsibility of the Ministry of Land Management, Urban Planning and Construction (MLMUPC). Also, land use planning, cadastral and geodetic surveying, property valuation and mapping are among their responsibilities. At the provincial level, the Department of Land Management, Urban Planning and Construction (DLMUPC) has this responsibility (Phann, 2006).

Ever since the Khmer Rouge period, land distribution has been prone to the rural proletariat according to Ovesen, Trankell and Öjendal (1996). They buy the land for a higher price so that farmers are not able to buy it for themselves. However, in 2008 a Land Policy Declaration was to set a vision of land policy in Cambodia in order to contribute to achieving national goals with regard to food security, poverty alleviation, national resources and environmental protection and socio-economic development. This was accomplished through managing, using, and distributing land in a fair, open, and sustainable manner (LandLinks, 2011). The goals of this land administration are (Royal Government of Cambodia, 2009): (1) accurately record ownership and other rights over immovable properties, both state-owned and privately owned; (2) carry out official transfers of those rights; (3) prevent and settle land disputes in order to strengthen the security of land tenure; and (4) ensure the dependability and efficiency of the land market.

Also, under the Land Law (Royal Government of Cambodia, 2001) any person who has uncontested possession of land for at least five years may request a definitive title of land ownership. Except for state public land. These are lands which are all lands which have a value for public interest (e.g. lakes, rivers (such as the Mekong), mountains, roads, archaeological sites and protected areas). In Cambodia, land is obtained through land distribution, sale,

exchange, lease, succession, concession and as a gift (LandLinks, 2011). Registered land title is considered to be the most secure type of ownership. Millions of acres, however, remain unregistered and it would take at least 30 years to close this gap. In addition, boundaries have not been demarcated properly- for example, boundaries between state and private land, agricultural and urban areas and forest land. As a consequence, these lands are vulnerable to taking or encroachment (Thiel, 2009).

In order to transfer land that is registered and thus has a certificate, the buyer must satisfy a legal requirement (World Bank, 2011). In case of land which is not registered through a certificate, the possibility of a 'soft' title comes in place. Evidenced by a so-called Letters of Possessory Right or 'other documentation' (as Sophal and Acharya call it (in LandLinks, 2011) can offer ownership with the assistance of a district chief (and possibly a village chief). These administrators can assist in evidencing the interest held and the transfer of this interest (piece of land). Also, it is possible to transfer the soft title to a certificate of ownership (ibid).

Another option to access land is leasing. The leases of private land are possible for both indefinite and definite periods of time. State private land can be transferred to private parties through land concessions and leases or by selling it. However, the government must convert state public land to private first before this can be done to private entities (LandLink, 2011).

Nevertheless, these land transfers to private entities do have consequences, especially for the population in the rural areas. Most of these forms of land concession are conducted as a suggestion by means of development and poverty reduction in the concerned rural areas. The study of Chev, Seng and Diepart (2011) has been conducted in the Kampong Speu province of Cambodia (West of Phnom Penh) but can be used as an example for the case study area in this thesis since this area is rural and land concessions are granted in Leuk Daek. The study was conducted "*in order to examine the necessary economic and social impacts of the Economic Land Concessions (ELC) development on local community's livelihoods*" (ibid, p.72). Intensive agricultural and agro-industrial activity development are the specific goals of these land concessions. The goal is to increase state and provincial revenue through land taxes while also diversifying and enhancing available livelihood options and managing natural resources based on ecologically sound ecological systems. All of this with the purpose to increase employment in rural areas. In their study, the aims and objective of the ELC were not met. Consequences, such as loss of access to fuel and non-timber forest products, a decrease of available agricultural land for local farmers and conflicts over land ownership, continue while at the same time granting of state-owned land through the ELC to private companies is continuously increasing (ibid).

## **6.8 Water distribution**

The government of Cambodia owns all water and the water resources in the country. As stated in the USAID report (Landlinks, 2011): “*Every person has the right to use water resources for his/her vital human needs, including drinking, washing, bathing and other domestic purposes (such as watering for animal husbandry, fishing and the irrigation of domestic gardens and orchards) in a manner that will not affect the legal rights of others. All uses of water resources for any other purposes are subject to a license or permit*” (p. 14). Implementation of plans and policies on water management can be formed by the Farmers’ Water User Committee by farmers who water for irrigation systems.

The extraction of groundwater is generally not managed which means there are also no fees collected. Therefore, there is a risk of overexploitation (as stated before in paragraph 6.5) because of the lack of an “*enforceable regulatory framework*” (LandLinks, 2011, p. 14).

## 7. Co-creation plan

Co-creation is a close collaboration between different stakeholder where mutual exchange of knowledge and contacts are crucial for successful results and collaboration. This thesis will depend on co-construction with the following stakeholders: Ecosystem Services and Land Use (ECOLAND), Royal University of Agriculture (RUA), Jean-Philipp from the Institut de Recherche pour le Développement (IRD) France placed at ECOLAND, government institutions, NGOs, inhabitants in Leuk Daek district, Andres Verzijl from University of Utrecht (UU) and fellow-student of the UU.

In the period during the preparations of the proposal, contact was established with ECOLAND via my supervisor Andres Verzijl. ECOLAND is a research centre based at RUA in Cambodia. This organization has been created in January 2014 in cooperation with the Institute of Research for Development (IRD) in France and the RUA. The main goal is to provide scientific activities on topics related to “*ecosystem services, rural development, land use management, and conservation*”. Their missions and objectives are: (1) building scientific capacity of Master, Ph.D., and Post-doctoral degrees, (2) enforce and enlarge scientific collaboration at different levels, (3) produce scientific outputs: publications, field data of ecosystems, of land uses and land use changes, and of value chains, and (4) analyze international agenda, agreements or issues in fields of ecosystem services, rural development, land use management, and conservation (RUA, n.d.). Knowing more about food security and commons in this specific village, the life worlds of the villagers and the entanglement with the government agency can give ECOLAND more insight in their own research agenda. Also, the much local knowledge is present in their organization. This was very useful for the regional thematic framework. RUA provided the official letters for my fieldwork. Mission and endorsement letters will assure my desired presence in the research area.

The contribution of an interpreter will be arranged with ECOLAND so I can conduct the research in the first place. This will partially be on the budget of the University of Utrecht. When I am in need of more time with an interpreter or another interpreter, I can arrange this with ECOLAND as well. I will depend upon the interpreter in conducting the active interviews and the transcription and translation of the interviews, i.e. co-construction of interviews. In addition, I depend on the interpreter to get access to a village. Moreover, the interpreter will have to elucidate the intention and aim of my research and, if appropriate or asked for, to present an informed consent form. Basically, all communication with the participants in the villages

depends on the interpreter to overcome the language and cultural barriers. Even with interviews and observations with the government agencies an interpreter is required. An employee from ECOLAND will assist me since my interpreter will assist the other student from the University. However, the vice-president or researcher from ECOLAND offered his assistance with these interviews for a proper introduction of my research and context related elaborations on his behalf.

As mentioned earlier the budget to finance the interpreter will be financed by the UU. Also, during this fieldwork a fellow student also conducts a fieldwork in the same area. We will exchange data and thoughts on our research.

Lastly, this research will be a pre-research for my supervisor Andres Verzijl which he will conduct in the wet season in Cambodia. The collected data can be used as a basis for the start of the research in collaboration with the University of Utrecht, ECOLAND and RUA.

## 8. Presenting commune K'am Samnar

### 8.1 Land, ownership and poverty

*“When I arrive in Leuk Daek district I feel sore of the long drive on the back of the motorcycle of my translator, but I am enjoying the greener countryside and less busy road. I noticed sale signs and fallow land.”*

*(Fieldnotes, 20 February 2020)*

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K'am Samnar is a commune at the border with Vietnam and located in the Leuk Daek district in the Kandal province. With a population of more than 5100 registered Cambodian people, a lot more people stay here temporarily, either commuting or living here unregistered. Being a border region, this commune is very diverse in its population (Citypopulation, 2021).

K'am Samnar is indicated with a sign along the road just before a bridge over a Prek. This commune consists out of multiple villages which seem to blend into each other when passing through with the motorbike. It is located on the left bank of the Mekong river and it has a main road and a secondary (mostly concrete now) road closer to the Mekong river. Alongside these roads some sort of ribbon development exists with the exception of (farm) houses along the Preks.

To understand in what kind of village the fieldwork has taken place, a description of a typical Khmer village in Cambodia is in place. To of this date May Mayko Ebihara (2018) is one of the few anthropological researchers who has described a Khmer village in utmost detail and over an extended period of time during 1959 and 1960. This research will help describe the commune K'am Samnar in the Kandal province. However, since Ebihara finished writing *Svay* in the early 1960s, she could not have foreseen the devastating period which soon followed.

In many ways, K'am Samnar is a typical rural commune in the Kandal province although it is difficult to categorize or delineate it in any tidy fashion. The larger majority are rice cultivators and even those who have another occupation are basically rural peasants. The majority are Buddhists, but some minorities of Cham (mostly Muslims) and Christians exist. However, being a border region, large groups of Vietnamese and Chinese people commute, live and work for variable periods of time in this commune. According to Ebihara (2018) among the traditional Khmer families there are no well-defined groups other than the family or

household that differentiate individuals. Also, status differences are marginal within a community.

However, there are some features which can distinguish one villager from another, so says Ebihara (2018). The villages' houses are constructed of different materials and in various shapes and sizes (Ebihara, 2018). Most houses are built on stilts and have a wooden structure. During the annual floodings of the Mekong river the houses, animals and villagers are then kept safe and dry. In the summer the shadow below the house provides coolness in combination with a soft breeze (see figure 7).

*Figure 7 Houses in Kandal next to the Mekong river*



*Author, 2020*

The history of these villages has seen changes after the Pol Pot regime. This has had a huge impact on the social relations. Judy Ledgerwood (introduction in the book of Ebihara, 2008) wonder whether social relations had been so badly damaged by the violence and betrayal that even kinsmen no longer helped each other or whether there had ever really been a sense of community in the period before the war. Ebihara and Ledgerwood (2018) both conclude that even though the post-war trauma and poverty have restricted the ways that people could support each other, they did see a reestablishment of systems of exchange and mutual aid in the 1990s.

During this period of reconstruction and reconciliation, an important part was to give people a home and assure a livelihood. An example of this is distribution of land for cultivation and agriculture. According to several interviewees in this research, different families could opt for land along a Prek, the Mekong river and in the village (interview 2, 3 & 5, 2020). People would go back to their birth area or just an area to build up their lives again. In order to work

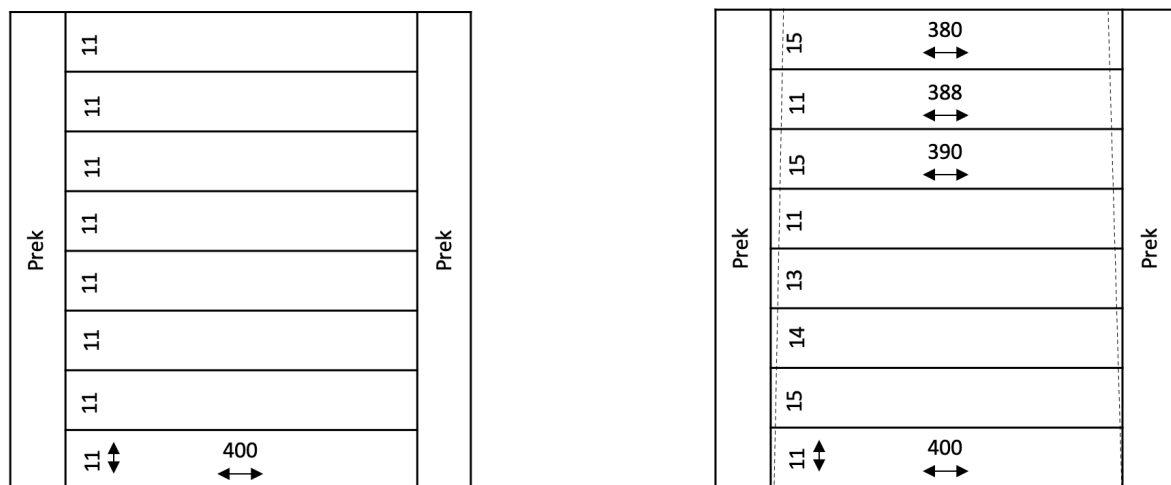


as a farmer on the land, the land needed to be cultivated. The collective problem in the research area is land and water security. To overcome this problem, most of the decision-making was (and still is) done on the commune level of the district K'am Samnar. How land is distributed and how resources are managed will be explained hereafter.

According to the leader of Prek 39 (interview 8, 2020), the plots of land (linked to the Preks) were divided in the same period in which the Prek was dug out by families who had registered themselves for agricultural livelihoods. The Prek already existed before the Pol Pot regime, but the land around it was not suitable for cultivation. The area was covered by forests and swamps. Most Preks were also not functional anymore, so they needed to be dug out by the families that would be living there and use the land for agriculture (interview 7, 2020). The picture on the left in figure 8 shows the original lay out of the distribution of these lands. However, in reality, these plots vary in length and width due to natural constraints and, later on, changes in landownership. Nowadays, the irrigation of the cultivation field comes from the Prek of which the farmer is obliged to join the Prek User Committee (PUC). So, not both Preks are used for irrigation.

A Prek User Committee (PUC) holds members who own land (farmers) next to the concerned Prek. So, every Prek has its own PUC. There is one leader who is elected every five years. This leader is responsible for the communication between the members, the pump owner and the possible communications with a village. Also, the maintenance of and any issue regarding (the use) the Prek is the responsibility of the leader.

Figure 8 Example of a lay out of land distribution next to Preks



Author, 2021

Multiple families helped each other with digging out the Prek. The amount of land adjacent to the Prek was equally divided among the families. Usually this was between 10 and 15 meters of land next to the Prek per family. The land in between Preks would be approximately 380 until 400 meters (right picture in figure 8). The length varies depending on the alignment of the land and the Preks. It is unclear which family would get the shorter pieces of land or whether these parts of land would always be considered the lowland on which the rice is cultivated. This last option would indicate that the rice farmers do not have a choice in this. It is also unclear whether all land is running unevenly between the Preks. That being said, the differences are minimal.

*“The families that would like to have agricultural land, dig out the Prek together and they divide the land around it equally.”*

*Interview 7, 2020*

According to the Prek leader of Prek 39, he could cut down more vegetation in order to gain more land. In his case the Prek was already present, so he needed to cultivate the land around it (interview 8, 2020). It is unclear whether the conditions of the Prek were good enough or that they needed to rehabilitate it as well.

Due to land selling and family redistribution, plots of land have changed in size or may belong to another family. When for example families are not able to pay for their medical bill, they are forced to sell their land<sup>1</sup>.

During fieldwork several plots of land were up for sale, marked with a sign on which a phone number was placed. Also, some plots along the Mekong river were filled up with a layer of sand (figure 9). A farmer cutting grass near the road explained that this was to eliminate everything underneath this layer and to reinforce the land that was eroding along the riverbank. This land has been bought by a rich Cambodian (Fieldnotes, 03 March 2020). According to two other interviewees (interview 3 & 8, 2020), these plots of land were bought by foreign companies which are believed to be Chinese. They wait for a better price to then sell it again (ECOLAND, 2020). The land along the river erodes due to strong currents and the seasonal floods.

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<sup>1</sup> This may even trigger worse consequences since they do not have any source of income anymore and cannot be self-sufficient in their livelihoods. Other forms of income can however be obtained from the clothing industry or in the capital Phnom Penh (interview 2, 2020).

During the interview with ECOLAND, we also discussed the land distribution in Kandal. Different actors play a role in the possibility for foreign companies or individuals to acquire or buy plots in Cambodia.

*“You know, one way of doing that I see that there is a kind of powerful people who can buy the land from the farmer and then they manage it for Chinese people to build or to develop it in the area. So, they have a role to represent those kind of Chinese people or Chinese companies.”*

*Interview ECOLAND, 2020*

The key role in this is played by the commune chief. The plots need to be registered and the official documentation can only come from commune level. It is not unthinkable that the interviewees have a financial gain in this process and might therefore be open for collaboration (interview ECOLAND, 2020). This process of land distribution has consequences for the local farmers and their ability to buy more land and to maybe improve their livelihood since the price will rise.

*Figure 9 Sand layer on plot in K’am Samnar next to the Mekong river*



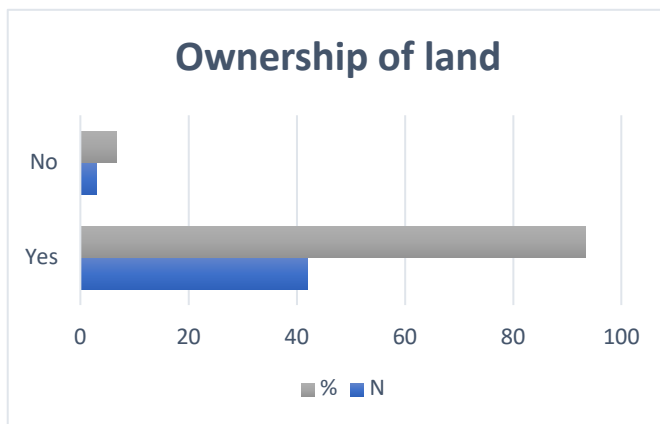
*Report ECOLAND, 2020*

The majority (93%) of the people participating in the survey in K’am Samnar own land for the cultivation of crops (figure 10). During the interviews the commune chief of K’am Samnar (interview 7, 2020) explained that the administration and registration of landownership is entrusted at the level of the commune. Historically, the legitimacy of the ownership is based

on ‘knowing’ each other and historical ownership (interview 7, 2020). Any conflict over landownership or boundary conflicts over land between farmers is dealt with at the village level, mostly by the village chief. Resolving this conflict, sometimes includes a field trip to the concerned area where he will measure and establish the new boundary. Other occasions only require a meeting between the quarreling farmers in which the matter can be resolved with guidance of the village chief. He can also be included to make sure no future conflicts can arise from the moment a new boundary is registered in the commune administration. If the village chief cannot resolve the conflict, he can forward the issue to the commune chief. Every commune has several village chiefs (depending on the number of villages in one commune).

For every interviewee the registration of land ownership at the commune level is regarded as sufficient. Even though this form of registration is not recognized at the national level (LandLinks, 2011), most people do not want to register officially because then they need to pay taxes. Also, when selling land, they need to pay taxes over their profit (Interview ECOLAND, 2020). So, they prefer to do this ‘unofficially’ at commune level. So, very strictly speaking, according to the national government unregistered land is owned by the government.

Figure 10 Ownership of land



Author, 2020

On a national level, the government is currently implementing a project (see chapter 7.7) to officially register landownership titles (Royal Government of Cambodia, 2009). According to interview 7 (2020), the government (the Ministry of Agriculture, Forestry and Fisheries (MAFF)) uses students to measure the current owner’s land and registers this on a national level. It is unclear how the alignment is with the registration of landownership on a community or district level. None of the interviewees indicated that this might influence the current state of landownership or that it would for instance create discussion about the current

boundaries of farmers. However, the new measurements during this national registration of landownership, can cause changes in the current situation. During the interview with the co-chief of commune K'am Samnar (interview 7, 2020), it was assumed that the government will adopt the current registration of landownership in the administration on both the commune and district levels, where the more customary arrangements prevail.

*“Around the houses I see corn drying in the sun (figure 11). I expect this is from the latest harvest. People walk with their bare feet through the corn to distribute it, and some use some sort of shuffle. I notice that they barely use any equipment”*  
*(Fieldnotes, 2020)*

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Figure 11 Corn lay out to dry in Leuk Daek district



*Author, 2020*

In K'am Samnar, agriculture is the largest economical sector and there for most of the participants work in this sector. Almost everyone mentioned that they have enough food throughout the year. This corresponds with the outcome that most participants own land (figure 10). The assumption is that when someone owns land, they can use part of the yield for their

own consumption. However, this is not an assurance for a sustainable livelihood or the absence of food insecurity.

*“Food security focus on rice. There is enough for people in this village in this commune no one lack of the rice for eating.”*

*Interview 7, 2020*

Every commune in the Kandal province has the social service to give poverty cards to families who cannot provide in their livelihoods. Most of these families who can make a claim for this card do this because they do not own agricultural land. There are two types of poverty cards which are be assigned to families through both registration and an admission interview by members of the commune board. These cards are valid for one year (interview 7, 2020). In K’am Samnar this card is used to get rice from the commune. The card is only given to those who do not have enough food to sustain their livelihood. The community chief does mention that most people who use this service do not have their own land. This is in line with the survey results, since more than 90 percent of the participants have their own land (figure 10) and should have enough food for the entire year. However, none of the participants mention the possibility of a failed harvest or a reduced amount of yield during the harvest due to possible pests or droughts and therefore the consequence of less or an insufficient amount of food for consumption, or the possibility of a decrease in the yearly or monthly income.

## **8.2 Land use and crops**

*“During my first trip to the research area, I saw women and men harvesting the last yield of rice. With a large harvesting machine, the big yellow bags were filled. The bags are kept in place by a person who then closed the bag with a rope. I tried one myself. It was very heavy and the sun was very hot. I burnt the skin on my feet since I wore slippers.”*

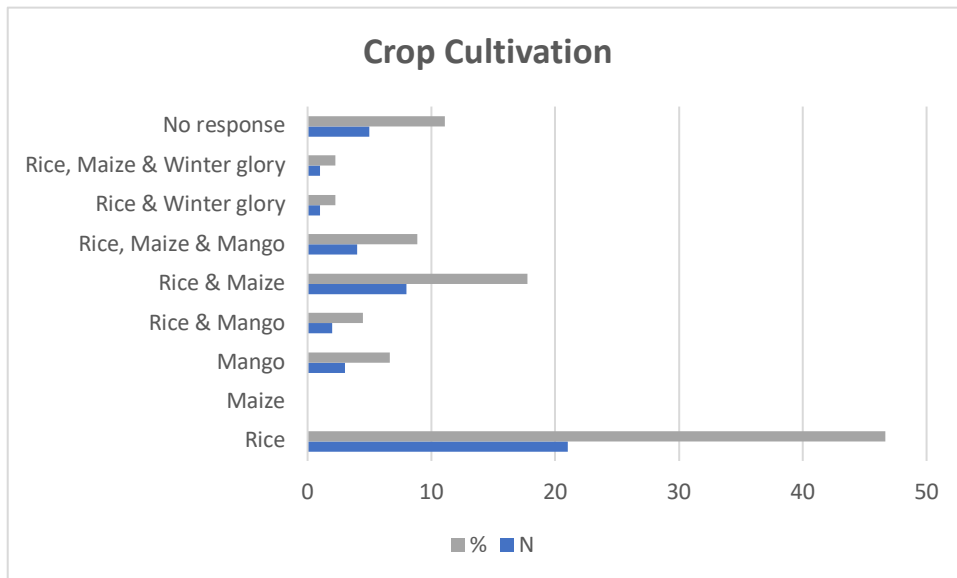
*(Fieldnotes, 2020)*

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Rice is usually planted and harvested two times a year. One harvest is in the dry season and the second in the wet season. The plot on which the rice is planted is not suitable for other types of crops due to the relative low location to the Prek and the larger distance from the Mekong river. The entire cultivating area and its agricultural system are called the *Chamkar* (interview 5, 2020 and ECOLAND, 2021).

Next to cultivating crops people also own livestock such as buffalos (figure 13), chickens, ducks and cows. They not only keep them for family consumption, but also as an extra source of income through trading. It can be seen as a safety net for harder times or just a possibility which is utilized when people have enough money left to buy livestock (interview 4, 2020).

Figure 12 Cultivation of crops in K'am Samnar



Author, 2020

In K'am Samnar it seems to be the case that rice is largely cultivated as a single source of income or used for the livelihood of a family for example. More than 35% have combined crops (such as rice and maize) and almost 47% have rice as a single cultivation crop (figure 12). When people have rice as the only crop they cultivate on a piece of land, almost all families have fruit trees or small plots next to their houses on which they can cultivate other crops for their own consumption.

Crops have a specific place in the agricultural area, depending on the height with respect to the Mekong river and Preks. Since the land elevation is receding from the river, mangos are cultivated in the Chamkar, then maize, then rice in the flooded part, called Boeung.

Figure 13 Buffalos in K'am Samnar



Author, 2020

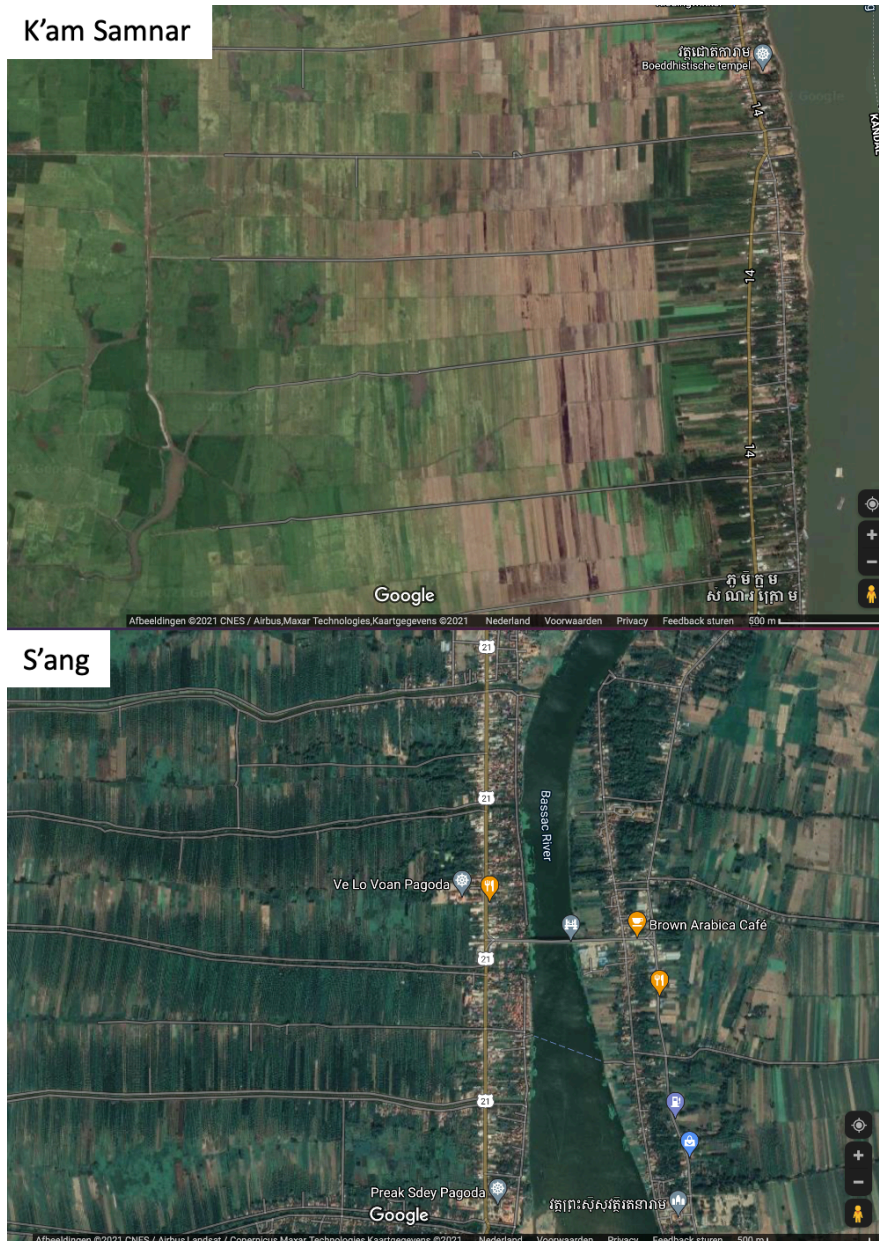
The land has a slight elevation descending from the Mekong river to the Bassac river. In K'am Samnar this has also led to the typical agricultural lay-out of the area. This means that fruit trees (such as mango and banana trees) are cultivated close to the Mekong river because then they are less prone to long periods of flood, then maize and consecutively rice. At the beginning of the Prek (the area close to the Mekong river) people may have their farm and house and may have some form of pond to breed fish in (fieldnotes, 2020). What is not shown in this image is that there are two roads between the main agricultural land and the Mekong river. One is the main road and the other is a service road. People live along both roads in ribbon development as mentioned before (fieldnotes, 2020). Also, between de Bassac and Mekong river there is a third smaller river, that functions are the drain out, which also 'feeds' the Preks according to Prek 36 leader (interview 4, 2020). This river is called the *Barra*.

The lay out of the *Chamkar* differs between K'am Samnar commune and other communes in Kandal province like S'ang (figure 14) and Kaoh Thum (South of S'ang and West of K'am Samnar). In between, the plots of land are not always divided equally. In interview 2 (2020) one interviewee mentions that plots of land get divided between families, so they split the plots. However, the lay out of the land between the Preks seem to have a more consistent pattern, rather than a random one of some being split and some not within or between families.



Also, the vegetation in S'ang and Kaoh Thum consists of much more trees than in K'am Samnar.

Figure 14 Geographical lay out of K'am Samnar and S'ang commune



Author, 2020

### 8.3 Spirit practices

*“During my last interview, a ceremony took place across the road. The music was very loud, and part of the main road was used for it.”*

*Fieldnotes, 2020*

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During the field work many places show or display religious objects (figure 18). Not only next to or on the property of households and the houses, but also bridges, pump stations, dining places, the commune hall, and many more. People believe the statues not only represent the spirits, but they believe the spirits stay within the statue (interview 6, 2020).

*Figure 15 Spirit house and ritual object near a bridge and pump*



*Author, 2020*

The elder (interview 6, 2020) is one of the few still active elders for ceremonial and religious activities in the region which he guides. Although he lives in the Koah Thum province, he does perform ceremonies in K'am Samnar as well. In addition to his duties as an elder (attending and performing ceremonies and rituals) he is also a farmer who cultivates maize. He told us that he is one of the last people able to perform ceremonies due to the required knowledge about the cultural practices. That is why people asked him to become an elder.

*“Whenever there is a religious ceremony, he says he must attend. Help to prepare the offering table and he will prepare many religious equipment.”*

*Interview 6, 2020*

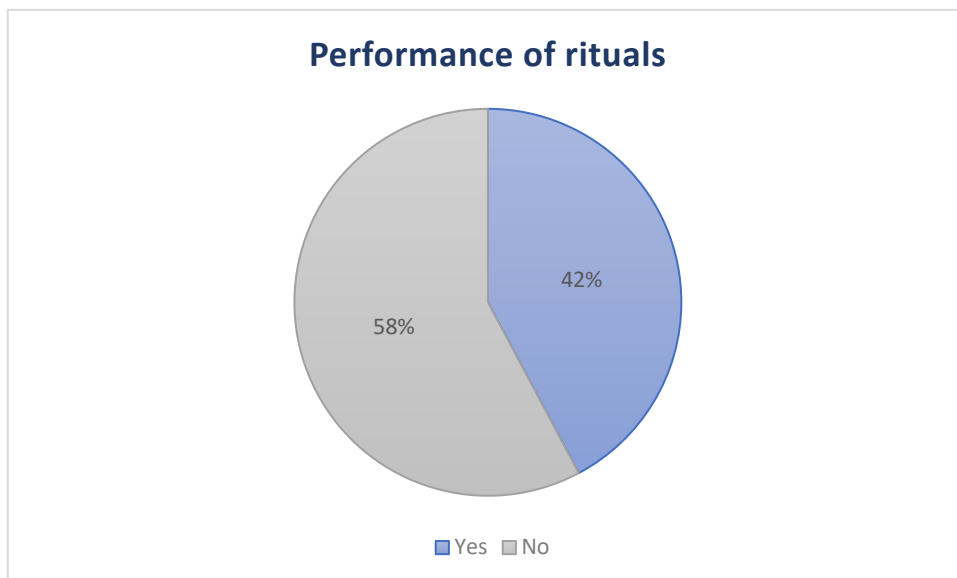
One particular spiritual practice is and has been very common in the rural areas where agriculture is the main source of income. Neak Tah of Lok Tah (depends on the setting) is known as “ruler of the land and ruler of the water”. According to the elder:

*“The Neak Tah is already there. [...] You can say that they are spiritual ancestors of specifically of a brave general of brave soldier who used to govern that place.”*

*Interview 6, 2020*

The elder argues that if someone does not offer, the *Neak Tah* will punish them. This is in the form of illness or other physical ailments. In this case only a traditional Khmer doctor may help him because he knows whether the illness comes from *Neak Tah* or not. Then, an offer and a request for forgiveness with an apology will instantly (or approximately 15 minutes afterwards) cure the ‘wrongdoer’. In any case the offering is always effective, according to the interviewed elder.

*Figure 16 Performance of rituals*



*Author, 2020*

However, the number of people performing rituals is declining (figure 19). There have been changes in the number of people believing in the spirits, the content of the spiritual meaning, the role and capabilities of the spirits, and the existence of them due to environmental changes. In addition, ‘modern’ technology and government intervention in the area caused an increase of health over time, according to the elder. He argues:

*“Before I believed that the power of Neak Tah is very powerful. Any wrongdoing might cause an instant illness to someone. [...] I think that the Neak Tah might follow the Buddhist teaching. So, they don't seem to be as aggressive as before.”*

*Interview 6, 2020*

This means that the ontology of some people has changed. This affects their behaviour and view towards their hydro social lifeworld. Also, some farmers in the commune of K'am Samnar do mention that the effectivity of the offers and the amount of people performing the ritual is declining:

*“Some don' believe, because when they offered, they did not get what they wanted. Last year there where many mice in the fields who destroyed the rice. They prayed to Lok Tah but nothing happened. [...] Also, the price of the rice product is very low and they prayed, but it does not work.”*

*Interview 5, 2020*

Likewise, in the survey more than half of the participants indicate they do not make offerings for good outcomes regarding the sowing and/or harvest season or business. These offerings are still being performed by the participants because their ancestors did so as well (interview 1, 2020).

#### **8.4 Local water management**

*“We drove along the nearest Prek (Prek Hon or prek 33). The road was full of bumps and very dusty. The water was very low in the Prek, but there were several pumps with flexible hoses operational which irrigated the fruit fields.”*

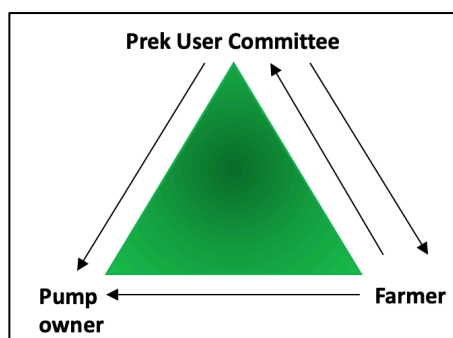
*(Fieldnotes, 2020)*

The main source of water in the commune is the Mekong river. With the Preks, water is distributed not only to irrigate the fields but also to provide fishing areas (in the Prek and in the Boeung area in the wet season), to serve spiritual practices and as a source for filling up private ponds.

To distribute the water into the Prek is not always a matter of switching on the machine. According to the pump owner of Prek 45 (interview 1, 2020) the head of the Prek is fragile and can collapse due to heavy rainfall, drought, or erosion. The pump owner had just repaired the head of the Prek and the pumps had been reinstalled and were already pumping the water into the Prek. The pump owner said he is (financially) responsible for the maintenance of the Prek. He receives money from the landowners who are users of the water in the Prek. They pay him per *Kong* (a measuring unit of five *Kong* is almost half an acre) which is eight liters of diesel used by the pump. In addition, they pay him 25 kilograms of rice. If people cannot pay for the eight liters of diesel, they can pay the pump owner with more rice. However, this can also pose a problem since the farmer will not have enough rice left to sell or to feed his family with (interview 2, 2020).

Governing the Prek(s) and thus the water to irrigate the cultivation fields is conducted using a hybrid water supply system in the context of rural water management. The three actors PUC, pump owner and the farmer form the core of the decision triangle (figure 15). The pump owner has a contract with the PUC. The PUC can forward any issue to the village chief (who is also part of the PUC) whenever the pump owner does not hold his end of the contract. The pump owner collects the money and/or yield from the farmers. The farmer can ask for extra water when they do not have enough without being charged extra (interview 1 & 3, 2020). During the dry season (of three consecutive months) they need to irrigate the field seven times separately. In addition, there needs to be continuous flow of water for ten days in a row (interview 1, 2020).

Figure 17 Hybrid water supply system



Author, 2020

Water is the most important resource for the agriculture in K'am Samnar and thus for the livelihood of many people in this area. The Prek system is an ancient way to irrigate the agricultural fields. They are also a source for food or water for many people who do not own

or rent a plot of land. K'am Samnar has 13 Preks (figure 16). The bridges on the road closest to the Mekong river are numbered and the Prek itself has a name. This name originates from the last person who has dug out the Prek, according to a woman who was taking some time to talk to us while she was harvesting rice (day report 1, 2020). Not all Preks have a number. One Prek between number 44 and 45 is not named and numbered at all (field notes 4, 2020). The reason for this is unclear, but the system of numbering Preks is more recently put into use than the naming since the naming came first after digging the Prek (day report 1, 2020). Preks which are no longer in use sometimes do have a number and Preks which are in use sometimes do not have a number, even though there are bridges.

Figure 18 Preks in commune K'am Samnar



Rothmono, 2020

Prek 36 is completely rehabilitated in 2016. The Prek has been dug out so that water from the Mekong river can always flow into the Prek. The flow of the water alters two times a day when the flow or also called tide of the Mekong river alters. This influences of course the direction of the flow of water and with that the amount of fish in the Prek (coming in or out).

To rehabilitate a Prek, the PUC and particularly the leader must vouch for his own Prek to claim the government sponsored rehabilitation program. Every year the government grants a budget to restore the Preks. According to the Prek leader of Prek 36 every Prek has the same chance to get rehabilitated, but it is up to the leader to lobby at commune level. All other Preks rely on a pump station at the head in the dry season to be able to withdraw water from the Prek for their agricultural practices.

The Prek system is an old way to irrigate the agricultural fields. However, the part of Prek used for this activity is not a common or public property and they need to ask the owner for permission otherwise they are trespassing the property illegally. The owners of the plots of land are mostly aware of illegal activities, but allow them to fish or grab some fruits for their own consumption or small resale for extra income, according to several farmers (interview 3, 5 & 8, 2020).

According to the leader Prek 39 (interview 3, 2020):

*“He knows that person. So, he just goes to tell them just don’t do that but he don’t speak to make them angry. Just talk.”*

In K’am Samnar, many households own cattle (chickens, ducks, cows and water buffalos) next to their primary occupation, such as farmer or a business owner. When people own a buffalo, this animal needs a bath at least two times a day to lose its heat (figure 17).



Figure 19 Watering a buffalo in a Prek in K'am Samnar



Author, 2020

However, not everyone has access to land bordering these water resources. This results in practices of letting buffalos access the water via someone else's plot or piece of land adjacent to the Prek. In doing so, these banks (mostly at the head of the Prek) are damaged by the buffalos as the ground crumbles into the Prek. The direct consequence is that the Prek becomes shallower and the Prek can sustain less water. The owners (in cooperation with the PUC) must restore the bank and dig out the Prek more often. The overall quality of the Prek decreases which has also direct consequences for the cultivation of crops on land further away from the Mekong river. The places usually used for watering the buffalos are close to the Mekong river, since most people live in the villages or next to the Prek close to their cultivation land. Also, there is less overview and supervision. But according to Prek leader 36 (interview 4, 2020) there is an impasse between the plot owners who know the illegal trespassers in person and the illegal trespassers themselves who keep trespassing in order for them to bathe their buffalos. He mentions that most of the time they try to solve these issues themselves and do not want to involve the police. They would rather involve a village chief or commune chief if there is no other way. The Prek leader can also play a role in solving this situation since he is authorized to issue fines. The Prek leader of Prek 36 has done this in the past. However, issuing fines is a

very unpopular method, because of the randomness and inability to fine everyone (since he cannot see everyone doing this). It is also possible that this might affect his position as a Prek leader. On the one hand he needs to act upon the complaints of the PUC members who are harmed by watering the buffalos and on the other hand these people who own the buffalos. This can jeopardize his position as a Prek leader since the members of the PUC can influence a possible voting for his reelection as a Prek leader.

He comments:

*“Before he had the agreement within the Prek committee that if someone would take their buffalo to the wrong place to bathe, he could give a fine or let them be arrested by the police. But people got angry and blamed him for his randomness”*

*Interview 8, 2020*

## 9. Conclusion

### 9.1 Introduction

This research aimed at answering the following main question: *“How are changing land and water practices influencing livelihoods and common relations in the K’am Samnar District?”*

Multiple ontologies were not found during this research. However, the multiple ontologies are still useful for this research because in K’am Samnar people do practice water differently and changes made, by for example a government, will have significant impact on the lifeworlds of the inhabitants. To indicate whether multiple ontologies and hydro social lifeworlds exist in the research area, sets of relations and procedures need to be studied. For this, more ethnographic research is needed. During this research I was not able to.

Starting with the assumption that water is seen as crucial to the rural economy and livelihoods, qualitative research was conducted to capture the relationship between water and the rural population in the commune K’am Samnar in Cambodia. This chapter concludes this study by firstly summarizing the key findings and looking back at the existing theories and secondly answering the main research question of this study.

### 9.2 Key findings

The sub questions supporting the main research question which were defined in chapter three are answered in this concluding part.

#### 1. *How are rural water livelihoods in the K’am Samnar shaped?*

Before answering the main research question, it is essential to know how Cambodian villagers live in the rural areas. In K’am Samnar the rural population heavily relies on the water resources from the Mekong river. The rural villages are located on higher ground, also called levees and the cultivation area is located in the lowlands that are periodically flooded. According to the results of chapter eight a few trends are observable in the livelihood strategies of the villagers. Firstly, most villagers have a diversity in crops to cultivate. Although the main cultivated crop is rice. Rice is seen as the most important part of food security. When you have rice you cannot be hungry, seems to be the overall thought. However, there is not enough diversification in food consumption for the poor rural villagers. That is why some (and mostly young) people steal mangos for consumption or to earn some money by selling these. Also, the introduction of cultivating mangos is relatively new in this area where rice has been the most important and

almost only form of commercial cultivation for hundreds of years. Owning a plot of agricultural land is one of the most important conditions for food security. Farming is the most common occupation, but there are varieties such as occupations in the garment industry and retail business. Secondly, villagers migrate to Phnom Penh to find work and to be able to provide remittances to their family in rural areas. This means less practices can be performed by the current and future generations. Knowledge and 'know-how' will be lost over time.

Religiously and spiritually, many rituals are performed every year in accordance with the cultivation cycle. However, the number of practitioners is reducing, and rituals performers are hard to come by. The spiritual link with nature and water is diminishing.

The villagers do have multiple issues to deal with. Firstly, low income due to low market prices. This leads to more debts and loans. Secondly, higher temperatures and lesser but heavier rainfall and thus heavier floods leads to pests and diseases in the crops. Also, new crops are more vulnerable for diseases when there is a period of water logging. Thirdly, land prices rise due to foreign and rich Cambodians' investments. Rural villagers are not able to buy the land for the lower original price. So, a form of land grabbing takes place in this area. Lastly, the use of chemicals has consequences for the water environment and for the health of the farmers and surrounding villagers.

## *2. How are the local water and land practices performed in K'am Samnar commune?*

According to Bishop, Penny, Stark and Scott (2003) water management has been embedded in Cambodia since the pre-Angkorian period. Angkor Borei is the closest location to K'am Samnar where a more complex water management system was used, based on the seasonality of the water availability. Water and river are still central in the rural culture of Cambodians. How much water can be used for the irrigation of the fields depends on the water level, the topography of the land and the type of Prek water management. Despite the use of chemical fertilizers, natural sediment is vital for the fertility of the cultivation fields. Traditionally, the floods determine the cyclical start of the cultivation practices. This also influences water practices. Machine pumps are used in the dry season to pump water out of the Mekong river into the Prek. This is an irrigation method which is vital during the dry season. For the harvest of rice a machine is alternately hired and used between farmers which makes this one of the few practices where farmers work together. Another practice is the PUC where the water flow to the Preks is coordinated, and fields are simultaneously irrigated. However, the pumping from the Prek to the field is an individual effort.

Land and water practices are performed with very little tools, and most are rudimentary. For example, post-harvest practices in maize involve the drying of the corn on large canvases in the sun where the product (stored in large bags) is with bare feet or the use of a simple rake when available. Also, a crucial practice as pumping water to the Prek and from the Prek to the fields is done with relatively simple and rudimentary tools such as a pump running on diesel. Which can break down when it is not properly maintained or shut down when the farmers did not pay enough for the diesel, etcetera. This means that there are many external influences which can alternate the outcome of the yield.

Many land rights are kept on local records and are not known to the official national government. This makes land ownership a difficult, complex and foremost local practice. The community seeks to solve conflicts over for example land division internally. Only when necessary, a dispute is forwarded to a village or commune chief, but this almost never the case. Even in cases like theft and abolition the issues are first handled without formal authorities. Buddhism and history have a large share in the reason for handling situations this way. Formal authorities are still not really trusted by the population since the Khmer Rouge period for obvious reasons. Buddhism learns to have respect for every living being and teaches to treat each other with respect. Going to authorities also does not fit this vision even though the act itself does not fit the vision in the first place.

Water rights are almost non-existing. Formally, water is a property right of the national government. The local governance makes it seem that the national government does not (or very little) play a role in the water practices. For agricultural practices most water is governed by a pump and its owner at the head of the Prek from where the water out of the Mekong river is pumped into the Prek. As a result, the farmers and the outcome of their yield are highly dependent on the pump owner, the PUC and the state of the Prek.

Preks are not only canals which store water with the intention to enhance the agricultural activities in the *Chamkar*, but they are also part of religious practices. Preks can be seen as a connection between things (Venot, 2021). The villagers are adapting to the water, but the water is also being adapted by humans in K'am Samnar. It is a nature on its own.

### *3. How are common relations shaped and entangled in K'am Samnar?*

Water out of the Mekong river seems to be accessible for everybody. At the local Prek level this water appears to be more like a common pool resource. According to Östrom (2008) a common pool resource can be described as resources that are large enough that it makes it hard (but not impossible) to exclude users. The Preks are a peculiar case. The governance of the

Preks on local level involves farmers (who use the water), the PUC (for organizational matters) and a private pump owner (who somehow holds a claim on the infrastructure including the canal). A village chief can intervene when there are issues or conflicts. For example, when a PUC leader or a pump owner does not take his responsibilities. Large maintenance is done on provincial level and rehabilitation projects are carried out on national level or by (international) NGOs.

A common property regime is demonstrated in agricultural and water practices. Water from the Mekong river needs to flow into the Prek. The pump owner plays a crucial role in this practice (the hybrid water supply system) and has proven to be unreliable on several occasions. For instance, not holding up his end of the deal by not starting, not maintaining the pump or when there are defaulters. This causes delays, frustration and distrust amongst the PUC and the pump owner. However, when all Prek should be canalized this practice is no longer required. This provides an all year availability of water. However, the farmers will then be highly dependent on chemical fertilizers (even more than they are now) because the flood does not bring in the natural sediment on the fields. The Prek will be excavated this deep that the fields will only be flooded very shortly or not at all. This does not apply to the Boeung area though, because it is geographically lower than the area closer to the Mekong river.

Land use in the research area is mostly organized unofficially on commune and district level. Not all land titles (actually very few) are registered on national level, even though the government of Cambodia has started a national programme for this. To acquire new land farmers can inherit it or buy it. The prices have however increased over the years because outsiders have pushed up the price. These outsiders can be industrial developers, Cambodians who want to invest and sell the land when the prices go up, etcetera. This means that acquiring land for agricultural purposes by small holders become increasingly difficult. Also, for example debts may cause farmers to sell their land to pay off their debt when other debts are not granted anymore by for example private banks in the area. This causes even worse living conditions for these people.

Development projects which ensure the availability of water for agricultural practices throughout the year, seem to lessen the necessity of spiritual practices. People notice that the offerings and respecting the spirit do not ensure the good outcome of a harvest, the working of machines and an abundance of rainfall. This might play in the hands of development organizations and the state. According to Beban and work (2018) this is an active strategy from the state to increase the independence towards the state. This process of 'developmental takeover' or the restructuring of the relationship between the environment and human culture

also changes the view and perspective of water as a natural occurrence and resource and the position of the villagers within their hydro social lifeworld. In addition, the changes in the climate also contribute to this change, because practitioners notice the rituals do not have the desired effects when for example rainfall does not come and drought persists.

The Mekong river and its water are and have always been a subject of debate on different levels amongst countries, and local communities. The Preks for example are also an integral part of the national state-making campaigns (Venot & Jensen, 2021). Which makes the Prek in this case a tool for the political agenda of the national government. Furthermore, climate development policies are predominated by issues of scale, in- and exclusion of local communities and (unintended) negative consequences for downstream local communities. Issues of scale arise when upstream dams or other alterations to the water stream are made in delta planning projects. These interventions have direct influences on fish populations, water supply (mainly on local level) and generally on livelihoods; and these are felt in K'am Samnar as the research shows. Another more invisible aspect is the comparison of what is in Cambodia and the dominant framework of what should be. This creates conflict on its own. Most development project intend to change the current situation, irrelevant of the instigators who want change. This can even be the local farmer. Comparison, which indicates imitation, conformity, adjustment to a pattern, or modified continuity of what has been through the present and what will be in the future, is the root cause of this. All of this is a process of conflict, because of what is into what should be or what might be or try to transform what is into something that is not. The result is overlapping multiple ontologies.

### **9.3 Answer to research question**

Explaining the key findings and answering the sub questions provides an overview for answering the research question: *“How are changing land and water practices influencing livelihoods and common relations in the K'am Samnar District?”*

Hydro social lifeworlds are shaped by the relation between culture and nature. These worlds can overlap, coexist, and collide within the same territory (regardless of national and natural borders). The ontology people have (natural, political, ecological, etcetera) are shaped by power dynamics from different scales and actors which highly impact the way people experience their reality and this hydro social territory. These experiences and possible changes in turn partly or completely shape the behaviour which has direct impact on the water and land practices.

Within the Prek every element of these lifeworlds seem to come together. The Preks are shaped by and shaping culture and nature. Initially, the Preks are manmade but have become part of a social, institutional and spiritual framework. Power relations are created and preserved using the Preks as an ontological resource suited by the user to achieve the intended goal. Politics on multiple scales, environmental change, change in local governance, etcetera, can change land and water practices and these changes have direct impacts on the lifeworlds of the local inhabitants living in K'am Samnar. Water shortages, floods, droughts, pollution, (inter)national trade, land prices and politics are examples of possible influences on land and water practices.

Land and water practices in K'am Samnar are significantly different from the dominant developmental framework. Floods are welcomed by farmers and fishermen. They are a necessity and crucial for the fertilization of the cultivating area and the livelihood of many when people are for example able to fish. The e.g. floods shape common relations which create the corresponding practices in this particular area. This makes it a necessity to research the relations and procedures of these practices when altering for example these practices with development projects. These alterations change the hydro social lifeworlds especially of the local population directly.

#### **9.4. Discussion**

In this paragraph the outcome, implications and limitations of this research are discussed. Also, recommendations for further research are provided.

The analysis of the findings suggests that multiple perspectives and power relations from different levels are interconnected with the effects of development changes in Cambodia. However, due to covid it was not possible to investigate this analysis any further during this research. The local tensions over water resources in K'am Samnar seem to be interconnected by the availability of water resources. The irrigation development by the government and private organisations try to improve the water situation in rural areas by providing irrigation systems with water all year round even though locally several techniques already exist. This raises the several questions. One is, for how long will floods be allowed to exist in Cambodia and two, are local perspectives and experiences included in development projects? Another is, what happens with the flood water (and with that the cultivation area) if all Preks are canalized and the area is kept dry throughout the year? Research in other communities in Kandal could provide a broader perspective regarding the development of irrigation systems, experiences



with development projects and whether certain development changes should take in their current form. Thus, more time should be spent in K'am Samnar to develop in-depth results about the way people are connected with water and how this affects their lifeworld in this area.

Ontologies from different stakeholders and scales, coexist simultaneously. Not every ontology is aware of the other and often exists in parallel with each other. But it does show that, depending on the scale, water can be seen as a common, a Prek, a spiritual place, a delta and many more. This creates conflict on its own.

### **Implications**

This part discusses why the results of the research matters and which general theoretical and practical implications the findings have. Firstly, the research will be an addition to existing literature and knowledge about the area. Existing literature about the Kandal Province is scarce but slowly growing. Due to historical reasons, more French literature is available but harder to read for international audiences. Literature before the Pol Pot regime, such as Ebihara (1968) is insightful but outdated regarding the environment and social structures. The basis and details of this research has been unparalleled since. That is why this research broadens the knowledge of the rural societies and livelihoods in K'am Samnar in relation to water but also highlights the changes since the Pol Pot regime. This research provides an overview for further research in K'am Samnar and could be used as guiding.

Secondly, a practical implication of the research is that it could gain the interest of development organisations. A variety of (international) organizations are active in the area in areas of water development. The support of new development projects and organizations could give the local community a stronger voice and better positions during for example the planning process or in final decisions about the direct impacts on their livelihoods. On the other hand, organizations could provide the local villages and communities tools how to cope with climate change and to develop their livelihoods. This research could also attract the attention of the government of Cambodia to give insight in the rural livelihoods and pressing matters such as clean drinking water, market position and local differences.

### **Limitations**

This research has some limits. The most significant limit of this research was the time spent in the research area. Due to the COVID pandemic my research was terminated prematurely. First hand data is limited, but this was accommodated by the researchers of the Cambodian royal university of agriculture, my supervisor and secondary data. The limited time in the field

prevented me from building trust and a relationship with villagers for more in-depth data. During my fieldwork I also experienced other limitations which are listed below.

During field work I had to switch from translator. Our first translator did not have enough knowledge of the English language, which made the interviews very difficult. Due to the distance to the research site from my stay in Phnom Pehn, this switch could only be made after a week in the field. During the translating process it is possible that data were lost. There is always a chance that the interpreter summarizes the translation and selects responses during the translation process. To reduce the likelihood of this happening good communication and trust between the interpreter and the researcher is required. This of course goes for working with any translator, also very good ones.

Secondly, the research was conducted during the dry season in Cambodia. Consequently, the importance of water resources was also identified in the dry season since the water is scarcer during this time of the year. However, this research focusses on the seasonal floods and the entire lifeworld with water. Therefore, it would have been valuable to also conduct research during the flooding season to observe the water environment and the lifeworld(s) of the villagers during the floods. Especially since the people in that area are co-dependent of the floods and are dealing with this on a daily basis.

Third, the harvest period has had come to an end. The last harvest was conducted during the last week of the fieldwork. The next time I could have joined one of the farmers for the last harvest. During harvest, farmers are usually busy. Making appointments was harder due to their limited time so not every farmer (who would have been selected) could have been interviewed. This means that the collected data are not as comprehensive as presumed.

Lastly, cultural differences cause challenges when doing fieldwork abroad. Understanding the answers and responses of interviewees require a good understanding of the culture in this region. Even the help of an interpreter or help with the interpretation of the material can only partially overcome this issue. To overcome this, more time should be spent in the research area and with the research population.

## **Recommendations**

Considering the results of this research some recommendations can be suggested. These recommendations are made for practical implementations and for further research.

Based on these conclusions and discussion, practitioners such as the government or the province should involve the local commune or village chiefs at the beginning of rehabilitation projects, new regulations and management of water and land projects. Informing local

communes or villages is not enough. Inclusion to prevent ambiguity, dissatisfaction and misunderstandings can also create other possibilities, solutions, and approaches regarding issues. This does require raising awareness and maybe even so education when it comes to more technical matters. In order to prevent the waste of time, energy and money of every actor and, above all else, the efficiency and effectivity of the projects, communication and transparency are key.

Further research is needed to understand the relationship local villages, communes and people have with water and land. To better understand and confirm the results a future study will need to take place during the flooding season in the same study area. Another interesting study in the future could be comparison research between different areas in Cambodia to look closer at the impact of different topographies. Also, a study that is conducted at a higher level, for example regional, could also clarify more results. Lastly, a longer study period amongst the local population (on an ethnographic level) and government agencies such as MoWRAM can give the opportunity to observe the tolls these actors use in land and water practices.

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## Appendix A Operationalization questions

### **Hydro social lifeworlds**

- How are the relations between water and the community structured?
- How do you see the hydro social lifeworlds in the infrastructure in the village?
- How do villagers see water? What does it mean to them?
- What kind of connection do they have with water?
- Where do they use it for?
- What kind of hierarchy is there at community level? How is the power divided?
- How is local knowledge applied in water practices? Does it work? Why (not)?
- How does the local knowledge reflect traditional culture (religion, practices, divisions)?

### **Governance**

- How is the local system structured?
- What are the different kind of relationships within the village?
- Relationships as a community?
- Relationships between individual partnerships?
- How does this influence the water management?
- What kind of power relations within water management are there?
- Who is accountable/ responsible for the water resources?

### **Commons**

- What kind of water uses are there in the village?
- How much water is used for the multiple purposes?
- Who use the water resources?
- What are the power relations between the different types of users?
- Are there water rights/claims in the village?
- Who determines the right to access?
- Are there water conflicts?
- How is the water controlled? And by whom? Why?
- How is the management of water resources structured?

### **Food security**

- Remittances of relatives
- Land titles
- Profit from harvest/crops
- Environmental change
- Water flow from the Mekong river
- Debts



## Appendix B List of participants

### **Interviews during fieldwork**

#	Date	Name	Age	Gender	Role / Occupation	Village/commune
1	02/03	Village chief #1	71	Male	Village chief	K'am Samnar
2	03/03	Prek Leader 39	58	Male	Prek leader / farmer	K'am Samnar
3	03/03	Prek Leader 40	62	Male	Prek leader / farmer	K'am Samnar
4	04/03	Pump owner Prek 45	39	Male	Pump owner / farmer / contractor	K'am Samnar
5	04/03	Commune co- chief K'am Samnar	66	Male	Co-chief commune K'am Samnar	K'am Samnar
6	04/03	Prek Leader 36	68	Male	Prek leader / farmer	K'am Samnar
7	17/3	Village chief #2		Male	Village chief	K'am Samnar
8	17/3	The elder		Male	Elder	K'am Samnar

### **Survey Mr. Rothmono**

45 participants

20 female and 25 male

(separate file send via WeTransfer)

### **Interviews ECOLAND**

	<b>Name of interviewees</b>	<b>Position in the village</b>	<b>Contact</b>
1	Mr. Run	Deputy-village chief of Kaom Samnor village and agricultural agent of Kaom Samnor commune	097 963 0632
2	Mr. Sue	Elder person and Farmer	088 504 3843
3	Mr. Noy Phorn	Officer of the office of land management and administration of Luek Daek	015 946 465/097 999 3555
4	Mr. Lev Leng	Village chief of Kaom Samnor Lue	096 33 44 627
5	Mr. Em	Village chief of Reang Chor	097 679 3407
6	Mr. Ta Yorn	Village chief of Kaom Samnor Kroum	071 4124433

## Appendix C Informed consent form

English:

Subject: Research into water governance and food security of farmers in Kandal

I hereby declare that I have been clearly informed about the method and purpose of the research.

I understand that:

- (1) I can stop my participation in this research at any time and without giving a reason
- (2) data is processed anonymously, without being traceable to the person
- (3) the recording is separately stored after the interview has been worked out and will not be shared with others

I declare that:

- (1) I am fully willing to participate in this research
- (2) the results of this interview may be incorporated into a report or scientific publication
- (3) I give permission to have the interview recorded by means of a voice recorder

Participant name/number: \_\_\_\_\_

Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Signature: \_\_\_\_\_

I, the researcher, have provided explanation about the method and purpose of the research. I declare my willingness to answer emerging questions about the research.

Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Anna M. R. Koning

Signature: \_\_\_\_\_

Khmer:

សំណុំបែបបទយល់ព្រមផ្តល់ព័ត៌មាន

ប្រធានបទ៖ ស្រាវជ្រាវលើអភិបាលកិច្ចទឹកនិងសន្តិសុខស្បៀងរបស់កសិករនៅខេត្តកណ្តាល

ខ្ញុំសូមប្រកាសថាខ្ញុំត្រូវបានគេជូនដំណឹងយ៉ាងច្បាស់អំពីវិធីសាស្ត្រនិងគោលបំណងនៃការស្រាវជ្រាវ។

ខ្ញុំយល់ថា៖

(១) ខ្ញុំអាចបញ្ឈប់ការចូលរួមរបស់ខ្ញុំក្នុងការស្រាវជ្រាវនេះនៅពេលណាមួយនិងដោយមិនផ្តល់ហេតុផល

(២) ទិន្នន័យត្រូវបានដំណើរការដោយមិនបញ្ចេញឈ្មោះដោយមិនមាននរណាអាចកាត់ដានបាន

(៣)

ការថតសម្លេងត្រូវបានរក្សាទុកដោយឡែកពីគ្នាបន្ទាប់ពីការសម្ភាសត្រូវបានបញ្ចប់ហើយនិងមិនមាន

ត្រូវបានចែករំលែកជាមួយអ្នកដទៃ

ខ្ញុំសូមប្រកាសថា៖

(១) ខ្ញុំមានឆន្ទៈចូលរួមក្នុងការស្រាវជ្រាវនេះ

(២)

លទ្ធផលនៃបទសម្ភាសន៍នេះអាចត្រូវបានបញ្ចូលទៅក្នុងរបាយការណ៍ឬការបោះពុម្ពផ្សាយវិទ្យាសាស្ត្រ

(៣) ខ្ញុំផ្តល់ការអនុញ្ញាតឱ្យថតសំភាសន៍តាមរយៈមធ្យោបាយថតសំលេង

ឈ្មោះ / លេខអ្នកចូលរួម៖ \_\_\_\_\_

កាលបរិច្ឆេទ៖ \_\_\_\_ / \_\_\_\_ / \_\_\_\_

ហត្ថលេខា៖ \_\_\_\_\_

ខ្ញុំអ្នកស្រាវជ្រាវបានផ្តល់ការពន្យល់អំពីវិធីសាស្ត្រនិងគោលបំណងនៃការស្រាវជ្រាវ។

ខ្ញុំប្រកាសពីឆន្ទៈរបស់ខ្ញុំក្នុងការឆ្លើយសំណួរដែលកំពុងលេចឡើងអំពីការស្រាវជ្រាវ។

កាលបរិច្ឆេទ៖ \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Anna M. R. Koning

ហត្ថលេខា៖ \_\_\_\_\_

## Appendix D Interview guides

### Interview guide - Farmer

Thank you for participating in my research. The interview can be conducted completely anonymously also throughout the rapport if you want to. Preferably, I would like to record the interview, so my analysis of every interview can be more thorough.

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### Questions

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#### Introduction

1. Have you lived here all your life?
  - Do you like living in this village?
  - Would you ever move to another place? Where would that be?
2. Can you tell me your occupation?
  - Do you like being a xxx?
  - What do you not like about your job?

#### Food security

3. Do you have a family? How many children?
  - Do they all live at home?
  - Do some of your relatives or children send you money?
  - Do you have relatives in your village?
4. How many times per day do you go to your field? How many hours per day do you spend there?
  - What do you do on the field?
  - What materials do you use?
  - What does your family do meanwhile? What does your wife do?
  - What do you do when do not have to be on the land?
5. Do you work together with other members of your family to cultivate crops?
  - Does 'Prova' exist? (voluntary mutual help)
  - What does your wife/husband/daughter/son do?
    - Why is this (maybe) different from your tasks?
    - Has this been different in the past?
6. Do you work together with other farmers outside your family? Why?
  - Are there organizations in your village who help you with your food cultivation?
    - How does this work?
  - Do you hire people or services to cultivate your land? Can you give me an example?
  - What is the role of women in crop cultivation?
  - Have you heard of 'Srey Bangvel Changkran Minchum': Women are not capable of doing anything but house chores.
7. Where does your drinking water comes from? Do people get sick of drinking wrong water?
8. What crops do you cultivate?
  - When do you plant and harvest?
  - Do you perform any rituals during harvest or planting? Why?
9. How much land do you cultivate?
  - How much of your harvest do keep for yourself and how much do you sell?
  - Do you have enough for your family? If not, how do you cope with this?
  - Have you taken any loans? For what? How do you reimburse them?
  - Do you have other sources of income?

### **Changing patterns**

10. Has the environment changed over the last 5-10 years in this area? Can you describe what exactly and when this was?

- Did you change crops due to drought or flood or other environmental change?

When was this?

- What do you think causes these problems? Or who?

- Did you cultivate other crops before due these problems?

11. Are there any negative affects during the flooding season?

- How do the fruit trees thrive under the floods?

- Do you think this environmental change will get worse? How?

### **Governance**

12. Do you have your own land you can cultivate?

- How much land do you have? How is the distribution of the land handled?

- Do you have land titles?

- Where is it registered? How does this work?

- Rent: How much do you pay/ From who do you rent? / Why this piece of land?

- To whom do you go to in this village if you want to cultivate crops on a piece of land?

- Who decides what piece of land you can get? Why?

- Do some people get more or better pieces of land? Why?

13. What rules are there in the villages among farmers about using land and water?

14. Have you changed over time with different pieces of land? How does that work?

15. Can your wife or other women in the village own or rent land or get land titles?

16. Can you tell me how you grow your crops?

- What water resources do you use?

- Who else uses the same water? Does this mean that you sometimes have less water for your cultivation?

- I saw last week that someone collected the grass leftover from the rice harvest. Where do they use it for? Are all people allowed to do this or do you know these people?

17. What are the main difficulties/challenges do you have with cultivating your crops?

18. Have droughts or floods affected you negatively?

- Can you give an example of what happened and when?

18. Can anyone else use your land?

- What happens if they do? Can you give an example of what they do and why?

19. Are there pieces of land everybody can use?

- How does this work?

- Are there also pieces no one can use? Why?

20. Does anyone steal your crops (maize/mangos/grass.etc)? Do you go to the police or how do you solve or handle this?

### **Water practices**

21. What does the Mekong river mean to you?

- Where do you use the water for? Other than cultivating your crops?

- Have you observed changes in river flow/amount of water/quality of water regarding Prek water, pump, slues, etc?

- How do you think this has happened?

- Do you have any rituals when it comes to water?

22. What does the Prek mean to you?
- How does the water get into the Prek in this dry season (slues, pump, earthen wall, nothing, or other type)?
  - How did get its name? When was this?
  - Can you use as much water as you like?
  - How is the water quality in the Prek? How come it is good/bad?
  - Who controls the amount of water coming into the prek? Why?
  - Do you have to pay for the water?
  - Can you have a say in management of the water? Can other members of your family have a say?
  - Do some people get more water? Why?
  - Have you seen changes in the water levels during the dry season over the last 5 years? Can you describe this? What do you think causes this?
  - Have you also seen changes during the wet season? Can you describe this? What do you think causes this?
23. Can women become a Prek leader?
24. How is the Prek management organized?
25. Do you think using a pump/slues/etc. is a good way to get water into the prek or are there better solutions? Why? Why are they not implemented?

### **Spirit practices**

26. What traditional celebrations do you have during the year?
- What do they mean to you?
27. When you take something from the land or from the river, do you need to give something in return?
- Do you have offerings or parties in relation to your use of the land and the water?
  - How does that work?
  - Why do you do this?
28. What does: “Arak Neak ta, lok ta” means to you? (the owner/master of the water and the land).
29. How did your ancestors cultivate their land?
- Did they have many rituals?
  - Do they still exist today? Can you give an example?
- Are there practices from the government which are the opposite to your ritual practices or belief? How? Can you give an example?
30. What happens if you don't perform the ritual? Does this bring bad luck or is it just not protected?
31. Did Lok Ta caused any reprisal actions to people or the environment due to wrongdoings of people or developmental projects such as building roads.

### **Power relations**

32. Are there different type of religions and/or cultures in this commune/village?
- Do different rules apply to these groups? Why?

### **Conflicts**

33. Do you know there have been conflicts over sharing or diving the land in this village?
- When was this? Between who? Why did it happen?
34. Are there any conflicts between you or maybe other members in this village?
- Can you tell me what it is about?

**Entanglement government**

35. Does the government or provincial department control or fund anything about land or water in this village?

- Which one? How does this work? Does it work what they want?
- What does work according to you?
- Do other government officials have land or water rights in your village?

**Closing question**

36. What do you think could work better in your village regarding the land and water access, user quality and/or availability?

37. What do you hope for your children in the future or even the next generation?

## Interview guide – commune/village chief

Thank you for participating in my research. The interview can be conducted completely anonymously also throughout the rapport if you want to. Preferably, I would like to record the interview, so my analysis of every interview can be more thorough.

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### Questions

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#### Introduction

1. Have you lived here all your life?
  - Do you like living in this village?
  - Would you ever move to another place? Where would that be?
2. How long have you been a village/commune chief?
  - What have you done before this?
  - Do you like being a xxx?
  - What do you not like about your job?
  - What are your responsibilities?
  - What is your most important element of your job as a leader?
3. How many villages are there in this commune?
  - How many people live here? Village or commune
  - How many women work in community. Or per village. Percentage.

#### Food security

4. Are there problems with food security?
5. Do you personally have any problems with food security?
6. Do people move out of this commune? Why?
  - Where do they go?

#### Changing patterns

7. Has the environment changed over the last 5 (10 but maybe too hard to remember) years in this area? Can you describe what exactly and when this was?
  - Are there backups for people or do you or anyone else help them?
  - Has this negatively affected the crops?
  - Did you change crops due to drought or flood or other environmental change?  
When was this?
- What do you think causes these problems? Or who?
- Did you or others cultivate different crops before due these problems?

#### Governance

“See yesterday people have different plots in different places with different ownership status.” – JPV, 2020

8. How is water access, use, availability and quality governed?
  - Can everyone take as much water as they need for their crops and livelihood?
  - What does this mean for others who have little water left? Or is there always enough water?
9. How does the water get into the Prek in this dry season (slues, pump, earthen wall, nothing, or other type)? Does this happen for every Prek? Why does it differ?
  - Can you use as much water as you like?
  - How is the water quality in the Prek? How come it is good/bad?
  - Who controls the amount of water coming into the prek? Why? Do you have to pay for the water?
  - Do some people get more water? Why?
10. Do you work together with other village or commune chief to govern water or land?
  - How is the collaboration created? Do you always agree with each other?



11. Do people work together in villages or over the entire commune?
  - Are there committees or other types of organizations in which people work together?
12. Are you part of a committee? Where is it for?
  - How does this committee work?
  - Who can be on the committee?
13. I saw several signs along the road in Leuk Daek district with land for rent or sale. Who puts those signs there? How much do you pay for a hectare of land?
14. If you want to have a piece of land for cultivation, where should I go?
  - Where is it registered? How does this work?
  - Can people loan money? Where can they do this? How does this work with down payments?
  - Can women get a loan to buy their own land?
  - Rent: How much do you pay? / From who do you rent? / Why this piece of land?
  - To whom do you go to in this village if you want to cultivate crops on a piece of land?
  - How is the division of land governed?
    - Who decides what piece of land you can get? Why?
    - Do some people get more or better pieces of land? Why?
15. Do you have your own land for cultivation?
  - Who cultivates the land for you?
16. Can women own and cultivate their own land?
  - Why?
  - Are there certain rules for women?
17. What are the main challenges in governing land and water?
18. Where does the cattle graze?
  - Does that lead to any debates or conflicts?
19. Are there pieces of land everybody can use? Or pieces no one can use? Why?
  - How does this work?
  - Do sometimes people use your land? Why?
20. Since you are close to the Vietnamese border do you have migrants living here?
  - Can they own land? Why?

### **Water practices**

21. What does the Mekong river mean to you?
  - Where do you use the water for?
  - Have you observed changes in river flow/amount of water/quality of water?
  - How do you think this has happened?
22. What does the Prek mean to you?
  - Is every Prek the same? - How did get its name?
  - How many Preks are there in this commune?
  - Have you seen changes in the water levels during the dry season over the last 5 years? Can you describe this? What or who do you think causes this?
  - Have you also seen changes during the wet season? Can you describe this? What do you think causes this?

### **Spirit practices**

23. Are there rituals or spiritual practices in your commune?
  - Has this changed over time? Can you give an example?
24. When you take something from the land or from the river, do you need to give something in return?

25. Do you have offerings or parties in relation to your use of the land and the water?  
 - How does that work?  
 - Why do you do this?
26. What does: “Arak Neak ta, lok ta” means to you? (the owner/master of the water and the land).
27. Are there any rituals during harvest of plant season? Where does this come from? Why do you do this?
28. Do you have any rituals when it comes to water?

### **Power relations**

29. To whom do you hold responsibilities? And who to you?  
 - How does this work?

### **Conflicts**

30. Do you know there have been conflicts over sharing or diving the land in this village?  
 - When was this? Between who? Why did it happen?
31. Are there any conflicts between you or maybe other members in this village?  
 - Can you tell me what it is about?  
 - What role do you have in a conflict?  
 - What conflicts are more important than other? Also if you are a men or women? What would be the difference between men and women?

### **Entanglement government**

32. Does the government or provincial department control or fund anything about land or water in this village?  
 - Which one? How does this work? Does it work what they want?  
 - What does work according to you?  
 - Do other government officials have land or water rights in your village?
33. Do foreign companies or organizations sometimes meet you? Or do they have projects in your commune?

### **Closing question**

34. How do you compare your commune with the other communes in Leuk Daek with the status of the Preks?  
 - What is it that you would like to change for the people living in your commune?
35. What do you think could work better in your village regarding the land and water access, user quality and/or availability?
36. What do you hope for your children in the future or even the next generation?

## Interview guide - Female

Thank you for participating in my research. The interview can be conducted completely anonymously also throughout the rapport if you want to. Preferably, I would like to record the interview, so my analysis of every interview can be more thorough.

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### Questions

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#### Introduction

1. Have you lived here all your life?
  - Do you like living in this village?
  - Would you ever move to another place? Where would that be?
2. Are you married or about to marry?
3. Can you tell me your occupation? What do you do during a day?
  - Do you like being a xxx?
  - What do you not like about your job?

#### Food security

4. Do you have children?
  - Do they all live at home?
    - What do you hope your children will do in the future?
  - Do some of your relatives or children send you money?
  - Do you have relatives in your village?
5. How many times per day do you go to your field? How many hours per day do you spend there?
  - What do you do on the field?
  - What materials do you use?
  - What does your family do meanwhile? What does your wife do?
6. Do you work together with other members of your family to cultivate crops?
  - What does your husband/daughter/son do?
    - Why is are the roles (maybe) different?
    - Has this been different in the past?
7. Do you work together with other farmers outside your family? Why?
  - Are there organizations in your village who help you with your food cultivation?
  - How does this work?
8. What crops do you cultivate?
  - When do you plant and harvest?
  - Do you perform any rituals during harvest or planting? Why?
9. How much land do you cultivate?
  - How much of your harvest do keep for yourself and how much do you sell?
  - Do you have enough for your family? If not, how do you cope with this?
  - Have you taken any loans? For what? How do you reimburse them?
  - Do you have other sources of income?

#### Changing patterns

10. Has the environment changed over the last 5-10 years in this area? Can you describe what exactly and when this was?
  - Did you change crops due to drought or flood or other environmental change?  
When was this?
  - What do you think causes these problems? Or who?
  - Did you cultivate other crops before due these problems?

## **Governance**

11. Do you have your own land you can cultivate?
  - How much land do you have? How is the distribution of the land handled?
  - Do you have land titles?
  - Where is it registered? How does this work?
  - Rent: How much do you pay/ From who do you rent? / Why this piece of land?
  - To whom do you go to in this village if you want to cultivate crops on a piece of land?
  - Who decides what piece of land you can get? Why?
  - Do some people get more or better pieces of land? Why?
12. What rules are there in the villages among farmers about using land and water?
13. Have you changed over time with different pieces of land? How does that work?
14. If people talk about who owns land or about the access to land/water, do you have anything to say in it?
15. Can you tell me how you grow your crops?
  - What water resources do you use?
  - Who else uses the same water? Does this mean that you sometimes have less water for your cultivation?
  - I saw last week that someone collected the grass leftover from the rice harvest. Where do they use it for? Are all people allowed to do this or do you know these people?
16. What are the main difficulties/challenges do you have with cultivating your crops?
17. Have droughts or floods affected you negatively?
  - Can you give an example of what happened and when?
18. Can anyone else use your land?
  - What happens if they do? Can you give an example of what they do and why?
19. Are there pieces of land everybody can use? Or pieces no one can use? Why?
  - How does this work?

## **Water practices**

20. What does the Mekong river mean to you?
  - Where do you use the water for? Other than cultivating your crops?
  - Have you observed changes in river flow/amount of water/quality of water?
  - How do you think this has happened?
  - Do you have any rituals when it comes to water?
21. What does the Prek mean to you?
  - Are there things men can do with or in the prek you cannot do or are not allowed to do?
  - How does the water get into the Prek in this dry season (slues, pump, earthen wall, nothing, or other type)?
  - How did get its name? When was this?
  - Can you use as much water as you like?
  - How is the water quality in the Prek? How come it is good/bad?
  - Who controls the amount of water coming into the Prek? Why?
  - Do you have to pay for the water?
  - Can you have a say in management of the water? Why?
  - Do some people get more water? Why?
  - Have you seen changes in the water levels during the dry season over the last 5 years? Can you describe this? What do you think causes this?
  - Have you also seen changes during the wet season? Can you describe this? What do

you think causes this?

### **Spirit practices**

22. When you take something from the land or from the river, do you need to give 22. something in return?
- Do you have offerings or parties in relation to your use of the land and the water?
  - How does that work?
  - Why do you do this?
23. What does: “Arak Neak ta, lok ta” means to you? (the owner/master of the water and the land).
24. How did your ancestors cultivate their land?
- Did they have many rituals?
  - Do they still exist today? Can you give an example?
25. How did your ancestors cultivate their land?
- Did they have many rituals?
  - Do they still exist today? Can you give an example?
- Are there practices from the government which are the opposite to your ritual practices or belief? How? Can you give an example?
26. What happens if you don't perform the ritual? Does this bring bad luck or is it just not protected?
27. Did Lok Ta caused any reprisal actions to people or the environment due to wrongdoings of people or developmental projects such as building roads.

### **Power relations**

28. Can you do the same things men do?
- Do you want to do the same things as men do?
  - Are there rules what women may or may not do? Why?
  - Do you think it should be different? How?
  - Have the rules changed over time? Why?
29. Do you work together with other women in the village? Can you give an example?
30. Are there different type of religions and/or cultures in this commune/village?
- Do different rules apply to these groups? Why?

### **Conflicts**

31. Do you know there have been conflicts over sharing or diving the land in this village?
- When was this? Between who? Why did it happen, main reason (5 reasons)?
  - How is it solved?
32. Are there any conflicts between you or maybe other members in this village?
- Can you tell me what it is about?
33. Are there any conflicts between men and women? Can you give an example?

### **Entanglement government**

34. Does the government or provincial department control anything about land or water in this village?
- Which one? How does this work? Does it work what they want?
  - What does work according to you?
  - Do other government officials have land or water rights in your village?

### **Closing question**

35. What do you think could work better in your village regarding the land and water access, user quality and/or availability?
36. What do you hope for your children in the future or even the next generation?

## Interview guide – ECOLAND

Raksmey - November 2020

1. Tell a story about harvesting and how it has changed.
2. Do farmers collectively harvest?
  - a. If yes, why?
  - b. If no, is machinery shared or exchanged? How?
  - c. Does this differ per crop? Or is it only with rice cultivation?
    - i. Do they also work together during the sowing period?
      1. If yes, why?
3. Do farmers collectively irrigate?
  - a. Does this mean that every crop of every farmer grows evenly, and harvesting is simultaneously?
4. Does *Provas Dai* still exist? Why (not)?
5. Working at the lower end of the Prek, how they work and how that changed.
6. Why are there no Boeung/water reservoirs in Leuk Daek?
7. Which products of the harvest do farmers use for their own use and what part of the products are being used for the market?
8. Can farmers sell their land to anyone?
  - a. If not, what are the exceptions?
  - b. Do they have to report this to a certain (hierarchical) structure? E.g. village chief, commune chief, district land administration, etc., etc.
  - c. Can they also sell their land to foreign companies or domestic companies?
  - d. Are there differences in rules when selling land, in types of land (e.g. village, agricultural land, land across the Mekong or the Preks)?
9. What happened to the pieces of land along the Mekong with the enormous amount of sand on it?
  - a. To whom was this land sold? And why?
  - b. What are they going to do with it?
  - c. Who has put the sand on it? And why?
10. Is Prek 36 (the rehabilitated Prek) the textbook example for all the other Preks?
  - a. So, do all the other Preks need to become like that one? Would you like to?
  - b. Why (not)? What is the best type of rehabilitation?
  - c. What are the pros and cons of rehabilitating a Prek?
11. During rainy season, does the water from the Mekong flow into the Prek (not rehabilitated Preks) due to high water and subsequently floods the land?
  - a. Or Does the ground level water rise significantly so that the land gets flooded that way?
  - b. How does the rehabilitated Prek no. 36 influence this process?
  - c. What does this mean for the crops? (rice/mango/maize)
12. Relationship with Vietnam and how this changed village life and farmer life.

## Appendix E Survey

### Survey Leuk Daek district, K'am Samnar commune

Dear sir, madam,

I am a master student for International Development Studies at the University of Utrecht. I conduct this research to examine the way farmers secure their food and govern their water and land in K'am Samnar.

This survey is completely anonymous, and the data will only be visible for me. No personal data is linked to you as a person and therefore you are not retraceable. During the collection of data and during the process of writing the thesis, the data will be stored under my personal care. The collector will send me the data. After the completion of the thesis all data will be stored on my personal computer. If you have any questions regarding this research, please contact me on: [a.m.r.koning@students.uu.nl](mailto:a.m.r.koning@students.uu.nl)

#### 1. Food and water security

1. Primary occupation	<input type="checkbox"/> Farmer <input type="checkbox"/> Village chief <input type="checkbox"/> Prek leader <input type="checkbox"/> Prek Pump owner <input type="checkbox"/> Jobless <input type="checkbox"/> House chores <input type="checkbox"/> Contractor <input type="checkbox"/> Other:
2. Secondary occupation	<input type="checkbox"/> Retail business <input type="checkbox"/> Pension fund <input type="checkbox"/> Agricultural wage labour <input type="checkbox"/> Motor taxi driver <input type="checkbox"/> Construction worker <input type="checkbox"/> Garment worker <input type="checkbox"/> Individual fishing <input type="checkbox"/> Livestock rearing <input type="checkbox"/> Palm juice/sugar production <input type="checkbox"/> Farmer <input type="checkbox"/> Village chief <input type="checkbox"/> Prek leader <input type="checkbox"/> Prek Pump owner <input type="checkbox"/> House chores <input type="checkbox"/> Contractor <input type="checkbox"/> Other: <input type="checkbox"/> None
3. What crops do you cultivate? (>1 answer possible)	<input type="checkbox"/> Rice <input type="checkbox"/> Maize <input type="checkbox"/> Mango <input type="checkbox"/> Vegetables <input type="checkbox"/> Chamkar with mixed vegetables and fruit tree <input type="checkbox"/> N/A <input type="checkbox"/> Other:
4. Do you have enough harvest for your livelihood?	<input type="checkbox"/> Yes <input type="checkbox"/> Yes and I can also sell my harvest <input type="checkbox"/> No <input type="checkbox"/> I do not cultivate food so I need to buy food <input type="checkbox"/> No, I need to buy food from the market <input type="checkbox"/> Other:
5. Do you always have enough food for the entire year?	<input type="checkbox"/> Yes (proceed to 4) <input type="checkbox"/> No
6. How come?	<input type="checkbox"/> Due to drought my harvest has declined <input type="checkbox"/> Due to pests my harvest has declined <input type="checkbox"/> I do not have enough land, so my harvest is too small <input type="checkbox"/> Other:
7. What is your yearly income?	Farm: <input type="checkbox"/> 0-500.000 riel <input type="checkbox"/> 500.001-1 mln riel <input type="checkbox"/> 1 mln-3 mln riel <input type="checkbox"/> 3 mln-5 mln riel <input type="checkbox"/> >5 mln riel ( <b>specify per crop if necessary</b> ) Non-farm: <input type="checkbox"/> 0-500.000 riel <input type="checkbox"/> 500.001-1 mln riel <input type="checkbox"/> 1 mln-3 mln riel <input type="checkbox"/> 3 mln-5 mln riel <input type="checkbox"/> >5 mln riel Off-farm: <input type="checkbox"/> 0-500.000 riel <input type="checkbox"/> 500.001-1 mln riel <input type="checkbox"/> 1 mln-3 mln riel <input type="checkbox"/> 3 mln-5 mln riel <input type="checkbox"/> >5 mln riel
7a. How much do you spend?	<input type="checkbox"/> 0-500.000 riel <input type="checkbox"/> 500.001-1 mln riel <input type="checkbox"/> 1 mln-3 mln riel <input type="checkbox"/> 3 mln-5 mln riel <input type="checkbox"/> >5 mln riel
8. Do you receive remittances?	<input type="checkbox"/> Yes <input type="checkbox"/> No (proceed to 7)
9. From who? (>1 answer possible)	<input type="checkbox"/> My children <input type="checkbox"/> other relatives <input type="checkbox"/> N/A <input type="checkbox"/> Friends <input type="checkbox"/> Neighbours or other farmers <input type="checkbox"/> other:
10. How much do you receive?	<input type="checkbox"/> Riel per month / year
11. Where do you use the money for? (>1 answer possible)	<input type="checkbox"/> Health care <input type="checkbox"/> Education for children <input type="checkbox"/> agricultural investment <input type="checkbox"/> business investment <input type="checkbox"/> Paying off debt/loan <input type="checkbox"/> Home renovation <input type="checkbox"/> Savings <input type="checkbox"/> Ceremony/wedding/party <input type="checkbox"/> Food <input type="checkbox"/> Building new house <input type="checkbox"/> Helping family for migration <input type="checkbox"/> Other:
12. Do you have livestock?	<input type="checkbox"/> Buffalo <input type="checkbox"/> Goats <input type="checkbox"/> Cows <input type="checkbox"/> Pigs <input type="checkbox"/> Other: <input type="checkbox"/> No
13. Do you have any loans?	<input type="checkbox"/> Yes <input type="checkbox"/> No (go to d.)
14. Where do you use the loans for? (>1 answer possible)	<input type="checkbox"/> To buy agricultural inputs (chemical/pesticides) <input type="checkbox"/> To buy agricultural machinery (tractor, labour, sprayer, etc.) <input type="checkbox"/> To buy agricultural land <input type="checkbox"/> Investment in non-agriculture (shop, small business, etc.)



	<input type="checkbox"/> To build a house <input type="checkbox"/> To feed my family (buy more food) <input type="checkbox"/> To cope with crop failure <input type="checkbox"/> To pay for medical treatment <input type="checkbox"/> To pay for children's education <input type="checkbox"/> To repay previous debt <input type="checkbox"/> marriage/ceremony <input type="checkbox"/> For own migration <input type="checkbox"/> To help family members (children/married couple) to start business <input type="checkbox"/> To help family members (children/married couple) to start agricultural work <input type="checkbox"/> To support older members of family (parents) <input type="checkbox"/> Other :
15. How do you obtain the loans?	<input type="checkbox"/> Private bank <input type="checkbox"/> Family <input type="checkbox"/> Other farmers <input type="checkbox"/> Neighbours <input type="checkbox"/> Saving group <input type="checkbox"/> Other:
16. What means do you use as collateral? (>1 answer possible)	<input type="checkbox"/> Land title <input type="checkbox"/> House <input type="checkbox"/> Motor/car <input type="checkbox"/> Machine <input type="checkbox"/> Family member house/land title/etc. <input type="checkbox"/> Local authority witness <input type="checkbox"/> ID card <input type="checkbox"/> Livestock <input type="checkbox"/> Committee <input type="checkbox"/> Other:
17. If you do not have loans, why not?	<input type="checkbox"/> I don't need it <input type="checkbox"/> I cannot afford it <input type="checkbox"/> Too complicated <input type="checkbox"/> The interest is too high <input type="checkbox"/> I don't have collateral <input type="checkbox"/> Other:
18. Do you own land?	<input type="checkbox"/> Yes <input type="checkbox"/> No (go to 10)
19. If yes, how much hectare?	<input type="checkbox"/> _____
20. What is your plot number in the Prek area?	<input type="checkbox"/> _____
13. Do you rent land?	<input type="checkbox"/> Yes <input type="checkbox"/> No
14. If yes, how much hectare?	<input type="checkbox"/> _____
15. If yes, why do you rent land?	<input type="checkbox"/> I do not have land of my own <input type="checkbox"/> I don't have enough land <input type="checkbox"/> Other:
16. What are your natural resource collections? (>1 answer possible)	<input type="checkbox"/> Fish <input type="checkbox"/> Fresh water shrimp <input type="checkbox"/> Snails <input type="checkbox"/> Crabs <input type="checkbox"/> Snakes <input type="checkbox"/> Firewood <input type="checkbox"/> Grass for cattle <input type="checkbox"/> Water lily <input type="checkbox"/> Crickets and other insects <input type="checkbox"/> Frogs <input type="checkbox"/> Mice/Rat <input type="checkbox"/> Other:
17. How do you obtain your drinking water?	<input type="checkbox"/> Mekong river <input type="checkbox"/> Prek <input type="checkbox"/> Bottles <input type="checkbox"/> Groundwater with pump <input type="checkbox"/> Other:
18. Are you happy with the quality of your drinking water?	<input type="checkbox"/> Yes <input type="checkbox"/> No
19. Do you always have enough drinking water?	<input type="checkbox"/> Yes <input type="checkbox"/> No, sometimes I buy more bottled water <input type="checkbox"/> No, sometimes I use water from the Mekong river <input type="checkbox"/> No, sometimes I use water from the Prek <input type="checkbox"/> No, sometimes I use groundwater <input type="checkbox"/> No, sometimes I buy groundwater <input type="checkbox"/> Other:
20. Do you drink water out of the Mekong river?	<input type="checkbox"/> Yes <input type="checkbox"/> No (proceed to "water and land practices") <input type="checkbox"/> Yes, but I always boil it first <input type="checkbox"/> Other:
21. Do you always boil or filter the water out of the Mekong river?	Yes <input type="checkbox"/> No <input type="checkbox"/> Sometimes

## 2. Water and land practices

22. For which activities do you use the water of the Mekong river? (>1 answer possible)	<input type="checkbox"/> Drinking water <input type="checkbox"/> Cooking <input type="checkbox"/> Washing/cleaning <input type="checkbox"/> Irrigation agriculture <input type="checkbox"/> Other: <input type="checkbox"/> I don't use the water
23. How do you obtain water from the Mekong?	<input type="checkbox"/> Small material <input type="checkbox"/> Pump <input type="checkbox"/> Other machine <input type="checkbox"/> Other: <input type="checkbox"/> I don't use the water
24. Are you satisfied with the quality of the water?	<input type="checkbox"/> Yes <input type="checkbox"/> No
25. For which activities do you use the water of the Prek? (>1 answer possible)	<input type="checkbox"/> Drinking water <input type="checkbox"/> Cooking <input type="checkbox"/> Washing/cleaning <input type="checkbox"/> Irrigation agriculture <input type="checkbox"/> Other: <input type="checkbox"/> I don't use the water
26. How do you obtain water from the Prek to irrigate your field?	<input type="checkbox"/> Small material <input type="checkbox"/> Pump <input type="checkbox"/> Other machine <input type="checkbox"/> Other: <input type="checkbox"/> I don't use the water

27. Is there enough water throughout the year to irrigate your field?	<input type="checkbox"/> Yes <input type="checkbox"/> No
28. Are you satisfied with the quality of the water?	<input type="checkbox"/> Yes <input type="checkbox"/> No
29. Is there a difference in the quality of the water in the Prek and the Mekong?	<input type="checkbox"/> Yes, why? _____ <input type="checkbox"/> No, why? _____
30. What fertilizers do you use for your field?	<input type="checkbox"/> Chemical fertilizer bought from Vietnam <input type="checkbox"/> Natural fertilizer (sediment from flood) <input type="checkbox"/> Chemical fertilizers bought in Cambodia <input type="checkbox"/> Compost <input type="checkbox"/> I don't use fertilizers
31. Do you use pesticides for your crops?	<input type="checkbox"/> Chemical pesticides bought from Vietnam <input type="checkbox"/> Chemical pesticides bought in Cambodia <input type="checkbox"/> Other: _____ <input type="checkbox"/> No, Why? _____

### 3. Governance

32. Do you share land in the rainy season?	<input type="checkbox"/> Yes <input type="checkbox"/> No (proceed to c)
33. If yes, with whom?	<input type="checkbox"/> Other famers <input type="checkbox"/> Fishermen <input type="checkbox"/> Other: _____
34. If yes, why?	<input type="checkbox"/>
35. If not, why?	<input type="checkbox"/> I don't trust others <input type="checkbox"/> No need <input type="checkbox"/> Other: _____
36. Do people also use your land without your consent in the rainy season?	<input type="checkbox"/> Yes, why? _____ <input type="checkbox"/> No
37. Which Prek is the most important for you (number and name)?	<input type="checkbox"/> _____
38. Do you live next to a Prek?	<input type="checkbox"/> Yes <input type="checkbox"/> No, I live in the village <input type="checkbox"/> Other: _____
39. If yes, which Prek?	<input type="checkbox"/> Name and number: _____
40. Are you satisfied with the quality of the Prek itself (not the water)?	<input type="checkbox"/> Yes <input type="checkbox"/> No
41. How does the Prek retain the water in the dry season?	<input type="checkbox"/> Dredged so there is always water <input type="checkbox"/> Pump <input type="checkbox"/> Other: _____
42. Do you receive enough water for your field from the pump station?	<input type="checkbox"/> Yes <input type="checkbox"/> No
43. Are you satisfied with the owner of the pump station of your Prek?	<input type="checkbox"/> Yes, why? _____ <input type="checkbox"/> No, why? _____
44. Are you satisfied with the payment to the pump station owner?	<input type="checkbox"/> Yes <input type="checkbox"/> No, why? _____
45. How does the pump station owner collect the money?	<input type="checkbox"/> During a meeting <input type="checkbox"/> He collects it personally <input type="checkbox"/> I must go to him whenever I need the water <input type="checkbox"/> Other: _____
46. Do you always pay the pump station owner?	<input type="checkbox"/> Yes <input type="checkbox"/> No, why? _____
47. Do you need to help keeping the Prek clean?	<input type="checkbox"/> Yes <input type="checkbox"/> No
48. Do you clean your part yourself?	<input type="checkbox"/> Yes, why? _____ <input type="checkbox"/> No, why? _____
49. Is there a Prek User Committee for your Prek?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A (proceed to 9)
50. Are you a member of the Prek User Committee?	<input type="checkbox"/> Yes <input type="checkbox"/> No
51. Do you attend the meetings?	<input type="checkbox"/> Yes <input type="checkbox"/> No, why? _____
52. Do you adhere to the regulations of the use of the Prek?	<input type="checkbox"/> Yes, why? _____ <input type="checkbox"/> No, why? _____
53. Are you a member of another committee?	<input type="checkbox"/> Yes, which?: _____ <input type="checkbox"/> No
54. Are there rehabilitated prek in your area?	<input type="checkbox"/> Yes <input type="checkbox"/> No (proceed to b)

55. What is the result?	<input type="checkbox"/> The gate is broken due to the flood <input type="checkbox"/> The gate is too small <input type="checkbox"/> The gate works good <input type="checkbox"/> Other:
56. What is your perception on the rehabilitation projects of preks? (>1 answer possible)	<input type="checkbox"/> There is now a regular inflow of water <input type="checkbox"/> It is broken <input type="checkbox"/> I have an increase in harvest now <input type="checkbox"/> Provides enough water <input type="checkbox"/> Bigger flood <input type="checkbox"/> Fragile Prek <input type="checkbox"/> Other:

#### 4. Changing patterns

57. Have you seen changes in the climate and/or environment over the last 5 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No (proceed to 5)
58. What are the changes? (>1 answer possible)	<input type="checkbox"/> More drought <input type="checkbox"/> Less rain <input type="checkbox"/> Less forest <input type="checkbox"/> Heavier floods <input type="checkbox"/> More rain <input type="checkbox"/> Less fish <input type="checkbox"/> More plagues and pests <input type="checkbox"/> No changes <input type="checkbox"/> More agricultural ground <input type="checkbox"/> More extremes <input type="checkbox"/> Less agricultural ground <input type="checkbox"/> Irregular flooding <input type="checkbox"/> Other:
59. What are the causes of these changes you think personally? (>1 answer possible)	<input type="checkbox"/> Less forest <input type="checkbox"/> Pollution <input type="checkbox"/> Angry spirits <input type="checkbox"/> Dam construction <input type="checkbox"/> Other:
60. Do you perceive you have had losses due to the environmental changes?	<input type="checkbox"/> Reduced quantity in harvest <input type="checkbox"/> Crop losses <input type="checkbox"/> Other: <input type="checkbox"/> No
61. Have there been organizations who have helped you or others in your community/village in problem solving?	<input type="checkbox"/> Yes <input type="checkbox"/> No
62. How is the efficiency of those interventions?	<input type="checkbox"/> I don't know <input type="checkbox"/> I have seen no changes <input type="checkbox"/> More crops <input type="checkbox"/> Cleaner water <input type="checkbox"/> Other:

#### 5. Spirit practices

63. Do you perform any rituals?	<input type="checkbox"/> Yes <input type="checkbox"/> No, why? (proceed to 'conflicts')
64. Which rituals do you perform? (>1 answer possible)	<input type="checkbox"/> Neak Tah <input type="checkbox"/> Hae Nam Mav <input type="checkbox"/> Morinh Kongveal <input type="checkbox"/> Other:
65. Do you think these rituals work?	<input type="checkbox"/> Yes, why?: _____ <input type="checkbox"/> No, why?: _____
66. Have the rituals changed over the last 5 years?	<input type="checkbox"/> Yes, why? _____ <input type="checkbox"/> No
67. Do you think more people should perform rituals?	<input type="checkbox"/> Yes <input type="checkbox"/> No
68. What is the main reason for performing rituals?	<input type="checkbox"/> Health for me and my family <input type="checkbox"/> Protection for me and my family <input type="checkbox"/> More money <input type="checkbox"/> To solve a problem <input type="checkbox"/> Because I am taught to do it <input type="checkbox"/> Just in case <input type="checkbox"/> Other:

#### 6. Conflicts

69. Do people steal products from your land?	<input type="checkbox"/> Yes <input type="checkbox"/> No
70. How do you settle this?	<input type="checkbox"/> I let them and do nothing <input type="checkbox"/> With help from the village/commune chief <input type="checkbox"/> I settle this myself <input type="checkbox"/> I call the police <input type="checkbox"/> Other:
71. Do you have conflicts over landownership with others?	<input type="checkbox"/> Yes <input type="checkbox"/> No
72. With who?	<input type="checkbox"/> My neighbour <input type="checkbox"/> Other farmers <input type="checkbox"/> My landowner <input type="checkbox"/> My family <input type="checkbox"/> Other:

73. Why?	<input type="checkbox"/> Border issues <input type="checkbox"/> Land usage <input type="checkbox"/> They claim it is theirs <input type="checkbox"/> Other:
74. How do you settle this?	<input type="checkbox"/> Village/commune chief <input type="checkbox"/> Police <input type="checkbox"/> I settle this myself <input type="checkbox"/> Other:
75. Do you have conflicts over water usage or water management?	<input type="checkbox"/> Yes <input type="checkbox"/> No
76. With who	<input type="checkbox"/> My neighbour <input type="checkbox"/> Other farmers <input type="checkbox"/> My landowner <input type="checkbox"/> My family <input type="checkbox"/> Pump station owner <input type="checkbox"/> Other:
77. Why?	<input type="checkbox"/> Amount of water usage <input type="checkbox"/> Water supply <input type="checkbox"/> Quality of the water <input type="checkbox"/> Others use too much <input type="checkbox"/> Other:
78. What happens when people use too much water out of the Prek so others have nothing left to irrigate their land?	<input type="checkbox"/> They just restart the pump <input type="checkbox"/> It is bad luck for them <input type="checkbox"/> I don't know <input type="checkbox"/> I will help them to get more water <input type="checkbox"/> Every man/women for themselves <input type="checkbox"/> Other:

### 7. Entanglements

79. Are there water and/or land projects in your village?	<input type="checkbox"/> Yes <input type="checkbox"/> No
80. How many projects in the last 5 years?	<input type="checkbox"/> 1 <input type="checkbox"/> 2-4 <input type="checkbox"/> 4-8 <input type="checkbox"/> 8 or more
81. What do they do?	<input type="checkbox"/> Improving agriculture <input type="checkbox"/> Improving water sanitation and quality <input type="checkbox"/> Improve water management <input type="checkbox"/> Prek rehabilitation <input type="checkbox"/> Prek/water management and gender <input type="checkbox"/> Other:
82. Do the projects help you in your livelihood?	<input type="checkbox"/> Yes <input type="checkbox"/> No
83. How?	<input type="checkbox"/> They provide accessible funds <input type="checkbox"/> They provide food <input type="checkbox"/> Providing knowledge on technical water management increases agri productivity <input type="checkbox"/> Other:
84. Do projects harm you in your livelihood?	<input type="checkbox"/> Yes <input type="checkbox"/> No
85. How?	<input type="checkbox"/> They do not ask what I want <input type="checkbox"/> I have lost land because of their project <input type="checkbox"/> Other:
86. Are there foreigners living in your village or community?	<input type="checkbox"/> Yes <input type="checkbox"/> No
87. Where are they from?	<input type="checkbox"/> Vietnam <input type="checkbox"/> China <input type="checkbox"/> Thailand <input type="checkbox"/> Europe <input type="checkbox"/> Other:
88. How do you feel about their presence?	<input type="checkbox"/> I don't mind <input type="checkbox"/> They harvest fish <input type="checkbox"/> I rent land to: _____ (nationality) <input type="checkbox"/> I need them as clients for my business <input type="checkbox"/> I don't like it <input type="checkbox"/> They steal out jobs <input type="checkbox"/> They influence the agricultural price market <input type="checkbox"/> They are polluting our agricultural land <input type="checkbox"/> Other:
89. Are there foreign companies or foreign investments in your village/community?	<input type="checkbox"/> Yes <input type="checkbox"/> No
90. How do you feel about that?	<input type="checkbox"/> Good <input type="checkbox"/> Bad <input type="checkbox"/> Not good/not bad <input type="checkbox"/> I don't know
91. What projects/investments do they do?	<input type="checkbox"/> Agricultural investments <input type="checkbox"/> Land buying and selling <input type="checkbox"/> Other:

8. General

92. Indicate how important you consider the issue that is asked in the left-hand column by circling on the same line on the left the number that **most closely** matches your opinion

Question	Degree of importance				
	Not at all	Somewhat	No opinion	Very	I don't know
Housing	1	2	3	4	5
Enough food (whole year)	1	2	3	4	5
Regulations for the Prek	1	2	3	4	5
Village chief	1	2	3	4	5
Community chief	1	2	3	4	5
Good neighbours	1	2	3	4	5
Friends and family	1	2	3	4	5
Natural environment	1	2	3	4	5
Living conditions	1	2	3	4	5
Climate	1	2	3	4	5
Collaboration with other farmers	1	2	3	4	5
Foreign investment in your village/community	1	2	3	4	5
Water use regulations	1	2	3	4	5
Land use regulations	1	2	3	4	5
Spirit practices / rituals	1	2	3	4	5
Prek User Committee	1	2	3	4	5
Farmer cooperation	1	2	3	4	5
Working together with other farmers	1	2	3	4	5

93. Gender

- Male  
 Female

94. Age

years

95. Village name

96. Province + District

: \_\_\_\_\_

97. Status

- Married  
 Single  
 Divorced  
 Other: \_\_\_\_\_

98. Nationality

- Cambodian  
 Vietnamese  
 Other: \_\_\_\_\_

**END**

Phone number: \_\_\_\_\_

**EXTRA Questions female head of household:**

99. In what way are you involved in water management or decision-making processes?	<input type="checkbox"/> Never <input type="checkbox"/> Only in matters concerning my Prek <input type="checkbox"/> I always attend the meetings <input type="checkbox"/> I am a Prek committee member <input type="checkbox"/> Other:
100. How do you perceive the role women in your community?	<input type="checkbox"/> Unequal with men <input type="checkbox"/> Equal with men <input type="checkbox"/> I don't know <input type="checkbox"/> Not good/not bad \ <input type="checkbox"/> Women are care takers <input type="checkbox"/> Women are the base of our community <input type="checkbox"/> Other:
101. How do men perceive women in your community?	<input type="checkbox"/> Women can do the same as men <input type="checkbox"/> Women are only good for house chores <input type="checkbox"/> Women cannot physically do the same as men <input type="checkbox"/> Other:

## Appendix F Initial time planning

<b>Week</b>	<b>Activity</b>	<b>Goal</b>
07 Feb – 09 Feb	Recovering from jet lag	Explore Phnom Penh
10 Feb – 16 Feb	<ul style="list-style-type: none"> <li>- Finding long-term apartment</li> <li>- Contact and meeting ECOLAND staff and student research assistants</li> <li>- Move in new apartment</li> </ul>	<ul style="list-style-type: none"> <li>- Working on final research proposal</li> <li>- Making interview guide</li> <li>- Building relationship with interpreter Mr. Chhengven</li> </ul>
17 Feb – 23 Feb	<ul style="list-style-type: none"> <li>- Meeting with interpreter Mr. Chhengven and Mr. Kimchin to explain my research.</li> <li>- Find out with ECOLAND which department is responsible for water governance in Kandal and writing an official letter for approval of meeting (WoRWAM, and others).</li> <li>- Visit fieldwork location as an orientation</li> </ul>	<ul style="list-style-type: none"> <li>- Creating in participant logbook</li> <li>- First observation with field notes</li> <li>- Transcribing day report of visit</li> <li>- Finishing interview guide</li> </ul>
24 Feb – 01 Mar	<ul style="list-style-type: none"> <li>- Verifying and practicing interview with interpreter</li> <li>- Community/village selection</li> <li>- Visits to research community</li> <li>- Introducing myself to community and gate keeper/chief of the community</li> <li>- Determine whether weekly stay over in a guest house is required</li> </ul>	<ul style="list-style-type: none"> <li>- Approval of research proposal</li> <li>- Transcribing day reports</li> <li>- Observation notes + transcribing</li> </ul>
02 Mar – 08 Mar	<ul style="list-style-type: none"> <li>- Planning the first interview</li> <li>- Conducting first interview</li> <li>- Evaluation with interpreter</li> <li>- Reading first transcript and check concepts</li> </ul>	<ul style="list-style-type: none"> <li>- Working on final research proposal</li> <li>- Transcribing day reports</li> <li>- Observation notes + transcribing</li> </ul>
09 Mar – 15 Mar	<ul style="list-style-type: none"> <li>- Visit research location</li> <li>- Planning interviews</li> <li>- Conducting interviews</li> <li>- Participant observation at research location</li> <li>- Weekly reflection to evaluate the research progress in a report</li> </ul>	<ul style="list-style-type: none"> <li>- Transcribing day reports from fieldnotes</li> <li>- Coding interviews</li> <li>- Weekly reflection to evaluate the research progress in a report</li> </ul>
16 Mar – 22 Mar	<ul style="list-style-type: none"> <li>- Transcribing interviews and fieldnotes</li> </ul>	<ul style="list-style-type: none"> <li>- Coding interviews</li> <li>- Weekly reflection to evaluate the research progress in a report</li> </ul>
23 Mar – 29 Mar	<ul style="list-style-type: none"> <li>- Participant observation at research location</li> <li>- Planning &amp; conducting interviews</li> </ul>	<ul style="list-style-type: none"> <li>- Transcribing day reports from fieldnotes</li> <li>- Coding interviews</li> <li>- Weekly reflection to evaluate the research progress in a report</li> </ul>
30 Mar – 05 Apr	<ul style="list-style-type: none"> <li>- Meeting with interpreter Mr. Chhenghuy</li> <li>- Participant observation at research location</li> <li>- Planning &amp; conducting interviews</li> </ul>	<ul style="list-style-type: none"> <li>- Transcribing day reports from fieldnotes</li> <li>- Coding interviews</li> </ul>

	<ul style="list-style-type: none"> <li>- After extensive time in the research community/location I will try to have the interviews scheduled with the government agency this week.</li> </ul>	<ul style="list-style-type: none"> <li>- Weekly reflection to evaluate the research progress in a report</li> </ul>
06 Apr – 12 Apr	<ul style="list-style-type: none"> <li>- Participant observation at research location</li> <li>- Planning &amp; conducting interviews</li> <li>- Interview with government agency</li> </ul>	<ul style="list-style-type: none"> <li>- Transcribing day reports from fieldnotes</li> <li>- Coding interviews</li> <li>- Weekly reflection to evaluate the research progress in a report</li> </ul>
13 Apr – 19 Apr	<ul style="list-style-type: none"> <li>- Khmer New Year (13-16): most people will probably not be available.</li> <li>- What does new year mean to the farmers and inhabitant of the research location and to the government agency.</li> </ul>	<ul style="list-style-type: none"> <li>- Joining the festivities of Khmer New Year</li> <li>- Maybe some traveling in the area</li> <li>- Weekly reflection to evaluate the research progress in a report</li> </ul>
20 Apr – 26 Apr	<ul style="list-style-type: none"> <li>- Conduct the final interviews in research location</li> <li>- Weekly reflection to evaluate the research progress in a report</li> <li>- Participant observation</li> <li>- Interview with government agency</li> </ul>	<ul style="list-style-type: none"> <li>- Transcribing day reports from fieldnotes</li> <li>- Coding interviews</li> <li>- Weekly reflection to evaluate the research progress in a report</li> </ul>
27 Apr – 03 May	<ul style="list-style-type: none"> <li>- Labour day</li> <li>- Finalizing data</li> <li>- Back-up for conducting interviews &amp; Participant observations</li> <li>- Observing day in the field with government employee(s)</li> <li>- Possible visit boyfriend</li> </ul>	<ul style="list-style-type: none"> <li>- Transcribing day reports from fieldnotes</li> <li>- Coding interviews</li> <li>- Weekly reflection to evaluate the research progress in a report</li> </ul>
04 May – 10 May	<ul style="list-style-type: none"> <li>- Visak Bochea Day</li> <li>- Royal plowing ceremony (observed)</li> <li>- Gathering missing data</li> </ul>	<ul style="list-style-type: none"> <li>- Transcribing day reports from fieldnotes</li> <li>- Coding interviews</li> <li>- Weekly reflection to evaluate the research progress in a report</li> </ul>
11 May – 17 May	<ul style="list-style-type: none"> <li>- Backup research period</li> <li>- King's Birthday</li> <li>- Visit of boyfriend?</li> <li>- Say goodbye to research team and closely aligned participants</li> </ul>	<ul style="list-style-type: none"> <li>- If appropriate handing over gifts</li> <li>Rest: TBD</li> </ul>
18 May – 20 May	Conditionally planned free	TBD



## Appendix G Report ECOLAND

### **Synthesized minutes of the interviewed with key informants in Luek Daek**

Date of interview: January 07, 2021

Prepared by Raksmeay

Doubt-UvA

The interview was conducted to collect additional information to complement in the study of a master student in Amsterdam University of Netherland. 6 interviewees were discussed on some key questions proposed by the students for research assistants.

#### **The back ground of collective action:**

Based on the interviews, they mentioned that since last 20 years ago they had stopped exchanging labor to each other which is in Khmer term called “Provas Dai”, in their agriculture and particularly harvesting. The reasons are because of the harvesting machines were available in the area, so that they rely on the harvesting machines rather than manual harvesting. They could not harvest their crops on time. As experiences, they face with flood if their crop could not be harvested on time especial in July/August.

#### **Selling and buying land**

Farmers can sell their land to anyone. Some part of their land is recognized by village/commune level while some part is recognized by district level (office of Land management and Land administration). The process of selling land depends on their existing land title and buyers and the price of the land. If any farmer sell land to another farmer in their village/neighbor while the land title was issued by village/commune level and the price is lower than 10 000\$ per hectare, so they just inform village and commune chief in order get a signature and stamp to approve on the contract of selling and buying as well as property right.

Sub-degree on tax from land in 2018 of Cambodia, all Cambodian people have to pay tax on the sold land based on the specific amount of its price in the office of Land management an administration in the district level. Thus, with this perspective, in the village, farmers prefer would prefer to work with village/commune chief for soft title in order to avoid the complications and cost of administration process.

Farmers also can sell their land to either national or international private company unless those companies are recognized and certified by the government. The companies can go directly to negotiate with local people to buy the land, so the under national level officers who are in charge with this concern are playing important roles to facilitates between these two partners such as the farmers (sellers) and private company (buyer).

As far as concerned about the piece of land along the Mekong with the enormous amount of sand on it, the interviewees mentioned that a Chinese company has purchased this land from many farmers who owned small piece of this land in last 3 years. They are not sure about the main purpose of the company, but some of the interviewees suspected that the company will build a pot on that land while some mentioned factory of alcohol. In last 3 year, the price was 3\$/m<sup>2</sup> which was reasonable price for land owner to sell out. People who sold their land mainly for building new houses, investing in agriculture and paying debts. Until now, the company are expanding this through buying more land from farmers, but the price quite increased to 5\$ /m<sup>2</sup>.



A land along the Mekong with the enormous amount of sand on it

### **The issue of Prek 36 and land Tenure**

In K'am Samnar commune, only this Prek is excavated bigger compared to the other Preks. This Prek can be considered a an example for the other Preks.

The pros of rehabilitating of the Prek are 1). Farmers will get sufficient water for their crop cultivation which they can intensify their cropping system from 2 to 3 cycles per year; 2). Farmers reduce high cost of pumping operation from Prek to their rice field. Normally, in Preks which are not rehabilitated farmers are not able to pump water from the Mekong, so they have to pay additional fee to private pumping owner who operates a big pump at the head of Prek to serve farmers.

The fee was set between farmers and pumping owner and approved by local authority such as village/commune chief and Prek User committee. The main agreements are farmers have to pay 6 L of diesel plus 20kg of paddy rice per Kong in first season and 7 L of diesel plus 20kg of paddy rice per Kong in second season (6.5Kong equal 1ha). For third benefit is in the lowland/Boueng area where farmers cultivate rice will be fertilized through the sediment from the Mekong. One of village chief indicated that, in recent years, the soil fertility is decreased due to higher amount of chemical sustainces area used by farmers and less and less of sediment from the Mekong because of flood is smaller and smaller while the Preks are shallow. Furthermore, the village chief perceived that excavating Prek is the best way to drain chemical residues from the area to the lower Mekong or Bassac through the Preks.

During the rainy season, depending on the level of flood, this year, one or two of Preks did not get flood from the Mekong river, while the part of lower/tail of those Preks were influenced by the other Preks. Most of the Preks get the water flows from the Mekong due to high water and subsequently floods the land. For Prek 36 which was excavated, it was strongly influenced by the flood from the Mekong. The flow from the Mekong through this prek to the tail/Boeung area.

### **Additional information**

- Prek 36 was excavated in last 4 years which was strongly supported by provincial governor. This Prek could be accepted to excavated because of all farmers who are living along this Prek have agreed with local thority to do it. Excavation the Prek is not always easy because of the impacts on residential land of farmers who are living along Preks. Fortunately, in Prek 36 there are not many farmers living a long, just 2 farmers were impacted by this project, but they agreed to get the compensation from the local authority, exchanged to next plots.

At the same times, for the other Preks there are many people are living along the Preks, so it is very difficult to deal with this impact on residential land.

- There is a barrage system which is installed in this Prek. This system was initiated in last three years. However, it is managed by individual person who is a member of its Prek User Community (PUC). Auction system was applying to select the person who is able to operate the system. The agreement was to allow the owner to install the system in early October until mid of January. The owner has to pay 1000\$ per year with the 3-year-contract. With this amount of money, PUC uses it to maintain the Prek. Some part of the money, they used to build a small dam across the Prek in order to protect the crops in lower area against flood from Mekong in July/August and after harvesting they open it.
- Generally, farmers keep paddy rice and mango for their consumption. However, very small portion of mango are kept (1%) for consumption as while paddy rice is higher which is 5% to 10%, it depends on their family members which is 4 to 6.

#### List of interviewees

	<b>Name of interviewees</b>	<b>Position in the village</b>	<b>Contact</b>
1	Mr. Run	Deputy-village chiefe of Kaom Samnor village and agricultural agent of Kaom Samnor commune	097 963 0632
2	Mr. Sue	Elder person and Farmers	088 504 3843
3	Mr. Noy Phorn	Officer of the office of land management and administration of Luek Daek	015 946 465/097 999 3555
4	Mr. Lev Leng	Village chief of Kaom Samnor Lue	096 33 44 627
5	Mr. Em	Village chief of Reang Chor	097 679 3407
6	Mr. Ta Yorn	Village chief of Kaom Samnor Kroum	071 4124433

## Appendix H Field notes

### 1. Day report (Field visit to Leuk Daek district) – 20 February 2020

Around 06:00AM we left with our two interpreters (two master students, Chhengven and Chenhuy) from our apartment in Phnom Penh. Using two motorbikes it took us around two hours to get to the district. It was not very busy on the road and it was actually very chilly on the bike in the morning. After the sun rose the temperature got, of course, a lot higher. Sitting on the back of a motorbike for a long time is quite uncomfortable, but budget wise there is no other option. The roads are in good condition, but the driving techniques of trucks and larger cars is something I cannot get used to. By honking they let us now they approach us with high speed from behind to make way for them.

Road 44 leads you into Leuk Daek district which is more sandy and of lesser quality with loose pavement than the main roads. The road was still passable though. My overall impression is that there is garbage everywhere. Along the road, on the property of people, people burning garbage, literally everywhere. Whether is in the city or in the rural areas. The fumes of the little fires are ofcourse bad for your health, but the dust from the road and the area and the traffic is also very unhealthy.

When I arrive in Leuk Daek district I feel sore of the long drive on the back of the motorcycle of my translator, but I am enjoying the greener countryside and less busy road. I noticed sale signs and fallow land.

The Leuk Daek district area immediately looked like rural area to me. Most of the houses are built along the road and the area looked greener so with more trees than along the main road. Most people have their own banana and mango trees for their own consummation and livelihood. Since this period is the second harvest season of rice and maize many of the villagers were drying their products in the sun, since they do not have the equipment to dry it, according to our interpreters. Under and next to some of the houses, cattle were grazing. I only saw cows of two different types, white with small horns and brown with large horns.



We drove to the second to last commune, Sandar, to rest and drink a refreshment. And to discuss out next steps in exploring this district. In the week before, employees of ECOLAND warned us about the condition of the water. I already read something about the high arsenic levels and water pollution because of the use of pesticides in the agriculture. I ordered an iced coffee, but I completely forgot about this. Afterwards, I remembered and think we got lucky because she sold also sold bottled water. So maybe she uses this for making the coffee and the ice. Luckily, I have had no side effects from it. The coffee was good by the way.



After our stop we drove into the nearest prek (Prek Hon or prek 33) on with several motorbikes were driving. The road was full of bumps and very dusty. The water was very low in the prek, but there were several pumps with flexible hoses operational which irrigated the fruit fields. From the road further along the prek we first saw mango and banana trees, then maize and then rice. We got lucky, because some of the farmers were harvesting their rice. On one field six or seven people were filling bags and tying them up so we stopped here to have small talks with these farmers. The women claimed this was her land which she inherited from her family after the Khmer Rouge period. She explained that the plots were divided among those who helped dig out the prek. They are 11 meters wide and approximately 100 meter in length. The name of the prek was given after the man who dug out the prek last, mister Hon. I asked if I could help with something in the field and they started laughing immediately and saying my skin is too white. But I could help closing the bags with rice with a short plastic robe. The bag must have been around 50 kilograms I think and thus very heavy to move. I managed to close five bags after which my hands felt sore and my feet (because I only wore slippers) were burnt. So, I need some better preparations for the next time! Everyone one the field wore a hat, gloves and long clothes, which were meant to protect against the sun I think. What was striking to me is that I saw no bottles of water for them to drink during their work.

Also, the woman mentioned that that particular plot was her property. Unfortunately, we could not ask anything more since she had to move on to another plot to harvest the rice. Apparently, they use one machine to harvest the rice and to deposit the rice into bags. They help each other with this process. The grass from the rice is collected by a person which stores this on his (I only saw men doing this) bike. During our rides on the motorbikes, I saw that this grass was used to feed the cattle. We tried to make an appointment with her, but she was too suspicious and did not want to give her phone number.

The second Prek we entered there was a fisherman who was working in the water next to a sluice. Also, another women living nearby came to see us. Chenghuy convinced the men to talk to us by saying that we would like to know how the ancestors worked and how they work to learn more about history. He found this very interesting and agreed to meet Mees. Chhengven tries to make an appointment with her, and she agreed. However, since I have to make my exact time planning yet, I could not set a date. I think these people are very flexible with their time so this should not be a major obstacle. Lastly, we stopped near a broken bridge. Mees (the other student) suggested to drink something in (what seemed to be) a small restaurant/cafe. This time I saw no water bottles so I asked Chenghuy if he could ask where she got the water from. First, he thought it was unpolite but asked later anyway. Mees already drank from the glass. She told us she got the water out of the river and boiled it. I politely walked to the remaining of the bridge and disguisedly threw away my iced coffee. However, I realized that these people do not have the choice to drink bottled or potable water and had to drink from the river in which, also, a lot of garbage was in. Next to pollution and arsenic, I guess.

After this long day, I realized that researching the entire district might not give in-depth results and that I may have to analyse just two communes and the villages in there. And maybe this is still too much to really analyse the hydro social lifeworlds of the people.

After a three hours (due to traffic) drive back to our apartment I was exhausted and not able to properly sit on a chair anymore...



## 2. Field notes – 02 March 2020

- We left around 06:00 AM from my apartment Phnom Penh and arrive around 09:30 AM in the final commune K'am Samnar. I discuss the interview and rules for interpretation with my translator Chhengven.
- Along the Mekong we saw a guesthouse and a pump. We decided to stop here first.
- Chhengven calls the commune chief to make an appointment. The chief will be available on Wednesday.
- Via the owner of the guesthouse we can contact the deputy of the commune chief. From there we will try to make new contacts.
- I see that many Preks are dry, so I am wondering whether this is the right commune for the research.
- The deputy has given two new contacts of the village chief Pengtuhof the village Hum Sa em.
- we have made an appointment with the owner of the pump for 10:00 AM at 03/03.
- 1:00PM meeting with the village chief.
  - we are seated underneath his house in the shadow. He takes out his notebook with number about his village, such as male-female ratio and the population number. He looks very calm and patient. His hair looks neat, he wears glasses and a golden watch (not sure whether this is real of course). I struggle with understanding my translator and the other way around. Chhengven takes some paper and the copy of my passport to show to the village chief.
  - Meanwhile, rice is unloaded and spread on cloths a few meters away from us and in front of the house. A man and a woman distribute the rice over the cloths.
- The responsible individuals for the Preks are a leader and co-leader of the Prek committee. Prek 36 has water throughout the year (sponsored by the province).
- We try to make new appointment with new contacts with help of the village chief.



### **3. Day report – 03 March 2020**

We start at Prek number 35 and try to explore the Preks in the Commune K'am Samnar. At every Prek we try to find the concerned Prek Leader and his contact details.

At Prek 39 and 40 we scheduled an interview for later that day.

The interview with the owner of the pump of Prek 45 does not take place, because he is not there. He was buying goods and materials in Vietnam for his pump.

We made a new appointment at 5PM that same day.

Around 10AM we went to the police station to express my intentions of the research and to show and hand over the endorsement letter with a copy of my passport and visa. During this meeting multiple pictures were taken of the documents and me. The chief of the police told us they have had some bad experiences with foreigners. They (allegedly) incite the population against the government. Also, he explained that if something would happen to me they would know my whereabouts and who I am to respond and assist faster.

During this visit I noticed a map hanging in the office. When they are in the room next to the office, I quickly take a picture with my phone of it. Since they are (or seem) heavy on the rules I do not wish to take the chance of my photo request to be rejected. It is a map of the commune made by Australian Aid.

Around 11:30AM we take a small break and sit at the river in the shadow. There is a cool breeze making it very pleasant to write this day report and listen to the rippling water.

#### 4. Field notes on Preks in K'am Samnar – 03 March 2020

Prek 35:

The head of the Prek has been filled with earth. This was around 1981 according to the village chief. Now this land belongs to someone. There is thus no more water in the Prek. People get their water by means of pumps, so groundwater. These pumps are around 40 meters deep into the ground to irrigate their crops. Their drinking water comes out of the Mekong river which they store in large jugs. They boil this water before they use it.

Prek 36:

This is the only Prek which has been excavated (government funded). Throughout the year, this prek has water. The tide of the Mekong river determines the water level (which is two different levels per day). Here there is a lot of activity with small boats.



Prek 37:

The head of the Prek seems to be locked, but with a further look the water does seem to flow into the Prek. Which is odd because the water in Prek number 36 was flowing towards the Mekong river. So, I think that there must be a pump working. Arrived at the head of the Prek we saw a pump. Between the road and de head of the Prek the Prek was crossed to allow the water to fill up (what seemed to be) a fishpond and then to irrigate the next field. Underneath the bridge (of the main road in the commune) it looked like there were fishing boats and fishing nets stored.



Prek 38:

Only at the head of the Prek water seemed available. The sand that was filled onto the field next to the Prek was partly slipped into the Prek. Then it seems that the head of the Prek has been shut off from the river with sandbags.

Some parts of the land along the Mekong are filled with large amounts of sand. When we talk to someone who is cutting grass, he explains that someone bought the land and uses the sand to strengthen the land and let everything die underneath so the land is clean again. The sand filled land in this case has allegedly been bought by a rich Cambodian who lets everything 'die' underneath the pile of sand to then sell it again for a higher price.



**Prek 39:**

Uses two pumps at the head of the Prek from the Mekong river. Here a man is watering his buffalo. We found some sort of holy or offering element at the pumps. The meaning is unknown to us.





Prek 40, 41 or 42:  
Uses a pump.



PREK 43:

The pump is somewhat overgrown with vegetation and is covered by tarpaulin.



Prek 44:

There is one large pump which pushes the water through some sort of handmade water way of wood and canvas, into a pond. The Moringh Kongveal offer house looks like it has not been used for some time now, because it looks old, crooked and is skewed. The pump is not in use.

At the top of the pump is a roof made of tarpaulin. The pond seems hold the water well. The rest of the Prek inland is dry. The dam seems to hold the water in very well and thus seems to be well constructed.



Prek 45:

One large pump. The dam which was supposed to hold the water from flowing back into the Mekong river, was just broken. So, men were busy rebuilding this dam. After the first bridge, there is a lot of vegetation in the Prek. The water does not seem to get very far into the Prek, but maybe this just takes time and more pumping. I will interview the owner of the pump later. One Moringh Kongveal offer house near the pump and one offer house next to the bridge.

