

Institutional Profiles from the Tonle Sap Lake Region: Findings from Informant Interviews



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INSTITUTIONAL PROFILES FROM THE TONLE SAP LAKE REGION: FINDINGS FROM INFORMANT INTERVIEWS

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BACKGROUND AND OBJECTIVES

This report is based on key informant interviews conducted in 6 of the 12 villages where the WorldFish-led CGIAR Research Program on Aquatic Agricultural Systems (AAS) proposes to work with local communities and other stakeholders to address natural resource management and related livelihood challenges. The socioeconomic setting of the Tonle Sap Lake is characterized by a rapidly growing population, high poverty levels and deep dependence on natural resources. The basin is also notable for its diversity, including ethnic diversity and seasonal variation of livelihood activities, as well as its inequality, especially in terms of unequal access to natural resources.

WorldFish and its project partners have already carried out considerable scoping work, which provided the basis for selection of the program's 12 target villages. As AAS moved towards identifying and designing on-the-ground interventions, key informant interviews were initiated to provide a more detailed picture of formal and informal institutions that shape local-level resource use and management, as well as structural causes of poverty and inequity linked to poor resource management. Information generated by these interviews complements a series of more extensive local stakeholder dialogues in the form of focus group discussions, which were held in parallel to generate information on a much broader suite of topics. Both activities represent complementary diagnostic tools for the process of prioritizing interventions at village and broader scales in 2014 and beyond. The key informant interviews are intended to record both significant differences and similarities among the villages, especially with respect to the types of institutions linked to fisheries, agriculture and water management, and thereby to help identify both village-specific and cross-cutting constraints and opportunities with respect to the identification and design of interventions.

The key informant interviews were conducted by the International Water Management Institute as a contribution to this diagnostic process, with facilitation of site selection and organization of field logistics provided by WorldFish through its offices in Phnom Penh and Siem Reap.

This study is based on key informant interviews conducted in 6 of the 12 AAS focal villages in and around the Tonle Sap Lake (Table 1). Each village profile focuses on the roles played by institutions primarily at village and commune levels. While it is recognized that some actors with influence over fishery, agriculture and water management activities in and around the lake are situated at other geographic and administrative scales, the limited time available for this study in conjunction with the logistics involved in accessing field sites meant that priority was given to local resource management institutions in operation either by government design or through community initiatives. Some provincial and national institutions were also investigated in the limited time available. The profiles seek to capture some of the key resource management challenges, first within the specific context of each village, but also with a view to drawing out issues that are shared by two or more villages.

Selection of the villages to be profiled has also been influenced by the importance of understanding how resource management

institutions operate in different bio-geographical contexts according to the floating, seasonally flooded and land-based typology adopted by AAS for classifying the situation of villages in the Tonle Sap Lake. The profiles thus also seek to generate understanding of how these contexts define challenges and may need to be factored in when assessing intervention strategies. It is noted, however, that not all types of activities and institutions may exist in each village type. Table 1 presents the original classification of the six villages, as well as a suggested reclassification of these villages based on the key informant interviews. The suggestions are based on the presence or absence of water during a typical year. This approach is adopted to reflect a practical livelihoods point of view. For instance, according to this approach, the fact that a village is flooded for the majority of the year (e.g. 7–8 months) does not make it a floating/water-based village, as the availability of dry land creates the potential for agriculture. Consequently, this classification does not fully tally with the classification of villages used for selecting the target villages for this exercise.

Village	Original classification	Suggested classification	Province	Date visited
Chnok Tru	Floating	Floodplain/Seasonally flooded	Kampong Chhnang	1 November 2013
Phat Sanday	Floating	Floating	Kampong Thom	2 November 2013
Tramper	Floodplain/Seasonally flooded	Floodplain/Seasonally flooded	Pursat	3–4 November 2013
Raing Til	Floating	Floodplain/Seasonally flooded	Pursat	5 November 2013
Rohal Suong	Land-based	Land-based	Battambang	6–7 November 2013
Muk Wat	Floodplain/Seasonally flooded	Floodplain/Seasonally flooded	Siem Reap	8–9 November 2013

Table 1. Original and suggested classification and location of the six selected villages.

A third factor considered in the selection of villages for profiling was the need to reflect situations that are considered to be functioning well and those that are not. The obvious question that arises is how “functioning well” is defined and according to whom, since perceptions are likely to vary between various observers and the communities in question. The profiles are meant to provide opportunities to explore this question specifically from local stakeholder perspectives, and to provide relevant insights with respect to the performance of resource governance mechanisms.

In recognition of the broad range of actors involved, the study commenced the key informant interviews with a representative from the Tonle Sap Authority (WorldFish’s core national partner in AAS) based in Phnom Penh. A representative from the Tonle Sap Biosphere Reserve Secretariat based in Phnom Penh was also to be interviewed, but this was not possible, as permission from the relevant authorities was not forthcoming. The key informant interviews also included officers from key provincial and district agencies in each of the provinces in which the selected villages are located. (See Annex 1, which provides a complete list of the 55 individuals interviewed.)

Selection of the six villages was done by WorldFish personnel based on the previously stated considerations and their knowledge of each village. WorldFish’s local partner organizations working in these communities were also consulted. The key informant interviews were conducted by the author, with Mr. Samnang Oum from WorldFish and Mr. Khov Vengsong from the Tonle Sap Authority providing translations.

The short duration spent in each village was often a challenge in terms of gaining an understanding of the true nature of the local institutions, especially those that are informal and hence less explicit. The limited number of interviews also restricted the ability to obtain a range of perspectives on formal institutions, though the selection of key informant interviews actively sought to represent a range of actors, mainly based on the scale of livelihood activities (e.g. small- and medium-scale fishers), gender, and spatial

distribution within each village (e.g. not limited to individuals in the center of a village). It should also be noted that the data presented in this report is based on key informant interviews that involved verbal translation from Khmer to English.

Tonle Sap Authority

Initiated in 2009, the Tonle Sap Authority represents a relatively new institutional layer in the lake's complex governance structure. (See Annex 2.) It gives expression to the need felt by the government for an institution with a mandate to coordinate the multiple sectoral interests at play in the basin. The fact that the Tonle Sap Authority reports directly to the prime minister¹ also suggests an ability to garner the necessary political support in discharging its functions, though this may also provide a mechanism for political agendas to be manifested more directly in the lake's management.

In practice, however, no formal coordination mechanism exists, and there is no common vision for the lake's management. Management activities are limited to the national parks established by the Ministry of Environment. Other activities consist of monitoring and delivering status reports to the prime minister, especially on the condition of fish stocks, illegal fishing activities and the status of flooded forests (zoning and fish species inventoring). While the Tonle Sap Authority is meant to protect flooded forests as fish breeding spaces, the dispersed nature of these ecosystems and continued forest loss highlights the actual limited level of control the Authority is able to exercise, despite an awareness of the role of large farmers in initiating deforestation through the agency of local actors. A fundamental constraint is that the Tonle Sap Authority is not authorized to enforce laws against illegal flooded forest clearance or illegal fishing. Nor is there any formal institutional mechanism for coordinating activities among other agencies. This lack of coordination is a concern, especially given the wide array of sectoral actors with jurisdiction over the Tonle Sap Lake and its surroundings. A further constraint is the failure on the part of the four departments² of the Tonle Sap Authority to communicate with each other. The Tonle Sap Authority is well aware of these challenges. As a new institution, it currently operates with a mostly young (but motivated) staff who will benefit from a period of capacity building.

Despite a crackdown on illegal fishing in 2010 at the behest of the Prime Minister (led by the Tonle Sap Authority in conjunction with the Fisheries Administration), illegal fishing is increasing, since the crackdown was not sustained beyond 2010.³ The Tonle Sap Authority also recognizes that community fisheries are ineffective in dealing with illegal fishing, partly due to kinship networks within the local communities. Engagement in illegal fishing is considered to be especially high in floating villages because of their easy access to fish stocks and their remoteness.

Provincial Fisheries Administration

Functions of provincial Fisheries Administration offices include enforcing fisheries laws, training fishers in the use of legal fishing gear and promoting aquaculture. The Fisheries Administration also oversees the creation of community fisheries and supports their operation. Community fisheries are intended to reduce the Fisheries Administration's administrative burden while giving local communities more say in fisheries management. The Fisheries Administration officers interviewed believed that while the removal of fishing lots has increased the area accessible to local fishers and some fish species not seen in 2009 are now being caught, there is an overall decline of the fisheries. Fishing activities became much harder to control after the fishing lots were removed, since fishing is more dispersed and more people have entered the industry.⁴ Government fund allocations for law enforcement have not matched this increase in the enforcement burden.⁵ There is not enough money for patrolling even though stopping illegal fishing is the Fisheries Administration's primary focus.⁶ Therefore, illegal fishing has also increased, both by locals and by people from other provinces. For example, Battambang, which has the largest floodplain, attracts large numbers of people from other provinces.⁷ Illegal fish traps can catch 60 kilograms (kg) in two days, while legal nets can catch only 30 kg in one and a half days.⁸ Moreover, the equipment for illegal fishing is easy to make (requiring only two to three hours) and cheap, which makes confiscation of equipment less effective. The investment needed for monitoring is high, especially in light of the limited capacities available to the Fisheries Administration.⁹

When creating community fisheries, the Fisheries Administration, commune council head and village head meet and agree to include specific villages in a fishery.¹⁰ Community fisheries are expected to develop a management plan to protect the area they manage in coordination with the Fisheries Administration. Plans focus on stopping illegal fishing and the cutting of flooded forests.

Regulations are made by the community fishery with Fisheries Administration facilitation and documentation.¹⁰ The regulations are relatively standard across community fisheries, with some variation to reflect differences in conditions. Most equipment choices have already been made by the fishers in response to existing Fisheries Administration rules, and the community fisheries follow these.¹¹ The community fisheries are expected to provide reports to the Fisheries Administration on illegal activities.

Sixty percent of the community fisheries in Pursat Province are considered to be working well by the provincial Fisheries Administration office, and the most active ones are those close to the Tonle Sap Lake. The community fisheries not working well tend to be in more resource-poor villages further away from the lake.¹² The main requests received from community fisheries are for cooperation and fuel. Community fisheries generate some funds through savings groups supported by NGOs; the interest earned by these groups is used by the community fishery. Although a Fisheries Administration officer is expected to visit each community fishery regularly to check its status, especially with respect to illegal activities, the lack of funds¹³ means that there are no regular meetings with community fisheries unless there is a specific problem.¹⁴

The Fisheries Administration also provides marginal support to aquaculture, which can potentially realize a value 10 times that of agriculture, although the high operation costs (pumping water, fingerlings and food) make it difficult for lower-income households to adopt the practice. Fisheries Administration support mainly consists of providing fingerlings.

Provincial Department of Water Resources and Meteorology

The Ministry of Water Resources and Meteorology became an independent state entity in 2000, and was part of the Ministry of Agriculture, Forestry and Fisheries before that. Its primary functions are surface and

groundwater management, research, and building irrigation systems. This also includes the formation of farmer water user committees and interventions in water management during drought. The Provincial Department of Water Resources and Meteorology, however, is not involved in resolving resource-use conflict in its full sense, but only in helping to manage water supply for irrigation.¹⁵ Irrigation schemes are classified as small (25–500 hectares); medium (500–5000 hectares) or large (greater than 5000 hectares).

There are many informal farmer organizations in the floodplains, including 50–60 in Battambang Province. The Provincial Department of Water Resources and Meteorology is working with some of these.¹⁷ While there is no need for large irrigation infrastructure to form a farmer water user committee, the committees are expected to control and maintain all irrigation infrastructure after the primary canal and to ensure equitable water distribution. The Provincial Department of Water Resources and Meteorology is not mandated to play a role in the election of farmer water user committee members, although it may facilitate this process. It will, however, train the committees regarding rules and responsibilities. At the beginning of the wet and dry seasons, the Provincial Department of Water Resources and Meteorology meets with the farmer water user committees to discuss water supply. How much will be irrigated depends on water availability, though it was claimed by the Provincial Department of Water Resources and Meteorology in Battambang that farmers don't often listen to advice on water availability when deciding on dry season cultivation.¹⁸

The Provincial Department of Water Resources and Meteorology stated that the aquifers are too deep and too small to support rice cultivation in Battambang, but is also aware that groundwater use has become prevalent since 2011. Although farmers traditionally did not grow dry season rice in Battambang, people who moved into the area from the floodplains started to do so on leased land. The significant income they gained from this activity has created a demand for groundwater among others who wish to follow suit.¹⁹ This demand may also increase due to changes in rainfall. The annual rainfall of 1200 millimeters per

year has not changed, but it has become more intense with fewer rain events. The timing of rainfall has also changed, causing uncertainty, and there has been increased flooding.²⁰

Demand for groundwater irrigation may also increase given the challenges (in terms of topography, funds and human capacity) in increasing surface irrigation from the current 44% in the province to the 60% target set by the Provincial Department of Water Resources and Meteorology, though the entry of China and South Korea as financiers of such schemes in Cambodia may change this scenario. The Provincial Department of Water Resources and Meteorology office in Battambang currently has only four staff members to cover four districts, and they all operate from the provincial office.

Ministry of Environment

The mandate of the Ministry of Environment covers any illegal activity linked to biodiversity, including illegal fishing. The rules allow small-scale fishing methods (throw nets and long nets of prescribed length) anywhere. Priorities are rule enforcement and the maintenance of flooded forests. Expanding agriculture (mainly vegetables) is a concern due to pollution and replacement of flooded forests through illegal felling, which occurs in the dry season.²¹

Commune councils are tasked with a broad range of functions at both commune and village level. In addition to the police, army, monks and elder members of communities, the commune councils are involved in dealing with village and commune security, including matters of alcohol and drug abuse, theft, and domestic violence. Their jurisdiction also covers illegal fishing and logging of flooded forests, where they cooperate with the Ministry of Environment and Fisheries Administration.²² In Muk Wat, for example, the two commune council members responsible for fisheries are involved in preventing the emptying of small lakes in the southern extremity of the village to catch fish, though this is difficult, as the lakes are far from the village.²³ Commune council members also attend the village development planning meetings, where they help facilitate the selection of village priorities along with the village head.²⁴

With respect to conflict management in general, any issue that arises in a village is taken to the village head first, with the commune council becoming involved only if the village head cannot solve the problem unilaterally. In such cases the commune council member in the village and commune head are informed by the village head. Each commune council is expected to have a conflict management committee led by the commune council head. This committee has seven members: the commune council head, the first and second deputies of the commune council, the clerk, and three other commune council members. The village head can also be invited.²⁵

Noren Commune, to which Rohal Suong village belongs, consists of 10 villages. There are nine commune council members and nine other candidates who act as backups or replacements in the event a commune council member is unable to serve (due to death, illness or resignation) or is removed. Both of these groups are elected by the villages. The process begins with voting for 36 candidates, 18 of whom are from the ruling Cambodia Peoples' Party, while the rest of the candidates represent the other parties. In the first stage of voting, 9 out of the 18 Cambodia Peoples' Party candidates are elected and then 9 out of the 18 candidates from

other parties are elected.²⁶ This disproportionate number of ruling party candidates makes clear that the commune councils are very much part of the power structure established by the Cambodia Peoples' Party. In the Noren Commune Council, for instance, seven of the nine members are from the Cambodia Peoples' Party.²⁷ It is important to appreciate here that the commune councils are meant to represent a component of political and administrative reform as part of the heavily donor-supported Decentralization and Deconcentration Program. Although the reforms are intended to generate more locally driven and representative governance, the current structure of the commune councils suggests a strong element of political capture of this process, whereby the very institutions meant to broaden political participation have become instruments for consolidating the existing power structure.

In terms of the distribution of functions among members, the commune council head has overall responsibility. The first deputy is responsible for conflict management, while the second deputy covers social affairs and conflict resolution, though they do not make the decisions. They are, however, expected to facilitate the emergence of solutions. It is also mandatory, in a rather token way, to have at least one female member on the commune council.²⁸ Two of the nine members are responsible for fisheries management. Commune council members are paid a salary, as is the village head, and these salaries are funded from the commune budget.²⁹

With respect to village development plans, the commune council head and the head of each village together develop the village priorities with the villagers. These priorities are integrated into a district development plan through an integration workshop where NGOs, donors and government departments select activities to fund that are deemed to be priorities at commune level.³⁰ An officer from the district attends the commune council meetings, so the commune priorities are known at district level prior to the workshop. One commune having a different priority than others is not a problem if someone is willing to fund it.³¹



Ms. Vy Vanndy (left), commune council member, Muk Wat village.

Village priorities can also be funded through the commune fund allocated annually by the Treasury Department to each commune council. Of this, 3% is retained by the Treasury as an unofficial commission. Even after the fund is allocated, the Treasury retains control of the money, supposedly to avoid wastage and corruption.³² This is notable not just for the unofficial 3% commission, but also because it flies in the face of the principle of empowerment on which the Decentralization and Deconcentration Program is founded. When an activity is to be funded, the commune council therefore needs to request the required funds from the Treasury.

The commune fund for Noren Commune³³ in 2013 was KHR 150 million (USD 37,500), which needed to be distributed among 20 villages (i.e. an average of USD 1875 per village). The commune council uses the list of priorities developed by each village to determine which priorities to fund. Village heads also attend this discussion. In general, the commune council selects the most common priorities across the priority lists of the 20 villages. In

addition, the commune council focuses on the first priority on each list. Where the priorities in each village require more money than is available, some villages will not receive any funds, even if their priority is the same as the most common priority among all the villages. This process therefore makes it all the more possible for the priorities of the more resource-poor and marginalized groups to be lost if these are not high or even first on the list of the village's priorities. And even if their priorities are high on the list, which is very unlikely, there is no guarantee that they will be funded, as they compete with the interests of several other villages.³⁴ In fact, sometimes only a single village priority will get funding through the commune fund.³⁵ The odds against more resource-poor and marginalized groups accessing developmental support from the village development planning process or the commune fund are in addition to the odds against getting their interests onto the list of priorities of their respective villages in the first place.

What is funded through the commune fund is also heavily biased towards the construction of infrastructure; in Muk Wat village, for example, many of the funds have been spent on roads in the past.³⁶ “Soft” activities such as training of farmers, fishers and others are left until an NGO can be found. These are not seen as valuable by the commune council compared to hardware investments.³⁷ It was also claimed in Rohal Suong village³⁸ that a full account of the village priorities is not presented to all the commune council members by the commune council head, so that discussion of priorities is skewed in favor of what the commune council head prioritizes. This appears to be linked to allegations of corruption, where only the commune council head is claimed to be involved when there is bidding for work such as infrastructure construction, and details are not disclosed even to the other commune council members.

Gender dimensions at play within community leadership structures may be illustrated through the example of Ms. Vy Vanndy³⁹ who was a village head (the first woman to hold this position in the commune) from 2008 to 2012 before she became a commune council member in 2012. Although she was first a deputy village head, she was initially not accepted by the men upon her election as village head. She was initially not clear about how she should go about her responsibilities in this capacity. She therefore sought the advice of an NGO, and felt more confident after that. The previous village head (a man) did not help her and blamed the commune council head for electing a woman, stating that as a woman she could only work in the home. Her friends thought that she was foolish to take on the position, which illustrates the state of consciousness of not only men, but also women towards such positions and their own situations. She concurrently volunteered with the Cambodian Red Cross, which provided valuable experience and training that has proved helpful during her tenure as village head and then as a commune council member.

Despite her own success as a community leader, Ms. Vanndy continues to believe that people are more afraid of the authority of a man. She also points out that many of the key livelihood and other activities are still dominated by men, and decisions relating to village affairs are closely linked to male-centric social networks, such as when men gather in the evenings to drink alcohol.

Phat Sanday village (village classification: floating)

This village has a population of 695 people in 185 households. The village is dry for four to five months (March–July) of the year.

Natural resource management, livelihoods and the roles of institutions

Fishing is the primary livelihood in Phat Sanday. No one has land on the mainland, as people cannot afford the land prices, especially since there is very little unutilized land left. Fishing is considered to be better about 7 kilometers (km) from the village, which is where a number of households fish.⁴⁰ In the dry season, people go to Tonle Sap Lake, located about 8 km away. This village is near the same conservation area (3 km² in size) as Chnok Tru village. Fish migrate to the conservation area as water in the deep areas recedes at the season's transition from

wet to dry. Because of the village's proximity to the conservation area, fisheries in the vicinity of the village are limited to small-scale equipment.⁴¹ This, however, is the exception rather than the rule, since about 90 percent of fishers in the commune are medium-scale fishers, according to Mr. Pan Saveng, deputy of the Fisheries Administration station adjacent to the village. This figure was 60 percent before the fishing lot was closed. Some of the people who worked in the fishing lot now use medium-scale gear. Large-scale gear involves longer nets—up to 1 km—capable of catching a ton of fish a day. These large nets have now been made illegal. The closed season is from June to October; during this season fishing does occur, but is limited to nets with large mesh sizes, and catches are meant to support only home consumption. However, these rules cannot be realistically enforced with the large number of fishers spread across such a large area.⁴²



A woman engaged in small-scale fishing in the conservation area (left) and a trader (right).

According to Mr. Sem Chhet,⁴³ medium-scale fishing makes use of better equipment, such as 300-meter (m)-long floating nets, compared to 100-m nets for small-scale fishers. Consequently, the daily catch averages 40 kg for medium-scale fishers, compared to 10–20 kg for small-scale fishers. According to Mr. Saveng, medium-scale catches can be as high as 100–200 kg a day between February and May when the water level is low. Medium-scale fishers can also use fish traps, which catch 100–200 kg a day. Making the transition to medium scale, however, requires a significant up-front investment (including a different boat, engine and nets), which often requires a loan. Mr. Chhet was a small-scale fisher for 15 years and transitioned 3 years ago with the help of a bank loan. The cost of the change was KHR 4 million (USD 1000). For a small-scale fisher, a boat and net costs about USD 60, whereas a medium-scale net alone can cost as much as USD 500, and this denotes the significant income difference between the small and medium categories. Most people who shift to medium-scale fishing take a loan from a bank at an annual interest rate of 3%. In Mr. Chhet's case, the transition was achieved in stages. Although he states that no permission or licensing was needed for this change, with only a requirement to inform the police (who are expected to update their records of people's livelihood activities), Mr. Saveng from the Fisheries Administration confirmed that anyone wishing to engage in this class of fishery must obtain a license from the Fisheries Administration, which can be issued by the local Fisheries Administration office. A tax of USD 4 per year is levied on the engine, and failure to pay will result in a fine and ultimately the loss of the boat. Payment is made to the Provincial Customs Office. According to Mr. Saveng, not all medium-scale fishers have had to incur these costs, as some of them are hired by business interests on the mainland who pay the fishers USD 200 a month and provide several boats at no cost to the fishers.

Decline in the fishery and lack of livelihood options

Mr. Saveng believes that the fish catch is higher since the fishing lots were removed, and that some fish species have returned after the large flood in 2013. In contrast, Mr. Chhet observes that the fish catch is declining even

for medium-scale fishers, mainly due to the increase in fishing effort needed. Whereas only one person in a family would fish and catch about 20 kg a day, now most family members fish but can catch only 10–15 kg each a day. Another reason for this proposed by Mr. Saveng is the greater area available for fish to migrate after the fishing lots were removed. When the fishing lots existed, fish would migrate along the fishing lot fences, so people put their nets there and caught large numbers of fish. Now the fish are not impeded and can migrate freely, and this has meant that people's catches have declined, as the fish are more dissipated. Migration also depends on the water levels and so will vary each year. There is also a need to create more awareness on fish migration and its importance in sustaining the fishery. Furthermore, Mr. Saveng believes that the Tonle Sap Lake is also becoming shallower due to natural factors and sedimentation from upstream. The biggest sediment load comes from the Mekong River.

Mr. Chhet would prefer to become a middleman. He feels this would provide a more regular income, since as a fisher, he is not sure how much he will catch each day. However, becoming a middleman requires an investment of about USD 5000. His hope for his nine children is that they will become businesspeople. Some individuals, such as Mr. Samnang, have already stopped fishing. He started fishing in 1989 as a small-scale fisher, graduated to medium-scale, and then stopped in 2000 because it was not profitable even at that scale. While the reason for his decision was the monopolistic behavior of the fishing lot owners and threats posed by its workers, he notes that even after its removal there are fewer fish. Lower incomes mean people who wish to move out of fishing cannot afford the transition costs and so are trapped. Mr. Samnang switched to selling vegetables, which he did for six years. He now runs a small shop. The declining natural resource base has meant that young men and women from about 100 households now work in factories in nearby towns.

The desire to exit the fishery sector altogether was expressed by another interviewee⁴⁴ who does not want her children to become fishers. She needs to fish all day, seven days a week, and to go far (10 km) to catch sufficient fish.



Mr. Sem Chhet (carrying one of his twin babies) with his family.

Photo credit: Sanjiv de Silva/WWF

She takes her small children on days that her relatives are unable to take them to school. Her husband helps at home and with the children by cooking and washing clothes. She hopes they will work for an NGO, have their own business or go to South Korea, as several people from this village have done. This work migration started a few years ago and involves both men and women.

Illegal fishing and corruption

According to the Deputy of the Fisheries Administration station, illegal fishing is another major factor in the fishery's decline, along with the cutting of flooded forests. Flooded forest clearing is done mainly by people who live far from the forests, see them only as a source of timber and are not aware of their ecological significance.⁴⁵ Illegal fishing consists largely of small illegal nets used by small-scale fishers, mainly from April to July when the water levels are low. When illegal fishers are caught, the Fisheries Administration officers first advise them of the rules and why they are important, and then let them go. This works with the majority. The exceptions are those who use electricity to kill fish. They are arrested and

taken to court. This, however, takes significant time, effort and funds due to considerable paperwork and the need to preserve the evidence. Each case costs about USD 250, and with only 11 officers (all men) and seven boats to cover five villages and 3,314,389 hectares (ha), there is insufficient workforce to do this regularly, even though the stated priority is stopping illegal fishing. The conservation area requires extra monitoring during the dry season when the water is low, as people know that fish concentrate here and catching them is easier due to the low water level.

Although the Fisheries Administration has the authority to prosecute illegal fishers and so is not reliant on the police, it is claimed that cooperation with the police is sought, especially if there is a lot of illegal activity. The Fisheries Administration is also said to cooperate with the Ministry of Environment in the province, though the Ministry of Environment does not have the same authority to prosecute. Ministry of Environment officers can, however, stop illegal fishing, though they need to hand the offenders over to the



Fish traps (left) and Mrs. Chhet processing fish for market (right).

Fisheries Administration or the police if they are to be prosecuted. Coordination at the district level within the Ministry of Environment was described as irregular and unstructured. The Fisheries Administration thus relies mainly on creating awareness of the fisheries laws among the communities in coordination with local authorities.⁴⁶

The other major actor in fishery management is the community fishery formed in 2003 following the partial removal of fishing lots and the subdecree on community fisheries. It is mandated to conserve fish stocks and flooded forests by enforcing its own bylaws and assisting in enforcing the fisheries laws, for which an enforcement officer is assigned. Enforcing the rules, however, has proven to be difficult according to Ms. Kun Srei, a small-scale fisher and community fishery member. She ascribed this to the lack of cooperation on the part of the village head, commune council, police and Fisheries Administration, who do not wish the flow of bribes to be disrupted. The community fishery has asked for an additional boat and funds for fuel in the current

village development plan. This is done every year without success. It is alleged that illegal equipment seized and sent to the Fisheries Administration office disappears unless Mr. Khan Von, the community fishery enforcement officer, makes sure the items are properly recorded.⁴⁷ The reliance on these actors is partly caused by the fact that the community fishery's role is limited to stopping rather than actually arresting anyone, as community fisheries are not vested with this authority under the law. As such, the community fishery's enforcement officer is required to inform the Fisheries Administration or the police if an arrest needs to be made. This is not practical, as he is unable to keep the illegal fishers long enough for the Fisheries Administration officers to arrive, if they arrive at all.⁴⁸ While people from outside the community fishery area who want to fish in the area are required to pay the community fishery to gain access, the community fishery has no capacity to monitor and enforce this and other rules. Consequently, a large number of people from other provinces fish in this area when the water is receding.⁴⁹ Moreover, the close kinship networks in the village mean that illegal fishers

are quite often related to the enforcement staff, which complicates the community fishery's role in fisheries management.⁵⁰

According to Mr. Khan Von, the community fishery enforcement officer, the enforcement challenge has intensified now that illegal fishers using electricity have formed groups, which reduces their transaction costs in the form of collective bribes to law enforcers, and creates the ability to intimidate anyone who tries to stop them. This is re-enforced by backing from powerful individuals on whose behalf the fishers use the illegal methods. The fish caught are bought by the same individuals. The community fishery is unable to stop this practice given the lack of support from the police and other agencies. Many of the fishers who use electricity come from Kampong Thom town; most locals don't use this method.

Similar assertions of corruption were made by Mr. Sem Chhet, who voluntarily admitted to paying the police to be able to break the rules. In fact, the community fishery itself appears to have engaged in facilitating illegal fishing when during the existence of the fishing lot it accepted the lot owner's offer of 10 kg of fish for every 100 kg caught if the village provided electricity to catch fish. This went on for three years, according to Mr. Um Meng, the current community fishery chairperson.

Given these issues and the lack of enforcement capacity within the community fishery, the enforcement officer adopts a similar approach to dealing with illegal activity to that of the Fisheries Administration officers. Where an arrest is not necessary, he will advise a person the first two times that he or she is caught. On the third occasion, he imposes a fine of USD 10, which he claims is used to support the community fishery. Fines, however, need to be restricted to nonmembers. This is another major weakness given that 40% of fishers in the village alone are not community fishery members. Serious nonmember offenders are caught and handed over to the Fisheries Administration or police. Illegal equipment is also confiscated and sent to the Fisheries Administration office. Some support is received from the Fisheries Administration through supplies of fuel, though the community fishery members use their own boats for patrolling the

area. However, these are nowhere near enough. Some training was organized by the community fishery for members and nonmembers with support from NGOs.⁵¹

The most difficult period to enforce rules is April–June, when water levels are low and there is a lot of illegal activity. Patrolling is made difficult by there being only one boat and by the low water levels. When water levels are low, some areas can only be accessed over land, which takes longer.⁵²

Community fishery

The community fishery has 450 members, of which the majority (250) are women.⁵³ Members are only Cambodian. The Vietnamese households were not invited to join, because the Fisheries Administration only allows Cambodians to join community fisheries. This is despite the fact that the Vietnamese are said to engage heavily in illegal fishing and in raising illegal fish species that are sent to Vietnam.⁵⁴ This is clearly a significant weakness in the fishery management structure. The community fishery's committee members were voted in by the general members. The community fishery formation process was facilitated by the village and commune heads together with NGOs. Once created, the community fishery signed an agreement with the Fisheries Administration accepting its responsibilities. The agreement was sent to the Minister of Agriculture, Forestry and Fisheries in Phnom Penh.⁵⁵ The community fishery structure consists of the chairperson, four deputies, a finance officer, a secretary, a cashier, an administrative officer, an enforcement officer, a communications officer and the general members. The chairperson and deputies make decisions and inform the commune council head. If the commune council head disagrees with any decisions, a vote needs to be held among the community fishery members.⁵⁶ According to the community fishery chairperson, Mr. Um Meng, this has happened a few times, such as when the commune council did not want the community fishery to monitor fishing activities, which would upset the flow of bribes for the commune council, Fisheries Administration and police.

The subdecree on community fisheries requires them to protect natural resources through sustainable management. This is to be achieved by promoting the fishery laws and by designating and implementing the area to be managed by the community fishery. The community fishery enforcement officer, however, does not receive payment for his work and does not have a uniform to indicate that he represents the community fishery. He goes on patrol with six to seven volunteers about three times a month. According to Mr. Meng, the original community fishery area identified by the Fisheries Administration was not helpful to the village, as a large part of it is dry in many years. His request by letter to the Prime Minister in 2004 to increase the community fishery's size was approved, which added an extra 8 km from the edge of the Tonle Sap Lake into the floodplains. This was not accepted by the commune council, however, which resulted in a second request as a petition to the government Senate in 2007. This resulted in a second letter from the Prime Minister affirming his original decision.

The community fishery's income is derived from its membership fees. The majority of its funds used to result from fees paid by outsiders seeking permission to fish in the community fishery area until this was stopped in 2006. Fees from outsiders used to earn the community fishery USD 50–100 a year. The income is now very small, leaving insufficient funds to purchase fuel for monitoring. News of illegal fishing reaches the community fishery every day, but it has no capacity to follow up.⁵⁷

The community fishery also operates a savings group, which was started in 2005. It is open to nonmembers. It is divided into groups of 20 people, with people paying USD 5 when they join. Contributions are deposited each month into the group account. These funds are collected for a year, after which they are used for microcredit. Progress has been poor due to the number of resource-poor people who are unable to pay back loans taken to purchase nets and hooks. Loans are also given for income diversification, such as poultry raising.⁵⁸

Chnok Tru village (village classification: floodplain/seasonally flooded)

Chnok Tru village consists of 575 Cambodian households and 540 Vietnamese ones. These live in the same area. The village is dry for four to five months of the year (March–July).

Natural resource management, livelihoods and the roles of institutions

Agriculture

Agriculture is constrained by the inundation of the village for seven to eight months of the year and by the village's location within a conservation area,⁵⁹ which prohibits agriculture during the dry season. Since agriculture is not possible in the vicinity of the village, there is no farmer organization. The difficulties faced in trying to maintain agriculture on the mainland are apparent from Mr. Loch Chiron, who used to grow watermelon and pumpkin in addition to fishing on lands originally obtained by clearing forest in 1979 with the fall of the Khmer Rouge regime. While one factor that causes Mr. Chiron to no longer cultivate is his age (62 years), his decision to stop farming originates from the village's location and an intensification of competition for land within a context of underdeveloped land titles and an inability to enforce them. Since the village is flooded for most of the year, villagers need to be able to access and retain control of land on the mainland. This also involves transaction costs in terms of time and effort, which intensify with age. To access his land in the wet season, Mr. Chiron needs to travel 5 km from the village. He used to stay on the mainland while cultivating, as regular travel from the village was time consuming. He owned the land, but has now sold it, partly due to a perception of its increased vulnerability to land grabs. He says that maintaining control of the land has been a challenge due to stiff competition for land and large numbers of landless households.⁶⁰ Consequently, forest clearing still occurs, with how much land a household can access depending on its capacity to clear the forest. Much of the clearing is for rice fields, since rice is perceived to be less risky than vegetables due to the latter's vulnerability to insects and disease during the dry season. This is the deciding factor, since rice and vegetables bring similar incomes. Water is pumped from the river by individual farmers.

Fishing

Fishing is the main livelihood for the vast majority of households.⁶¹ Despite there being a conservation area, the fishery in the area is considered to be poor, and many fishers go to fish in Kampong Thom Province. Fishing is much better there due to the large flooded area, which can support larger fish stocks.

Mr. Chiron roasts the fish before he sells them to a middleman for lower than market price (about 20 percent less). He is locked into this arrangement because he has borrowed money from the middleman to buy nets and other fishing equipment. Almost all the small-scale fishers in the village are in this situation.⁶² This system is operated by five or six middlemen.

Mr. Chiron decided that the uncertainty over his land assets makes full-time fishing more attractive in terms of the regularity (daily) with which food and income can be secured. However, it may be debated whether this decision reflects a voluntary choice or the lack of choice, given the continuing decline of fishing stocks. He acknowledged that the fishing effort has increased significantly (due to the number of fishers and large quantity of illegal equipment). Indeed, Mr. Chiron admits that he would prefer to live on land, but with land being scarce and the ability to defend it diminishing with age, this is no longer possible. The commune council is trying to access social concession land and is

awaiting a decision from the government. If this is granted, the village will move to the land.

Overfishing

Mr. Bunthum of the Ministry of Environment perceives the removal of private fishing lots as having expanded the resources (area and quantity of fish) available to the village. On the other hand, he acknowledges that these potential benefits have been undermined by the influx of new fishers from the mainland (including adjacent provinces). The impact this is having on the fisheries results not only from an estimated 20 percent increase in the number of fishers, but from the lack of a fisheries tradition and understanding of fish habitats and behavior, which also are expressed in a notable lack of regard for fisheries rules. Removal of fishing lots has consequently failed to arrest the decline of the fishery, and it was opined by Mr. Bunthum that small-scale fisheries can no longer support a family—which tend to be quite large.⁶³ A lack of knowledge on good fishing techniques is seen as a contributory factor.

It is also apparent that while a part of the lake in the village area liberated from the fishing lot's control is now a designated conservation area, there is no clear evidence of its role in supporting the fishery, as no data is collected to validate the impacts of such areas on local fisheries.



This waterway becomes the main village road during the dry season.

Illegal fishing

Illegal fishing is escalating as human populations increase around the lake, partly due to migration from other areas. Some of this is seasonal migration during the flood season, but all is focused on the fishery.⁶⁴ The large-scale methods adopted by the local Vietnamese population are considered to be especially damaging, but remain unchecked due to pressure applied on the Cambodian government by its Vietnamese counterpart to ignore violations of fisheries rules. The income generated by the use of illegal equipment also enables the payment of attractive bribes, which has become a self-sustaining informal system. For instance, illegal operations in this area are supported through a letter provided by a four-star general in the province. Although he does not have the authority to do this, it is accepted due to his position of power. Some species are no longer caught. Consequently, small-scale fishers like Mr. Chiron do not feel they have benefited from the removal of fishing lots.⁶⁶

The Head of the Fisheries Administration's commune office believes that illegal fishing can't be stopped unless people understand the relevance of the rules and get involved. The commune councils can also play a role in fisheries management by helping develop awareness of the fisheries rules and the importance of flooded forests.⁶⁶ The rules governing fisheries can be learned from the Fisheries Administration, the commune council or the community fishery where one exists, but the transfer of knowledge depends on whether a fisher attends the meetings called by the Fisheries Administration and commune council. Mr. Bunthum believes that illegal activity is due to a lack of awareness of the rules.

Insufficient rule enforcement

The Fisheries Administration regulates fisheries and aquaculture and also seeks to maintain flooded forests. According to Mr. Bunthum, there is very little capacity in terms of physical infrastructure, personnel and funds to regulate fisheries. With only 10 staff for the province, enforcement strategies have been adapted to resource scarcity, given the large physical area (80,000 ha covering six communes) and the fluidity of movement that water enables. Arrests are avoided due to the significant transaction costs (time, funds and effort)

involved in court procedures, and only occur occasionally with large-scale infringements. Most infringements, when detected, generate a warning and lecture about why the rules are important. A second infringement is likely to lead to confiscation of equipment (including fuel). Such methods are adaptations to the lack of capacity, reveal uncertainty of the likelihood of actual prosecution due to corruption, and are reflective of sympathy towards especially small-scale fishers in light of their waning livelihoods.

The District Fisheries Administration Office is trying to get people to replant flooded forests by creating awareness of their importance and by providing funds to communities for seedlings. However, most people who cut the forests are from outside the fishing communities, as they have no vested interest in the forests' fishery-related ecological functions.⁶⁷

Interagency coordination does not occur at the district level, and Mr. Seanghang does not know whether this occurs at higher administrative levels since the crackdown on illegal fishing in 2010 ended at the end of that year.

Lack of a community fishery

Despite fishing being the primary livelihood in this village, there is no community fishery. The reason given for this is the small population size in the village and the lack of fish in the area.⁶⁸ The primary disadvantage of this lack is perceived to be the inability to source support for fishers in an organized manner. If a community fishery existed, this would have entailed sourcing fishing equipment for the less affluent fishers, mainly from NGOs. However, as pointed out by Mr. Chiron, the utility of a community fishery will depend on who benefits from it, which results from who controls it. He refers to the fact that some community fisheries are dominated by a few actors, which has excluded the majority of their members from benefits.

Village development planning

The process of developing village development plans began in 2007.⁶⁹ Needs are selected at a village meeting at the community center and priorities are selected through a raise of hands. The village head expresses the village priorities to the commune. Investments through previous village development plans include road construction, a community center,

a kindergarten and secondary school, sewing machines, a center for drying fish, support for pig raising, and a center for water filtering and boats for 40 resource-poor households provided by the Ministry of Education to enable children from these households to attend school, in addition to their use for fishing. Many of these interventions were funded by donors and NGOs.

Plans to relocate to the mainland

The village requested social concession land from the Provincial Governor through the commune council in 2012. The land requested is adjacent to the main road and covers 6223 ha. If the Governor agrees, then the village will relocate in a phased manner. People will keep fishing until they get used to farming. Mr. Sokham expects 80 percent of people to stop fishing eventually due to the lack of fish stocks in this area and the decline of catches. Moving to the land will also circumvent the time-consuming and costly maintenance work needed on the present houses, which are damaged by the floods and long periods of inundation.

There are, however, a number of factors that may prove to be obstacles. Currently, another village is using the requested land. The area will also need to be flood-proofed, as the seasonal floods reach the main road. This will require construction of a retaining wall at an estimated cost of USD 300,000. There has not been a response from the Governor so far.⁷⁰

Tramper village (village classification: floodplain/seasonally flooded)

There are 225 families living in Tramper village. Located 10 km from the Tonle Sap Lake in the dry season, part of the village is flooded from September to mid-November (see flood line in Figure 1), though the water starts to recede at the beginning of November. The flooding affects 68 families, some of whom need to relocate temporarily to higher elevations in the village.

Natural resource management, livelihoods and the roles of institutions

Although small-scale fishing is considered the primary livelihood by Mr. Sok Mum (village head) and Mr. Thoum Thien (chairperson of the

community fishery), agriculture is in fact the most valuable livelihood in terms of income generation, given that about 95 percent of families also engage in agriculture either year round or seasonally.⁷¹ The perception that fishing is the primary livelihood activity appears to be based on the larger percentage of families that fish (virtually all families), when in fact fishing is supplementary to agriculture in terms of revenue generation and the time and investments required.⁷² In fact, people generally fish only after completing their farming activities in the wet season, and during the dry season (April–July) people are forced to buy fish from the market when fish stocks in the ponds dwindle with the pumping of water for dry season farming.⁷³

About 30 percent of households are landless, and they either work as labor in the village or migrate within Cambodia or to Thailand for work.⁷⁴ Overall, most households engage in multiple livelihood practices in varying combinations, with farming being the most prominent, followed by fishing. For some families, fishing is supplemental. For others, especially those affected by the floods in the wet season or who cannot access irrigation

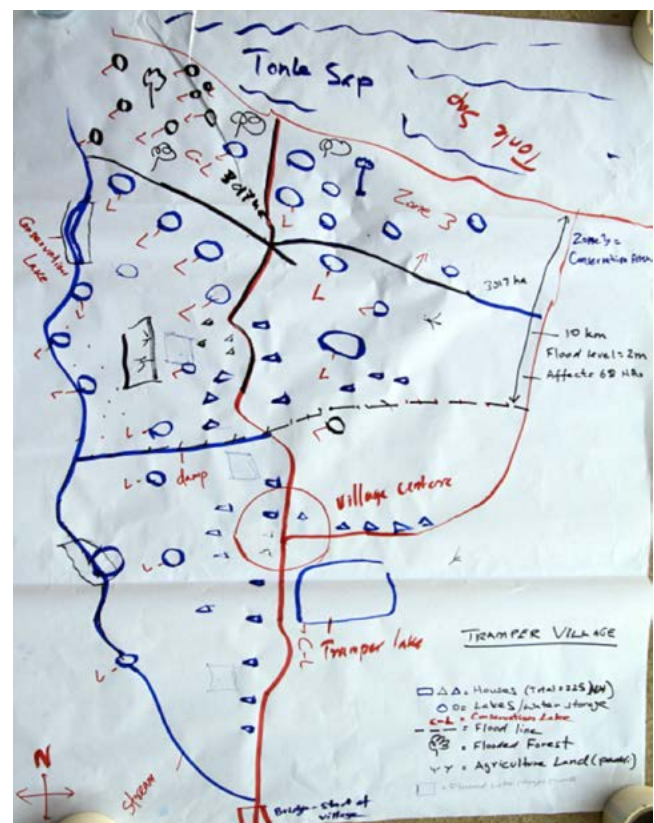


Figure 1. Distribution of natural resources and homesteads in Tramper village.



Throw nets are a dominant form of fishing, indicating that much of the fishing is small scale (left) and cattle appear to be kept mainly by the relatively resource-poorer households in the southern part of the village (right).

water in the dry season, fishing becomes the primary livelihood in these seasons, unless seasonal migration is preferred. Livelihood strategies thus vary to fit the resources available to each household each season.

Agriculture

Small, medium and large agriculture holdings are perceived as follows: small = 1 ha (70 households); medium = 3 ha (60 households); and large = >3 ha (70 households). Considering that 0.5 ha is generally considered to represent a marginal landholding, these figures suggest that the majority of households are well above the marginal status. However, 25 households do not own land. The other households own their land, although this ownership is not recorded in a formal title. This is not seen as a problem, as the extent of land and the owner are recognized by the commune council. The existing plots will get divided among children. There is claimed to be no discrimination between sons and daughters in this distribution.⁷⁵ Farm landholdings of many farmers are often not in single parcels, but distributed in smaller ones. Mr. Sam Roem exemplifies this: he has 3 ha of land consisting

of three parcels of 1 ha each in three locations. Moreover, 1 ha is highly susceptible to flooding, so it can be farmed only in the dry season.

Rice production is 4 tons/ha in both seasons, though the dry season involves much higher costs according to Mr. Hien Keun, the community fishery chairperson. He sells to a local businessperson, as he feels the lower price is offset by the high transport costs he would have to incur in taking the produce to a market. His son used to migrate to Thailand to work on a construction site, but has remained in the village this year, as he feels he can earn more in the village. His contribution to cultivation also represents a reduced labor cost.⁷⁶

Flooding

During the wet season, 68 households in the flooded part of the village are unable to cultivate due to a water depth of 2 m, and so resort to fishing using boats. Attention was brought to the fact that in 2011, the flood was considerably larger, flooding the whole village and destroying the entire rice crop. This experience increased farmers' perception of

flood risk, which caused many to not cultivate in the 2012 flood season. This choice was also influenced by a forecast of another large flood, which did not materialize. Overall, the observation is that there is a large flood every five years, with what is considered “normal” flooding in the other years.

Water scarcity and the political economy of irrigation

Overall, there is insufficient water for dry season agriculture, especially paddy. Mr. Hien Keun, for example, owns 6 ha of land distributed in different locations, but the area cultivated in the dry season is only 2 ha due to water scarcity. While he is aware of other crops that require less water, he chooses not to shift from paddy.

The small ponds are also a source of irrigation during the dry season, when water is pumped to the rice fields. It appears that access to the large ponds is concentrated among farmers in and around Tramper Lake, which is one of the bigger water sources in the dry season. It is situated close to the center of the village and relatively close to the Village Head’s house and the road providing access to nearby towns. Further support for this view is that farmers closer to this lake own larger land areas, which have been made possible by cutting forests in the past to extend farm sizes. The maximum distance water can be pumped is said to be 100 m, as pipes are too expensive to buy or hire for the more resource-poor farmers. This means that fields further from a water source are left fallow in the dry season. This is the case for about 25 households who are forced to send one or several members to cities in Cambodia or even to Thailand as labor to provide an income to the family.⁷⁷

Access to the pond water for irrigation is similar to access to the pond’s fish in the absence of any rules. If the water demand is greater than the water supply, it is left up to the farmers to prioritize access.⁷⁸ The only management initiative in this respect is a minimum depth marker (blue flag on a pole) in the large lake (Tramper Lake) at the center of the village, which was determined by the Village Head and the community fishery, though how much water each farmer can pump from the lake till this limit is reached remains unregulated.

The lack of storage in some areas of the village, especially towards the lake, is acute in the dry season. Tramper Lake quite often is unable to provide enough irrigation in the dry season, and when this happens, farmers leave a part of their land uncultivated. The water in this lake can only supply 1 ha of paddy per family, whereas some families own 5 ha. This 1 ha per family limit is not enforced, and people pump water on a first-come-first-served basis till there is no more water. It is unlikely that the minimum water level indicated by the blue flag will be respected by the farmers.⁷⁹

In addition to the inability to store adequate water for irrigation, more resource-poor families cannot afford the economics of pumping. According to Mrs. Sun Ki, a small-scale farmer and fisher, an 8-horsepower pump costs USD 500 and must be run for three to four hours to irrigate 1 ha. This costs USD 15. She gets only 2 tons/ha in the dry season (3–4 tons in the wet season due to different rice varieties). She bought her pump with a loan taken from a local businessperson, which meant the net cost of the pump was USD 800 when the interest component of USD 300 is factored in. She nevertheless perceives this to be more feasible than borrowing from a bank, which requires monthly payments. For those who need to hire a pump, like Mr. Eng Yoeun, the cost is USD 6 per hour, which he cannot afford since he needs to irrigate two to three times in the season.

Other aspects of dry season rice production are also expensive. The cost of harvesting paddy is high, as are the costs of pesticides and fuel for pumping, which are not necessary in the wet season.⁸⁰ The costs that occur throughout the growing season combine to keep the resource-poor families in a state of indebtedness until income is realized following the harvest. Yet much of this is used almost immediately to repay loans, including a mounting interest component. Mrs. Sun Ki therefore has to take loans each month to survive till the next rice crop, and so borrowing from formal institutions is not an option for people in her position.⁸¹

Mr. Yoeun has experimented with growing watermelon instead of rice, though this was limited to a 100 m² plot. Mitigating scarcity through crop choices is hampered by a lack of

technical assistance from the state. Mr. Yoeun noted that the Department of Agricultural Extension officer has not visited the village, or at least he is not aware of it. The location of farmland in relation to irrigation sources also enters the equation to further restrict dry season farming. Given the distribution of Mr. Yoeun's 2 ha among several plots, he can cultivate only the 0.5 ha that is closest to the water source, which must be shared between 35 families.

Using groundwater for irrigation is not thought to be possible by the Provincial Department of Water Resources and Meteorology since the water table is below 90 m.⁸² Furthermore, the fact that much of Tramper is now private land means that there is little space available to dig additional water storage ponds. A more feasible approach would be to make the existing ponds deeper.⁸³ The Village Head thus plans to rehabilitate Tramper Lake, to build a dike in another pond to increase its holding capacity, and to construct two new ponds each with a capacity to supply 20 households.⁸⁴ Increasing storage capacity in this manner could be linked to a collective approach to pumping, as suggested by Mr. Yoeun, who feels the solution is to introduce a large pump that can be managed collectively to supply water to all the fields in the area. This in turn needs to be linked to better management of dry season water access for more efficient and equitable water use. According to Mr. Sam Roem, however, those who have large rice fields and the means to pump water see such attempts to manage the water as a threat and so do not support the need for farmer organization.

According to the Deputy Director of the Pursat Provincial Department of Water Resources and Meteorology,⁸⁵ a reservoir exists between Tramper and the neighboring village of Toul Kou. Although the reservoir water is intended to be shared between the two villages, Tramper currently lacks the infrastructure to access the reservoir water. The Provincial Department of Water Resources and Meteorology intends to rehabilitate a stream in Tramper to perform this function, but lacks the funds to do this. Another element to the problem is that the reservoir is at a lower elevation than the stream and Tramper village in general. While each village has two water gates to access the reservoir water, the two gates for Tramper are at a lower elevation than the village.

The fact that the neighboring village has become accustomed to being able to use all the water is also likely to present a potentially significant obstacle, given that both farmers and fishers are likely to have organized and invested in production systems to benefit from current supplies of water. The likelihood of this being the case is enhanced by the fact that the Head of Toul Kou village owns a rice mill and needs the water from the reservoir to ensure that the farmers in his village can supply him with adequate rice.⁸⁶ Furthermore, the reservoir can supply only 100 ha of paddy land (50 ha per village), and is therefore unlikely to completely alleviate water scarcity in Tramper. Moreover, given its location at the northern side of the village, ensuring access to this water for the smaller-scale farmers who are further away will also be a challenge.

The importance of location

As already noted, the distribution of a household's land in several locations is a common and important feature affecting a household's ability to cultivate both in the wet and dry seasons. The distributional pattern in this village appears to be a legacy of the re-organization of landholdings following the Pol Pot regime. As explained by Mr. Eng Yoen, during this period, the village was emptied of its inhabitants, who were taken for labor in other parts of the country. Upon the demise of the regime, those who returned first were able to settle in any area, irrespective of landownerships prior to the Khmer Rouge era. This redistribution of land thus has led to major reversals of fortunes for households. For some, this has allowed repositioning closer to the center of the village (and the seat of influence and access to more irrigation water), while for others, such as Mr. Yoen himself, it has meant the opposite. Though he lived at the northern side of the village before 1975, upon return to the village in 1979, he found the best locations and land already occupied, and thus had to settle for what can be considered marginal land; his homestead and 2 ha of agriculture land are flooded annually by up to five feet of water. Households closer to the center of the village are at an advantage, as the rice fields are more productive and there are more fruit trees. Access to irrigation and to local markets is also better. This historical oddity was facilitated by the lack of registered title deeds to land, which

made it difficult for households to demonstrate and enforce rights to land.

Weather-driven uncertainty

As already noted, floods have been higher than expected in 4 of the last 10 years, with large floods in 2011 and 2013.⁸⁷ While the distribution of fields in several locations may have some disadvantages in terms of access to irrigation water and lost economies of scale, it seems to provide some degree of mitigation against flooding, since not all parcels of land are equally vulnerable. Some farmers, such as Mr. Chem Khenluong, have decided to lease their land due to uncertainty with respect to water availability in the dry season, as well as flood levels in the last few years. The decision to lease out land is also a result of insufficient funds to buy fertilizer and other inputs. Mr. Chem Khenluong receives 300 kg of rice a year from his land from the lessee, but recognizes that this gain is tied to the vulnerability to climatic conditions now borne by the lessee. It is now difficult to make a profit from paddy due to its low market price and the high costs of inputs such as fertilizer. Mr. Chem Khenluong is struggling to pay back the loan he took to purchase fertilizer, as he lost his crop last season. There is thus a heightened sense of risk linked to uncertain climatic conditions and the inability to correctly forecast these. This is further heightened by the lack of water storage options in the dry season, as already discussed. Floods are larger than before, while the dry season last year was drier than in previous years.

The uncertainty generated by varying flood levels appears to prevent the adoption of more water-tolerant rice varieties, as this is a risk many farmers feel they are unable to take.⁸⁸ Some farmers with land closer to the lake have adopted floating rice varieties, but these cannot be grown if water levels are too high, as was the case this year.⁸⁹

Absence of farmer organization

There is no farmer organization. While some farmers understand the potential benefits of association,⁹⁰ two possibly related factors appear to militate against collective action. One is a lack of confidence in each other. For instance, Mr. Sorn Bun, a farmer (and seasonal fisher), believes that group formation is hindered because people do not trust others to make financial and other contributions (i.e. fear of free-riding). Perhaps contributing to such a view is the belief that the larger land owners are especially uninterested in collective action because the current status quo suits them well, as the bulk of irrigation water can be appropriated by those with the equipment and funds for fuel (i.e. the means of access).

Farmers therefore operate individualistically,⁹¹ and this seems to be especially limiting to the smaller-scale farmers, who appear to have no access to technical guidance and other forms of assistance to make the most of their landholdings. They also deal with risks such as the higher variability in flood levels and dry season water scarcity. An obvious question is why these needs are not being met through



The impact of location. Left: Houses in the spatial and political center of the village are well built. They are also free of floods most years, which enables cultivation of all or some of the land. Better access to irrigation through being close to Lake Tramper is also an advantage. Right: Closer to Tonle Sap Lake, houses are much less sturdy and are flooded each year. No rice production is possible.

the village head, but given the short duration of time spent in the village, it was not possible to determine what the actual situation is. Some caution should be exercised in situating the issues with the authority figures only, as attitudinal issues among the farmers themselves could be equally pertinent. The roles played by the structure of the village and commune development planning processes should also not be underestimated given the propensity to select priorities based on numbers served, as well as the tendency for the commune councils to favor infrastructure over software investments.

Mr. Sorn Bun further notes the decline of a previously existing culture of mutual assistance among farmers, especially with respect to planting and harvesting. He attributes the decline of these values to the mechanization of these activities, since according to him almost all farmers use combined harvesters and other forms of mechanization. Demand for human labor has consequently fallen significantly.

Despite a number of village respondents confirming the absence of any farmer organization, the Deputy Director of the Provincial Department of Water Resources and Meteorology for Pursat Province⁹³ states the existence of a farmer water user committee to manage the reservoir shared between Tramper and Toul Kou villages. He in fact stated that the village head of Tramper is the deputy of the farmer water user committee, while the village head of Toul Kou is the chairperson.⁹² This could not be verified, as the Deputy Director was interviewed after the visits to the village.

Fishing

Fishing occurs mainly around the village in the wet season (July–October). Fewer households fish in the dry season (April–July), as the water recedes up to 10 km from the village. Much of the fishing in and around the village is based around 39 shallow ponds and small lakes. (See Figure 1.) The equipment used are hooks, throw nets and long nets with 3-centimeter (cm) mesh size, which are placed in the shallow water and thus do not require investments in boats. Which method is most effective depends on where it is used. Throw nets, for instance, are better in small ponds, while long nets work better in the Tonle Sap Lake. As indicated in the resource map

in Figure 1, several shallow ponds are located throughout the village, and many of these are adjacent to paddy fields. Many of the fishers sell their daily catches to buyers who come to the village. Average daily income is about USD 10.⁹⁴

According to Mr. Thien (community fishery chairperson), access to these ponds is not regulated by the community fishery or any other actor. This creates a degree of unequal distribution by virtue of differing proximity between households and ponds, though this was not seen as an issue in any interviews. Moreover, any person is free to fish in any of these ponds other than those that are in the conservation area. Where fishers put their nets is also not regulated, with the better locations taken by those who arrive first. Consequently, households that live near a pond don't always fish there, but go to a pond closer to the Tonle Sap Lake, as the fishing is more productive in these. This amounts to a distance of about 15 km for houses furthest from the Tonle Sap Lake. The size of fish catch is not regulated, though in general fishers catch mostly for consumption and a small quantity for sale. The only households who catch larger amounts for sale are those closer to the Tonle Sap Lake, where fish stocks are higher. One form of differentiation between households in terms of how they benefit from the pond fisheries is the unequal ownership of fishing equipment. There are also no rules on how many people can fish in the same pond or lake at the same time, or for how long. Many of the fishers spend much of the day fishing.⁹⁵

Some of the ponds are in the conservation area established by the community fishery, which also includes the remaining area of flooded forest. Human use is limited to small-scale fuel wood collection, and this is not perceived as a problem.

Community fishery

The community fishery was created in 2005 to prevent illegal activities such as the use of electricity and long nets (1 km) with small mesh sizes in the Tonle Sap Lake and in Zone 3. (See Figure 1.) According to the community fishery chairperson, illegal fishing was done mainly by outsiders. It was claimed that the community fishery now monitors this area and informs the Fisheries Administration of illegal activities. Community fishery members sometimes join the Fisheries Administration on raids, since the community fishery itself is not authorized to arrest illegal fishers.



Fisheries activities: fishers collecting fish from long nets in a shallow pond (left), and a fish buyer who purchases fish from small-scale fishers on a daily basis (right).

The community fishery has 619 members, of whom 327 are women, and 11 of these women are committee members. Anyone over the age of 18 can join the community fishery. The area under the community fishery is from the Tonle Sap Lake inwards to the village, including the small ponds and lakes in the village. The community fishery signed an agreement to promote the Fisheries Administration's and the Ministry of Environment's rules. According to the community fishery chairperson, illegal fishing has decreased and fish catches have increased, and there is an increased awareness of the fisheries laws. But other fishers (e.g. Mr. Sam Roem) expressed the opposite view, stating that illegal activities occur mainly in the night. This includes logging of the flooded forest by outsiders.

An Asian Development Bank project provided boats and communications equipment, which is now broken. New equipment was requested under the village development plan in 2011, but did not materialize. The same request has been made this year.⁹⁶

Aquaculture: Can current constraints become future potential?

Aquaculture appears to be viewed as either a potential alternate livelihood or a supplementary livelihood. According to Mr. Eng Yoeun,

although a request was made to the commune council for a 100-m² pond to be dug for each household, only two were dug, both close to the village center. These were funded by the Cambodia Peoples' Party (the ruling party) at a cost of USD 30 each (the cost of fuel for the machine). However, Mr. Sok Mum, the village head, states that there are 38 ponds in the village that were originally meant for fish raising; 30 of the 38 ponds were supplied by the Cambodia Peoples' Party. He is, however, now the only person continuing aquaculture, since many others lost their fish stocks in the 2011 flood. This problem is compounded by a lack of technical knowledge about fish culture. While the Fisheries Administration can be requested to provide training, people are reluctant to do this, as they will be required to provide the officers with their per diem. Aquaculture is also seen as too much work, and people now use the ponds for bathing and growing vegetables.

The perception of risk is thus a key factor that has diminished aquaculture's attractiveness in the village. Another major constraint is the lack of access to fingerlings, given the fact that the Fisheries Administration is not involved in assisting these households. Mr. Sok Mum gets fingerlings from a hatchery in Pursat. While others can do the same, he claims they are lazy and prefer to wait for assistance. While lack of

fingerlings currently operates as a constraint, it may also present an opportunity if the supply of fingerlings can be feasibly incorporated into an alternate or supplementary livelihoods model based on aquaculture.

Migration

Many people migrate to the cities in December–January and return in May.⁹⁷ The preferred destination for labor migrants is Thailand, as finding jobs that will pay more than farming is difficult in Cambodia due to very low labor wages. Two of Mrs. Soung Ki’s four children migrate to Thailand to work in an ice factory where the work is easier and overtime pay is given. Each child earns about USD 200/month. This strategy is adopted despite the family owning 2 ha of paddy land. The constraining factor is the land’s distance from a water source, which limits cultivation to the wet season. According to Mrs. Ki, 20–30 families are in the same situation. They have not thought of the possibility of using groundwater and have not discussed these problems with the Village Head or Provincial Department of Water Resources and Meteorology. The Department of Agricultural Extension officer does not talk to them and focuses on the larger-scale farmers. She does not think that a farmer organization will help, but feels the Village Head can help address these problems.

Village development planning

According to Mr. Hien Keun, the village members meet at the Village Head’s house to discuss problems. Sometimes he and his wife go, but usually his wife attends the meeting. The village development planning was done in October. The priorities selected for Trumper were a new road, rehabilitation of Trumper Lake, building a dam to retain more flood water, installing drinking water wells, and creating more aquaculture ponds in addition to the two that exist. The village development planning priorities are selected by hand-raising so that the most popular needs get selected. From a developmental perspective, this method can discriminate against the needs of smaller groups. Evidence of this concern can be seen in Mr. Eng Yoeun’s statement that though the Village Head invites all the villagers, not all attend. Most of those who do are quiet, as requests made in the past have not been picked up. People have thus lost faith in the process. He cites a request made in 2012 to dig a lake, which has not happened. However, whether this was because it was not represented to the council by the Village Head or dropped by the commune

council is unclear, and most people in the village are not aware of the entire process involved in selecting initiatives to fund by the commune council. Nevertheless, Mr. Eng Yoeun sees the village development planning process as a positive development, as communities had no similar system to access government and others’ support previously.

Raing Til village (village classification: floodplain/seasonally flooded)

There are 54 households in the village. The entire village is flooded by 2–3 m of water during the wet season and is totally dry in the dry season. The flood water arrives in June. There are only three months when the entire village is dry, although half the village is dry beginning in January, so that this half is dry for 5–6 months.⁹⁸

Natural resource management, livelihoods and the roles of institutions

Agriculture

A major restriction to dry season agriculture is the declaration of a conservation area that includes the village. This means that agriculture is restricted to a small raised part of land where vegetables are grown but not rice. Therefore, even though this village is flooded only seasonally, there is little productive land use possible in the dry season. There is consequently no farmer organization.⁹⁹ Households must continue to fish in the dry season due to the lack of other livelihoods, and people move to the Tonle Sap Lake to continue fishing. These families move to floating houses closer to the lake and fish in deep water.

Fishing

Most fishing is done by men. Only a few women fish, mainly around the house. Women are involved in fish preparation and domestic chores. Illegal fishing occurs on the lake, and takes the forms of electricity and long nets and mosquito nets with very fine mesh size, though the use of electricity is the most common form of illegal fishing. It is claimed that these techniques are used mainly by outsiders, and is seen as a major issue for the small-scale fishers who are restricted to the smaller nets.¹⁰⁰ A quite different picture was provided by the local police, who stated that the illegal fishers they arrest are those committing large-scale illegal actions and repeat offenders (about 2–3 people a



Boat repairs (left) and the local school (right).

month), and that these are people from the local villages.¹⁰¹ The monitoring challenge is increased in the dry season, when many outsiders come to the area to fish in the small water bodies left behind by the receding water—an activity allowed by the community fishery.

The community fishery covers Raing Til, Prek and KohKer villages and has 620 members. Fishers are free to move between the three villages. The executive committee has 11 members: 3 from Raing Til; 3 from Prek; and 5 from KohKer, reflecting the relative sizes of the villages. The chairperson is from KohKer village, and was selected by a vote. It is not difficult to co-ordinate between the villages. Inter-marriage between the villages also occurs, which strengthens the relationships between them. Meetings are less frequent in the dry season, as the committee members are dispersed.¹⁰²

There is a reservation fishing lot established by the Fisheries Administration 3 km into the lake, which is meant for fish spawning. It is therefore a *de facto* conservation area.¹⁰³

The responsibility of preventing illegal fishing is shared between the community fishery, the Fisheries Administration and the local police. There does not appear to be much coordination among them according to Mr. Chun Pou, village head, who stated that hardly any meetings take place between the community fishery and Fisheries Administration staff, and joint monitoring is also infrequent. Community fishery members accompany the Fisheries Administration once in a while. Mr. Mao Vu

at the local police post also noted that it is difficult to catch people, as the police have to take the person to the Fisheries Administration office, which is 5–6 km from the police post. Coordination between the police and the Fisheries Administration also appears to be infrequent, while there seems to be even less cooperation with the community fishery.¹⁰⁴

Each of these actors has little capacity to deal singlehandedly with the scale of illegal fishing. For example, there are only nine police for the entire Raing Til Commune, and they are distributed between four offices. The total amount of fuel for the boats provided for three months is only 30 liters, and this needs to be shared between the four offices. This amounts to just 2.5 liters per office per month. They therefore have to be creative to get more fuel, such as by asking for fuel as a fine when they catch illegal activity. They also use some of the fuel that is confiscated. Consequently, monitoring for illegal fishing is rarely done by the police, for whom the focus is more on maintaining social harmony by dealing with violence, robbery, drugs and domestic violence. Thus they catch illegal fishers only if they are informed by a third party.¹⁰⁵

Coordination is also essential in combatting illegal fishing, since both the police and the community fishery are authorized only to catch individuals and confiscate equipment. They are required to hand the persons and equipment over to the Fisheries Administration, whose responsibility it is to prosecute the wrongdoers.¹⁰⁶

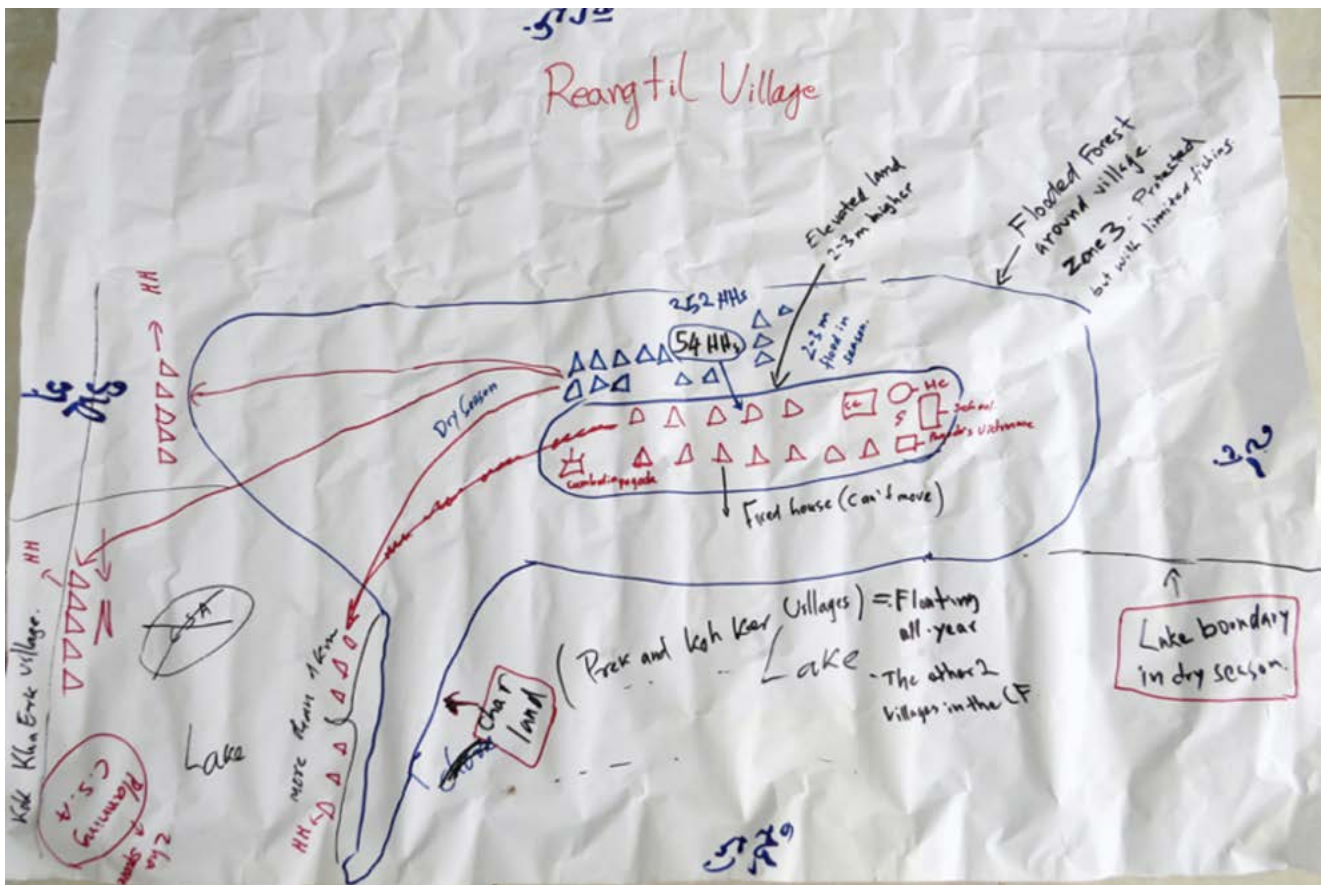


Figure 2. Resource map of Raing Til village.

Aquaculture

According to Mr. Chun Pou, the village head, aquaculture started 10 years ago, although the practice has been slow to take hold in the community. The growing period begins in July and the fish are harvested once a year in December. Fingerlings are supplied from Vietnam through a Vietnamese middleman. The cost of 1000 fingerlings is USD 50. The fish are grown mostly for sale.¹⁰⁷ According to Mr. Ly Ra, who recently adopted aquaculture, the fingerlings are bought on credit from the Vietnamese middleman. Losses are high. If 2500 fingerlings are bought, only about 1000 (40%) will remain at the time of harvest. The species grown (snakehead) is in fact illegal under the Fisheries Administration rules. The total cost of production is about USD 500. The profits are used for boat repairs and to purchase rice and vegetables. The family sometimes takes loans of up to USD 200 in some years to make ends meet. The family plans to raise pigs when not doing aquaculture in the dry season.¹⁰⁸

Many of the adopters of aquaculture are trying it out for the first time this year after seeing other households benefit from a net profit of USD 150–200. The biggest problem is the lack

of training, as fish often become ill and there is no knowledge on what to do. The community fishery can't get the Fisheries Administration to provide training, as it has to pay the officer's per diem, which the community fishery can't afford. (This should in fact be paid by the Fisheries Administration, as the officer is merely doing what he or she is supposed to.) It was also opined that the Fisheries Administration officers do not seem interested in visiting the village. The absence of knowledge sharing and cooperation among the households aggravates the lack of training.¹⁰⁹

Domestic water

Each of the three villages in the community fishery has a water purification unit. The one in this village is in the Village Head's house. It can process 4000 liters a day and can supply all the households in the flood season, but in the dry season can supply only about 80 households. Other households purchase water from the Village Head at USD 1 for 80 liters. A generator is used to provide the energy needed for the purification process. Fuel costs USD 50/month, and other costs include the chemical used to kill bacteria. The system has been operating for three years.¹¹⁰ While the purification system appears to

be managed by the Village Head's household as a private enterprise, which appears incongruent with the management of a community asset, another view could be that the small profit to this household provides the incentive to maintain the system. There was no indication that the price charged for the water was too high.

Village development planning

The planning process first started in 2004. It was asserted by one interviewee that people who live far from the commune office are not informed of the planning meetings, and that only the village head and a few others close to the commune council are involved.¹¹¹ The village wants a road built for accessing health and other facilities in towns, but this is not allowed by the Fisheries Administration, since the village is in a conservation area. The Fisheries Administration is concerned that more roads will attract more settlers and result in further loss of flooded forest. Geographical location thus drives livelihood options and access to infrastructure in this village.¹¹²

Muk Wat village (village classification: floodplain/seasonally flooded)

Natural resource management, livelihoods and the roles of institutions

Agriculture

Since the village is seasonally flooded, agriculture for the 131 households is possible only in the dry season. Cultivated crops are

mainly vegetables such as soybean and corn. Soybean is grown first and then corn (short season). Only two households grow short-duration dry rice. Much of the vegetable harvest is sold. Some farmers have little choice, as they need to pay off loans taken from middlemen that need to be settled at the end of the growing season. Having these outstanding loans forces them to sell to the middlemen at lower than market prices. Women also have home gardens for growing lettuce, parsley and cucumber.

Crop choices are driven by a scarcity of water as well as farm size. The average landholding is 0.5 ha, which is insufficient for paddy.¹¹³ Irrigation is entirely based on surface water, which is pumped, since gravity irrigation is not possible given the flat topography.¹¹⁴ Surface water sources are meager. A small stream is shared by Muk Wat and the adjacent Tsa Klang village, and several small ponds and lakes are scattered around the village. These include about 100 (generally small) natural water bodies in the commune,¹¹⁵ as well as ponds dug by hand by each farmer at the end of each wet season, as the Fisheries Administration does not permit the use of excavation machines. These hand-dug ponds are generally about 10 m² and 3 m deep. There is roughly a 1:1 ratio between households and ponds.¹¹⁶ Plastic liners are used to reduce water loss to percolation.¹¹⁷ There is also a conservation lake close to the rice fields from which accessing water is prohibited.¹¹⁸ The rice fields are located by the stream.



Small-scale (left) and larger-scale aquaculture (right).



The filtered drinking water plant in the Village Head's house.

Hiring pumps costs USD 2.50–5.00 depending on the duration of use. The renter also has to pay for the fuel. Irrigating the vegetables occurs twice a season.¹¹⁹ Those who cannot afford to pump water purchase it through an informal water market. Ms. Lam Laum¹²⁰ buys water for her vegetables at USD 1.50 per 200 liters. She does this five or six times a season. She does not hire a pump, since her land is too far from a water source. The extremely marginal farmers like Mrs. Rai Mou get water from a water seller who brings water on a cart. The cost would be USD 0.80 per 200 liters, but she receives the water as a payment for allowing the sellers to cross her land.¹²¹

Only two families grow rice. They are able to do so since each owns five or more hectares of land. Mr. Seang Yat is one of the rice farmers who grows paddy on 5 ha from January to April in the dry season. His land is located at the edge of the village near the main stream that flows through the middle of the village in the dry season. He also grows corn on 0.5 ha after the rice is harvested at the end of April. This takes 2.5 months and is harvested as the floods

begin.¹²² He produces 2.5–3 tons of paddy per hectare. Each ton sells for USD 200, which gives him a total income of USD 2500–3000 from the rice harvest. He sells to a middleman, and uses part of the income to pay back the loan taken from another businessperson to purchase fertilizer. He is limited to one rice variety due to fear of floods after April. In the wet season, Mr. Yat does aquaculture.¹²³ No registering of the land was required.

According to the Village Head, there is no farmer group, and people have not thought of forming groups given the lack of paddy cultivation. According to Mr. Nel Phallum, Deputy Director of the Provincial Department of Water Resources and Meteorology in Siem Reap, the Provincial Department has studied the groundwater aquifers in the province and their use in Muk Wat is not feasible.

Fishing

Households who don't have land fish in the Tonle Sap Lake and the stream in the dry season, though the stream dries up quickly.¹²⁴ The decline in fishing can be seen in reduced

fish consumption: where a household used to catch 1 kg per day, they now catch only half of this.¹²⁵ Most families have little choice but to fish in the wet season, though aquaculture is also popular. Ms. Lam Laum spends most of her day fishing close to home and around the lake with her brother. She has been fishing since she was young. About 20% of women in the village fish and she sometimes joins other women to fish. She also does aquaculture and grows vegetables on 1 ha. Despite these multiple income streams, she says she finds it difficult to save due to the cost of fishing equipment and inputs for vegetable production, and due to her contributions to food in her brother's house, where she lives since she is not married.

None of the individuals interviewed stated that there has been conflict between fishers and farmers with respect to the use of the water in the dug ponds in and close to the village in the dry season. If this is in fact true, the lack of conflict may lie in the claim that only 2–3 of the 20 natural lakes located in Muk Wat village are used for agriculture. Each pond is used by 2 or 3 families, with the exception of the lake closest to the village, which is used by 15 families for fishing. The other lakes are in the flooded forest area, which is protected and far from the village.¹²⁶ Both the Village Head and

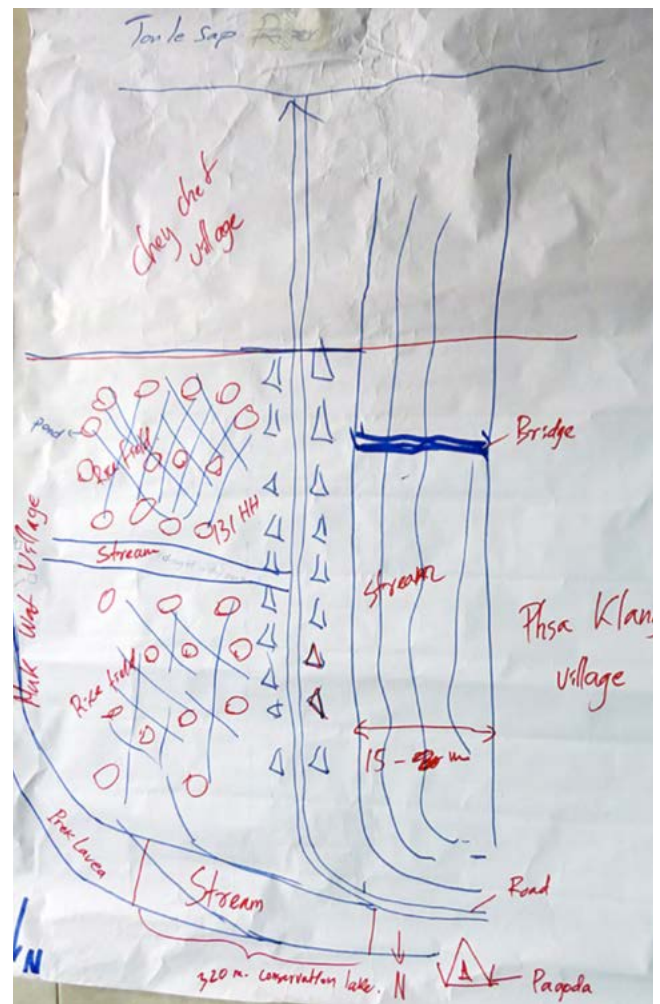


Figure 3. Resource and land use map of Muk Wat village.



Water plants (left) are one of many ecosystem services provided by the lake, which also includes cage culture (right).

the community fishery enforcement officer did note, however, that the lakes further away towards Tonle Sap Lake are emptied at night by external actors to catch fish. The Deputy of the Sof Nrkum District Fisheries Office¹²⁷ claims that the community fishery colluded with the people who are emptying the ponds. He claims that in 2009 he confiscated one pump and warned the community fishery not to do this. He is not aware of this activity happening after this event.

As with all the villages visited, controlling the fishery has become much harder despite the formation of a community fishery in 2002–3, as there are many more fishers, including people from other communes. Illegal fishing has increased, with more people using electricity and mosquito nets. They are rarely apprehended, as capacity is insufficient,¹²⁸ especially in the wet season when illegal activities are more frequent.¹²⁹ The lack of capacity is amplified in this case, since the community fishery includes nine villages and has 2026 members (including an 11-member committee). This reflects the large size of the commune and therefore the large area to be controlled by the community fishery: 29,094 ha—increased in 2012 from 19,094 ha when the fishing lot in the area was removed. The fact that 60 liters of fuel are needed to reach the furthest reaches of the community fishery area illustrates the nature of the constraints. Monitoring thus occurs only four to five times a month despite nominal support from the Fisheries Administration, mainly through fuel for catching illegal fishers. The large number of villages also makes coordination difficult since members are dispersed.¹³⁰ The community fishery is also expected to manage the conservation lake, which includes flooded forest. This area is demarcated as Zone 3 by the Ministry of Environment, and its monitoring suffers due to the distance from the village. Mr. Morn You, the community fishery enforcement officer, commented that he does not get any benefit from being a community fishery member.¹³¹

In view of the declining fishery, the maximum length of nets has been reduced from 500 m with a 4-cm mesh size to 150 m with a mesh size of 3 cm in the dry season. The 500-m-long nets are still legal in the wet season.¹³²

Aquaculture

Aquaculture appears to be occurring in fits and starts, although it seems to be a popular livelihood option in the wet season, as an estimated 80–100 households engage in aquaculture in Muk Wat. Ms. Choy Sokha started in 2005–6 on her own by purchasing fingerlings from a Vietnamese middleman. About 20–30 households started aquaculture around the same time, and all bought fingerlings from the same supplier. An aquaculture group was formed in 2008 by an NGO that gave free fingerlings and some feed. The mature fish are sold to the same middleman, as the fish species is not bought in the local market. Ms. Sokha stopped aquaculture in 2010, however, even though she would have liked to continue. One reason in this case was the competition for her time with cultivating vegetables and fishing. She was also dissuaded by high fish mortality rates and input costs. Only about 1% of the fingerlings survived. She cites poor water quality as the cause for skin wounds and death of the fish. She also does not want to leave her land uncultivated, and it is difficult to lease the land to others, as it is far from a water source.

Mr. Loung Chhnuch still engages in aquaculture. He started many years ago after learning the methods from his father. He grew a different fish species (a local species referred to as *bra*) until 2008, when he switched to the new species (snakehead, locally known as *ondai*). It became difficult to locate fingerlings of the original species, whereas snakehead fingerlings were brought to him by the Vietnamese middleman. As also noted by Ms. Sokha, this species is susceptible to illnesses such as swelling of the eyes and skin lesions. These occur in January, which coincides with the start of the dry season. He too therefore associates changes in the water with these illnesses, though he does not know what these changes are and how they affect the fish. Mr. Morn Youn, who has also practiced aquaculture since 2008, noticed that the water that comes from upstream was a bit “white” and had algae.¹³³

Mr. Chhnuch prefers the older species, as snakehead also need more food and take a longer time to grow (over a year). He admits to not knowing the correct methods for growing the new species, and claims that others also prefer the old species. Consequently, the older species attracts a higher price of USD 1.50–2/kg



Small-scale women fishers and traders.

compared to USD 1/kg for snakehead. He also grows vegetables, but prefers aquaculture because it can be done from the house and suits older people who can no longer travel distances and do heavy work.

According to the Village Head, *bra* fish (the old variety) have the same health issues, but fewer die. It is better to buy fingerlings from the Vietnamese trader than from the local businessperson, as the fingerlings are of better quality and grow faster. Although locals prefer the *bra* fish, people in the cities prefer snakehead, which are sold to a local middleman who supplies these urban markets.¹³⁴ The high mortality rates of snakehead appear to be undermining the feasibility of aquaculture for some households. Mr. Yat, for example, bought 5 kg of fingerlings (400 fingerlings/kg) from a Vietnamese trader. Of the 2000 fingerlings he started with, 1500 (75%) have died. He too points to a water quality change and mentions algae in the water. He reports that he makes a loss due to the cost of inputs and will stop raising fish. He too used to grow *bra* fish when it was abundant in the waters in and near the village. The recent decline in its abundance in the wild has meant that he would now need to use a fish trap, which is prohibited by the Fisheries Administration. He therefore dropped the idea. He says that this is the reason why others have also stopped growing *bra* fish.

Two other factors for the persistence of current production constraints are, first, institutional failure on the part of the Fisheries Administration

both to support a community that is clearly interested in aquaculture and to understand its potential financial rewards if properly managed. Second, there appear to be virtually no collective attempts to support each other among the households. According to Mr. Chhnuch, the aquaculture group formed in 2008 no longer functioned after its members accused the chairperson of withholding medicines for the fish he received from an NGO, which caused the chairperson to resign. Seeing the possibility of being similarly accused, the other members were not willing to assume the responsibility of being chairperson. Informal collaboration and assistance also appear to be lacking given Ms. Laum's response that if she needs advice regarding aquaculture, she prefers to ask the middleman rather than others in her community.¹³⁵

Savings group

In 2010, a savings group was started by the Fisheries Action Coalition Team, an NGO known by its acronym FACT,¹³⁶ with a start-up fund of USD 150. It has 60 members, of whom 40 are women. The group is subdivided into two groups of 30. The fee to join is USD 2.50, and members also have to save KHR 1000 (USD 0.25) a month. Each month, a member can borrow USD 25 at an interest rate of USD 0.50 a month. Most loans aid the purchase of fishing equipment in the wet season and fertilizer for vegetable cultivation in the dry season. Ms. Lam Laum, for instance, borrows from the savings group to buy fingerlings,¹³⁷ though Mr. Seang Yat finds it hard to take a loan. He claims the Village Head prioritizes other people ahead of him, and he is thus no longer a member.¹³⁸ If this is true,



A typical aquaculture operation in the village.

whether it is because Mr. Yat, as one of only two rice farmers, is perceived to be in a higher wealth category is not clear. There have been no new members since the group's formation. Since many members fish in the Tonle Sap in the dry season, they are unable to attend the monthly meetings, and it was claimed that this is why more people have not joined. The longest loan duration is three months and payments are regular. There is an annual general meeting at the end of each year, at which point the fund's status is communicated.¹³⁹

Water filtering plant

The water filtering plant in the village was established by Partners in Progress in November 2012. It supplies water for domestic use at no cost, and can supply 4000 liters a day. A household can take any amount in the wet season. The water for filtering is taken from the river. No information was available about the project's duration. The person interviewed has also been trained by the NGO to encourage people to convert to Christianity.

Women's vulnerability

The interview with Mrs. Rai Mou highlights the existence of perhaps a small number of highly vulnerable individuals in the village. In her case, her vulnerability appears to stem from quite specific circumstances—being separated from her husband and living with one of her sons, who has intellectual disabilities, at the edge of the village. In the wet season she buys fish, sells them to fish paste makers and sells the bones to *bra* fish growers. When she can't do this, she works as labor and gets fish heads and bones

as payment, which she sells in the village. She also collects aquatic plants growing around her house and then dries them and sells this for fertilizer as crops. She is too old to fish.¹⁴⁰

More generally, Ms. Lam Laum was of the opinion that many women will find it difficult to assume positions of authority in the village and commune because they are illiterate, though she noted that girls now stay longer in school.¹⁴¹

Rohal Suong village (village classification: land-based)

Natural resource management, livelihoods and the roles of institutions

Agriculture

Agriculture, and rice production in particular, is the main economic activity for most households. Dry season rice is grown from November to June, while the wet season is July–October. The floods start in September. There are 291 ha of rice fields in the village.¹⁴² The dominant crop in the wet season is rice. About 80 percent is dry rice, as it gives better yields and takes less time than floating rice. Yields are 3–4 tons/ha in the dry season for perfume rice and 5–6 tons/ha for other varieties after growing for 2.5 months. The perfume rice is more affected by disease and takes a month longer to grow. The majority of perfume rice is grown by farmers with land on the right side of the village (Figure 4), which is less affected by pests, though the reason for this is not known to the interviewee.¹⁴³ There are no

certificates of land ownership. About 30 percent of households lease their agricultural land to others at a rate of 1 ton of rice/ha.¹⁴⁴

Harvesting is done by machine at USD 90/ha. If labor were used it would cost USD 300/ha (USD 5/person x 60 people). Labor is still needed for floating rice, and much of it is sourced from outside the village given the dearth of labor supply in this village.¹⁴⁵

Location of agriculture land as a major differentiator among farmers

What people grow, how much they grow and its profitability is driven by the location of their fields. These are divided into two main areas: the larger fields to the right in Figure 4, on either side of the narrow canal, and the smaller land parcels to the left of the gravel road. According to one interviewee,¹⁴⁶ those who live on the right side of the gravel road have an average of 1–1.5 ha of land, with 2–4 ha being the largest size, while those on the left have an average size of about 0.8–1 ha, with the largest sizes being 2–3 ha. Another farmer¹⁴⁷ reported that there is about 80–100 ha distributed among 100 households on the left at an average of 0.8–1 ha, while on the right, 210 ha is distributed among 30–40

households at an average of 5.5–7 ha. While the overall figures vary, both estimates indicate a significant difference in land sizes between the two cultivation areas. This is partially attributed to the manner in which land was originally distributed by the government in 20-m² areas per family member. This meant the larger families got more land. Some people have also sold land to realize the land's appreciating value and now concentrate on fishing. This happened around 1986 when there were a lot more fish. How land is distributed between children depends on the land-to-children ratio. Where this is low, the boys may be able to farm the land owned by their respective wives' family.¹⁴⁸

In addition to larger plot sizes, better access to irrigation via the partially rehabilitated canal is a major advantage for farmers on the right side, since the dry season is marked by water scarcity. This canal enables a greater dry season cropping area, facilitates higher yields and provides more flexibility regarding the choice of rice variety. Before the canal was rehabilitated, there was very little dry season rice. Now 50–60 farmers cultivate rice in the dry season. The stream is in fact an old irrigation stream developed by the Pol Pot regime.¹⁴⁹ There is additional limited



Small-scale fishers (left) and fish being prepared for market (right).

access to water from the large conservation lake managed by the community fishery for the purpose of releasing fish in the floods to help populate the floodplains, and this enables 50–60 families to irrigate their dry season rice, including five farmers from Sday village.¹⁵⁰ This availability of irrigation water also explains why more of the higher-value aromatic rice is grown in this area.¹⁵¹ Yields in the large plots are 3–4 tons in both the wet and dry seasons, and are driven by the rice variety and the availability of water. The produce is sold to middlemen who come to the village.¹⁵²

In the dry season, farmers on the left side pump water from the two streams to irrigate crops. However, since water in these canals runs dry by April, they are required to pump water from the river to the canal that connects to the river, since the river's water level drops below the canal intake. They then need to pump water from the canal to their respective fields, representing a two-stage pumping process. Most of these farmers thus have had to invest in two pumps—one to pump water from the river or conservation lake to the stream and the other to pump from canal to field.¹⁵³ Each 1.5

ha of rice needs 60 liters of water for a period of 3 months. At a pumping cost of USD 1.15/liter, the 60 liters costs USD 70.¹⁵⁴ Gravity is used to transport water and reduce pumping costs where this is feasible.¹⁵⁵ These farmers are further disadvantaged by the fact that the area below the canal on the left side is another village, and farmers from this village also take water from the stream. Consequently, and due to the inability to access enough water, only a few families grow dry season rice on the left side, while the larger land owners close to the rehabilitated canal can grow rice in the dry season. Farmers on the other side of the dividing road have to settle for vegetables, which in fact are the dominant crop on both sides of the stream.¹⁵⁶ Vegetables grown include watermelon, pumpkin, cucumber and soybean. Although vegetables provide a higher income, these crops are harder to manage and are more susceptible to disease. Sometimes the land owners thus lease the land to transfer this risk.¹⁵⁷

Another important feature of the land holding in this village is the dispersed location of land owned by most individuals. This is prevalent among farmers who own land on the left of the

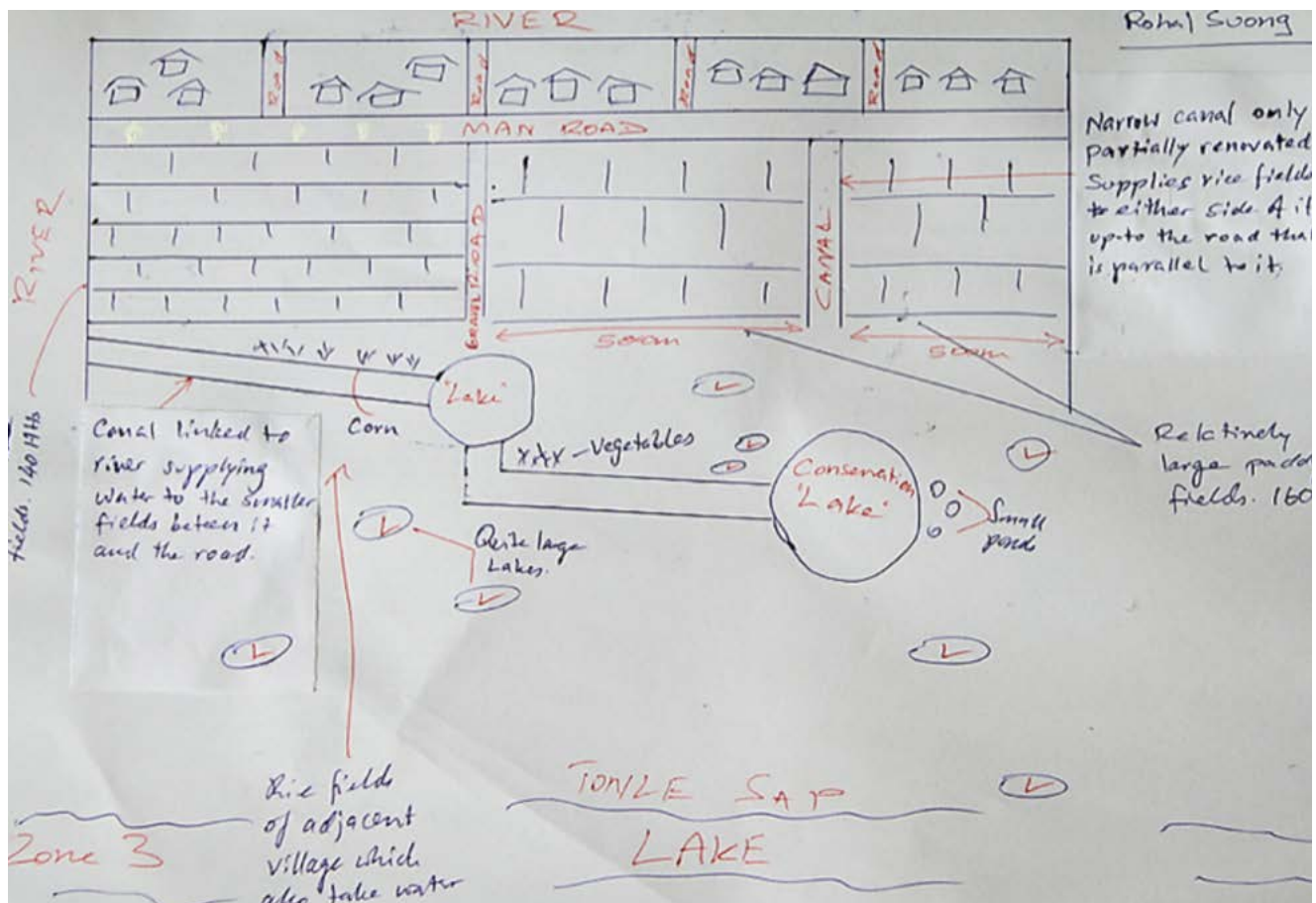


Figure 4. Resource use map of Rohal Suong village.

village, since individual plot sizes are small. Mr. Nen Koch, for instance, is a farmer with 5 ha of land distributed in seven plots. Some of these are in the area that has the smaller plots. Others are beyond the main cropping areas and more towards the lake. He cultivates only 2 ha with paddy in the dry season, as the stream is dry in December. He does, however, also cultivate 2 ha of vegetables, and he leaves 0.5 ha fallow. Which plots he cultivates depends on the conditions in each season. He generally follows the water after the floods. This is the opposite in the wet season, as the water from the lake reaches up to the village.

These differences in the situation of land can be seen in its pricing. Close to the partly rehabilitated canal, 1 ha costs USD 7000, while land on the other side of the gravel road costs roughly half of that at USD 3000–4000. Some land in the cheaper area is also elevated, which is less suited for rice.¹⁵⁸

There also appear to be differences between farmers at a smaller spatial scale. Mr. Uk See, the deputy chairperson of the community fishery, has 3 ha of land in five locations inside and outside the area serviced by the rehabilitated canal. He has 0.5 ha close to the canal and 1 ha far from it. In the dry season, in the field on the left side of the canal area, farmers get water from the stream and river. Only farmers close to the stream can get water from the stream, which means that dry season farming even in the area with larger farm plots is differentiated by the availability of irrigation from the rehabilitated canal. The other farmers have only the water from the small ponds, which is not enough, as they have water only from January to June. Many farmers don't bother planting during the dry season due to this uncertainty. Consequently, only about 30–40 households (about 200 ha) can farm in the dry season, and these are those with land closest to the rehabilitated stretch of the canal.¹⁵⁹

No groundwater irrigation exists. According to the Provincial Department of Water Resources and Meteorology, groundwater in Battambang is used only for domestic purposes and domestic vegetable cultivation, since the aquifer is very deep at about 50 m and the quantity is not enough to support large-scale vegetable or rice cultivation. This view is said to be based on

studies conducted by the Provincial Department of Water Resources and Meteorology.¹⁶⁰

Lack of organization to resolve a common need for irrigation

In spite of the shared challenge of water scarcity, farmer behavior appears to remain individualistic. In the dry season, farmers pump water from the river to the canal for their own use, which undermines opportunities for optimizing dry season water use. This is especially the case since there is in fact no physical water scarcity, given that the river adjacent to the fields continues to flow. The issue appears to be an inability to cooperate to pump the river water to the canal from which all the farmers can irrigate their respective fields. Instead, when a farmer starts to pump water from the river to the canal, other farmers pump this water to their streams. The farmer who is pumping from the river is compensated depending on what is grown and the area, rather than the duration of pumping by each farmer. This leaves the system open to abuse, especially when a farmer closer to the river can pump at the expense of farmers further down the canal, and the farmers closer to the river have less incentive to cooperate in establishing a shared irrigation system. Farmers further along the canal also incur a higher pumping cost of 3–4 liters of extra fuel per hectare, though the low fuel cost (USD 1/liter) means this is not a very significant increase. Some farmers sometimes even block the stream to prevent water from flowing to other parts of the stream, suggesting a degree of conflict among farmers.¹⁶¹

This contrasts sharply with the situation in the area served by the partly rehabilitated canal, where an informal farmer water resources management group has been formed by the farmers themselves. Membership is limited to those who have land in this area, although this does not preclude outsiders from buying land in this area and becoming members.¹⁶² People who hire these fields can also use the water.¹⁶³ There are 60 members in all, including 5 farmers from Sday village and a 9-member committee. It was formed in 2012 through the farmers' own initiative and that of the Village Head. The primary objective is to increase the efficiency of dry season irrigation. However, the group only controls access to the narrow canal. Access to water sources other than the conservation lake is unregulated.¹⁶⁴

The group has three committees: pump management, technical and water resources, and financial. Twenty-seven of the 60 members are distributed in these committees. Only households with land close to the canal (300–400 m on either side) are able to get water directly from the canal. Other farmers get water from adjacent fields. In the group, 90% of farmers have their own pumps, and the rest hire them.¹⁶⁵ Members of the group are required to give USD 15/ha for the use of the stream. This is not considered to represent an irrigation service fee, though the group intends to discuss this soon.¹⁶⁶ If the canal is to be rehabilitated further, farmers will need to pay an additional USD 15/ha. Rehabilitation of the canal has been requested every year in the village development planning for the past 10 years.¹⁶⁷ There is no limit to how much water a member can use, which suggests only partial regulation, and the fact that the payment is not linked to the quantity of water or pumping duration suggests that incentives for efficient water use may be missing.¹⁶⁸ Nonmembers can also get water from the canal but have to pay for it and also wait until the members have irrigated their land. This means they have access only if there is excess water. Farmers with land far from the canal also need to be able to afford to pump water that distance. This can be done by putting pipes across others' fields, though not in a way that damages the crops. These logistics make access more difficult and more expensive.¹⁶⁹

While the Provincial Department of Water Resources and Meteorology in Battambang Province is aware of the informal farmer group, it was stated that services cannot be provided to the group, as it is not a registered farmer water user committee. The office intends to promote its conversion to a farmer water user committee.¹⁷⁰

People do not have any idea about groundwater options according to Mr. Uk See, community fishery deputy and farmer.

Fishing

Fishing is secondary to farming, but most households do both.¹⁷¹ According to Mr. Nen Koch, fishers used to be able to use long nets with large mesh sizes, as there were not so many people fishing. Now, however, the

number of fishers has increased and modern equipment and illegal fishing is undermining the fishery. Only throw nets are allowed per the fisheries regulations.¹⁷² Although the ponds and lakes are meant to be controlled by the community fishery, fishers from other districts also fish in them. There are in fact very few rules applying to these resources, and the community fishery has very little control. It is nevertheless claimed by the Deputy Chairperson of the community fishery that there are no conflicts between farmers and fishers who use the same limited water.¹⁷³ The conservation lake is one area where the community fishery does strive to exercise some control by deciding how much water can be pumped for irrigation. It also has to cooperate with the village head, commune council and Fisheries Administration in doing this. If water is needed in the dry season, farmers need to make a request to the community fishery, which checks whether there is enough water. It is claimed that there have not been any instances of illegal pumping, as there is a guard employed by the community fishery. The guard is paid USD 20/month from the savings group operated by the community fishery.¹⁷⁴

Water was more available before the conservation lake was built, and farmers want more water, but the community fishery does not allow it. Mr. Nheeb from the commune council attempts to manage this conflict by assessing whether there is enough water in the lake and deciding how much can be used. However, according to him, the community fishery does not listen to his advice and listens only to the commune head. This is not influenced by political affiliations, but is rather because the community fishery does not recognize his authority, though it could also be due to collusion between the community fishery and village head. The result is that there is no agreement between the farmers and the community fishery, and so farmers continue to use as much as they need. If farmers feel that the water in the lake will be low, they do not grow rice in the dry season.¹⁷⁵

Aquaculture

Not many families engage in aquaculture. About seven or eight families grow fish, and another four grow eels, though eels are harder to find now in the lakes. These activities are supported

by Helping Address Rural Vulnerabilities and Ecosystem Stability (HARVEST), a United States Agency for International Development (USAID)-funded project that provides the fingerlings and half the fish feed. Farmers raising eels are also supported by the Fisheries Administration. The HARVEST project also provides training. The main problem is the absence of a good market for fish, since the market is already saturated. Farmed fish also look different than the natural ones, and this adversely affects their market price. The raised fish also smell bad when cooked. Therefore, input costs are high compared to the return on investments, according to Mr. Aum Choan. This also precludes the wider adoption of aquaculture, since the high start-up costs (the cage and inputs) and low market prices are perceived as a risk. There is also less risk in rice and vegetables. Mr. Aum Choan tried fish aquaculture in 2012 (January–April) after HARVEST provided a small net, fingerlings and training. He was also taken to a farm in the city to see how fish are raised. However, the fish died. The Fisheries Administration is not involved in promoting aquaculture in this village.

Village development planning

The village has not received anything from the commune fund.¹⁷⁶ A culvert is needed where the canal meets the main road of the village. (The farmland is on the other side.) This is estimated to cost USD 2500, and the Village Head has been asked to make a request to the commune council.

The decline of fishing as a primary livelihood activity and underlying drivers

One of the clearest and most consistent messages in all six villages was the declining ability—and indeed, the inability—of fishing to adequately support households' developmental needs. Fish catches have declined despite an intensification of fishing effort at household level, which also means added time, financial and energy expenditure, with attendant opportunity costs.

There are several causal factors, which again appear to operate in all or most of the villages. It is also notable that there was

general agreement on these among a range of stakeholders, including small- and large-scale fishers, village heads, community fishery officers, Fisheries Administration officers, and the police. While the demise of private fishing lots is generally viewed as a positive development, the entry of a large number of people into the fishery sector (many from land-based villages, including from other provinces) following this is seen as a primary source for the decline. Not only has this increased the overall fishing pressure on the fish resources, it has also significantly increased illegal fishing by most accounts. Moreover, this decline is not only a result of fish resources spread more thinly among more fishers, but was also ascribed to the influx of people with no fishery background

Constraint	Village					
	Floating	Seasonally flooded/Floodplain				Land-based
	Phat Sanday	Chnok Tru	Tramper	Muk Wat	Raing Til	Rohal Suong
Declining fishery	X	X	-	X	X	X
Water scarcity (agriculture)	N/A	-	X	-	-	X
Flooding (agriculture)	-	-	X	-	-	-
Rainfall uncertainty (agriculture)	-	-	X	-	-	-
Conservation area (fishing)	X	X	-	-	X	-
Conservation area (agriculture)	-	X	-	-	X	-
Lack of local institutional capacity						
• Agriculture	N/A	-	X	-	-	X
• Fisheries	X	X	X	X	X	
• Aquaculture ¹⁷⁷	X	X	X	X	X	X
Absence of extension services						
• Agriculture	N/A	-	X	-	-	X
• Fisheries	X	X	X	X	X	-
• Aquaculture	X	X	X	X	X	X
Uncertain parity in participation in village development planning	X	X	X	X	X	X

Table 2. Summary of institutional and other constraints related to key livelihood activities linked to natural resources.

and hence no understanding of or appreciation for sustainable fishing. Furthermore, while the capacities of legal equipment have been reduced (also contributing to lower catches for households), illegal methods—and particularly the prevalent use of electricity—are considered to be highly destructive. Also, while making more fishing area available to local fishers in principle, removal of the fishing lots has in practice allowed fish to disperse more widely, thereby diluting fish stocks in and around the villages.

It should also be recognized that illegal fishing is driven by different motivations arising from different contexts. While the declining fishery affects fishers in all the villages, it appears that the lack of livelihood options other than fishing creates a lack-of-choice situation for communities that are permanently flooded (e.g. Phat Sanday). This arises, of course, from the unavailability of dry land for agriculture in or near the village, as well as the costs and logistical challenges involved in acquiring and maintaining land on the mainland. This constraint is also faced by a number of seasonally flooded villages (Chnok Tru and Raing Til) even though they are free of flooding for several months each year. This results from the designation of a conservation area inside or adjacent to the village, which means that agriculture is prohibited by the Fisheries Administration in an attempt to avoid introduction of chemicals into the soil and water. This effectively restricts these villages to fishing and imposes an additional burden of having to follow the receding water line in the dry season. Overall, the absence of agriculture as a livelihood option is a distinct disadvantage for all of these villages—a fact well understood by the communities, as demonstrated by the request made by Chnok Tru village to move to the mainland. This request represents the decision by an entire community to effectively either exit fisheries altogether or to relegate fishing to a secondary livelihood option in favor of agriculture.

This rise in fishing pressure is paralleled by serious institutional failure. Based purely on the six village profiles in this report, the fishery management model based on community fisheries is not working, and cannot work unless some fundamental weaknesses are addressed.

An intrinsic discrepancy exists between the scale of the management challenge (area to be covered, intensity of illegal activity, prominence of corruption and patronage of the powerful) and the physical and human capacities within the community fishery, as well as seemingly the broader political will needed for rule enforcement. This weakens the institutional structure meant to manage fisheries from the outside as well as from within, if credence can be given to suggestions of neglect—if not collusion and corruption—on the part of the actors mandated to apply fisheries rules—that is, the Fisheries Administration, police, commune councils, village heads and community fishery leaders. A focus on corruption should not overshadow the genuine capacity issues within the entire structure, with human resources and basic supplies such as boats and fuel spread thin within the Fisheries Administration, the police and the community fisheries. This capacity gap is effectively crippling, and means that the majority of illegal activity may not be detected in the first place, and if discovered, will not be stopped. Whether this is simply a function of broader governance constraints or whether it is a deliberate strategy to maintain space for unregulated access to the lake's resources could not be ascertained from these interviews.

A fundamental weakness of the community fisheries is having virtually no means of generating income to become self-sustaining. Without this, the notion of managing often quite large areas of open water is completely unrealistic. The failure to stop illegal fishing on the one hand and the inability to provide other benefits to members (e.g. training, meaningful sources of credit and negotiated prices on equipment) on the other means that little value is created by the community fisheries compared to if a fisher were to operate outside the community fishery framework. This is compounded by the very low to complete lack of coordination between the numerous actors. Over a decade after community fisheries came into being, there still appears to be no formal institutional mechanism to coordinate the efforts between the community fisheries, the Fisheries Administration, the Ministry of Environment, and the police at local, commune, district and provincial levels.

A number of aspects of the fisheries regulatory framework further contribute to the status quo. The seemingly major influence of the large Vietnamese communities (especially in Phat Sanday, Chnok Tru and Raing Til villages) remains unresolved—and in fact barely acknowledged, due, it was claimed, to higher political considerations. These households are excluded from community fisheries, apparently following Fisheries Administration instructions, which means they are not bound by community fishery direction, and in fact they remain free to effectively disregard the laws of the land with little fear of consequences. For the fisher communities, therefore, this remains a problem that everyone is aware of but no one wants to acknowledge.

The declaration of conservation areas by the Ministry of Environment, meant to constitute part of the fisheries management system, also appears to have become part of the problem. As seen in Chnok Tru, Phat Sanday and Raing Til villages, these areas were established following the removal of fishing lots. While this was meant to help maintain fish stocks, it has also limited the fishing areas available to local fishers. There is also no evidence available (because it does not appear to be collected) to demonstrate the actual contribution of conservation areas, especially since the low levels of monitoring may not deter illegal fishing.

Agricultural water scarcity and the absence of institutional responses

This issue pertains specifically to the seasonally flooded and land-based villages, though as noted above, Chnok Tru and Raing Til villages do not have to deal with water scarcity from an agricultural standpoint due to the prohibition of agriculture in the conservation area. This means that in practical terms, the issue of water scarcity applies in Trammer and Rohal Suong villages. However, the discussions with key informants in these two locations indicate that Trammer has a higher degree of physical scarcity compared to Rohal Suong, where the issue is more economic and institutional, given the availability of water in the river adjacent to the affected farmland.

Both cases are nevertheless marked by a notable absence of collective action to maximize farming opportunities in the dry

season, and this does not appear to be because a viable alternate income option exists. In fact, seasonal migration, especially in Trammer, appears to be a coping strategy among the more resource-poor households during the dry season. An answer to the question of why collective attempts to resolve commonly shared challenges have not occurred, especially in Rohal Suong, was difficult to obtain. This is despite the fact that in this village as well as in Trammer, opportunities exist for exploring means of accessing more water (especially in Rohal Suong), improving accessibility especially for the more resource-poor farmers, and enhancing the efficiency of irrigation. The need for an emphasis on equity of access was prevalent in both villages, since it is the smaller-scale farmers who appear to be most affected, though it also needs to be recognized that the lack of dry season water is one of a number of production constraints they face. Plot size, for instance, may be another, along with the lack of knowledge of and access to seed varieties and other production knowledge.

The importance of augmenting water storage and access in the dry season appears to be increasingly important given the irregular rainfall patterns experienced in 2012 and 2013, which have caused intensification of both floods and the dry season, particularly in Trammer village. The heightened sense of risk was especially evident in Trammer village, as seen in the inability of many farmers to afford the costs of rice production; they depend on a good harvest to repay loans that have subsidized production. This increased sense of risk has consequently caused some of the farmers interviewed to abandon farming in the dry season, as opposed to defaulting on their debts.

Conservation areas as an additional constraint to agriculture in some seasonally flooded villages

As noted earlier, Chnok Tru and Raing Til villages cannot access agricultural land during the dry season because the rules linked to a conservation area prohibit this activity. As such, this prohibition has a significant negative impact on dry season livelihood options in these villages, and is especially important in the face of a declining fishery. While not intending to undervalue the resource management

rationale for these areas, it is argued that there needs to be an assessment of the tradeoffs these impose in the specific contexts of these villages. Adequate dialogue on this specific issue was not possible due to the lack of time.

The possibility of aquaculture's potential remaining unrealized

Given that it was claimed in one interview that aquaculture can potentially realize a value 10 times that of agriculture (which in turn is generally now seen as being more lucrative than fishing), the relatively low aquaculture production—with the partial exception of Muk Wat—suggests a significant untapped potential in virtually all the villages, though the costs, logistics and scale of aquaculture operations may vary among floating, seasonally flooded and land-based villages. Aquaculture activities were noted in Trammer, Raing Til, Muk Wat and Rohal Suong villages, with varying degrees of adoption. The number of adopters was low in all but Muk Wat despite a reasonable history, such as in Raing Til, where the practice was introduced 10 years ago.

The reasons for low levels of adoption appear to be similar in these villages, and pertain to high levels of fish mortality (with only about 1% of fingerlings surviving in some cases), high start-up and input costs, poor market access, and lack of knowledge and institutional support (with the Fisheries Administration being virtually absent at village level with respect to aquaculture), which culminate in a perception of risk. This risk, moreover, is perceived to be higher than for agriculture (where this is a viable livelihood) and fishing, and the risk factor appears to override the potential financial rewards that are well understood by households, who do not, however, have the financial capital to weather the risks.

Considerable scope therefore exists in principle to capitalize on the potential offered by aquaculture, although a number of institutional and other elements need to be addressed in the process. These include managing high start-up costs; developing sustainable and affordable local supply chains for fingerlings of—preferably—locally valued species and other inputs; extension services for generating an operational knowledge of fish culture

specific to the species grown, including disease management; water availability for some land-based and seasonally flooded villages; and market access. Another distinct feature of the present approach to aquaculture in all the villages is an individualistic mindset that appears to have precluded collective problem solving of issues such as sourcing fingerlings and assistance in dealing with fish disease, including knowledge sharing. This is despite the fact that the biggest problem is the lack of training in fish culture and not knowing what to do when fish become ill.

The livelihoods potential of aquaculture has two specific aspects that should be highlighted. The first is whether it can help offset the economic and nutritional losses faced by households in floating as well as seasonally flooded villages that rely heavily on a declining fishery. The other is its suitability for women and the elderly, who may be restricted to the house either by gendered social norms or the physical inability to fish or farm. The fact that the aquaculture cages are connected to the house partially eliminates the need for mobility, although inputs and the sale of produce will still require mobility unless these services come to the houses in the form of middlemen.

However, the fact that snakehead—the most dominant fish species being cage-cultured—is in fact illegal presents a fundamental constraint to realizing the potential of aquaculture. This therefore needs to be explicitly recognized and addressed in any future interventions.

Absence of collective action initiatives at village level and broader institutional failure as major constraints to livelihood development

This issue has already been highlighted with respect to fisheries management regarding the restrictions placed on agriculture by water scarcity in the dry season and the failure to mainstream aquaculture. In both these situations, local institutions are either absent (water scarcity) or failing (community fishery), while support from the relevant state agencies is virtually nonexistent. The space for institution building thus appears to exist at village scale, but also is likely to require the

greater involvement of state-sector actors such as the Fisheries Administration and the Department of Agricultural Extension in light of the large numbers of unserved farmers with serious cultivation challenges, the generally poor institutional coordination for fishery management, and the untapped potential of aquaculture partly due to the absence of the Fisheries Administration at village level.

Lack of significant development outcomes through village development planning

Interviews, especially with smaller-scale farmers and fishers, in general suggest that they have benefited little through the village development planning process. This view is based not only on the absence of clear benefits listed in response to questions regarding individual perceptions of benefits, but on the lack of enthusiasm towards the process and explicit claims of dominance by elite groups and individuals. Even with respect to the villages overall, the village development planning process appears not to have had a significant impact in virtually all the villages.

Another important reason for this is the structure of the planning and financing process, which is marked by insufficient funds allocated by the center to communes. This triggers an additional prioritization of already identified village priorities by the commune councils in line with available funds. The fact that this sometimes means that only 1 of 10 villages receives funds makes clear that this is a fundamental constraint. A further issue is the culture of prioritizing large and expensive physical investments at the expense of smaller and less costly investments in soft skills linked to capacity development that may be more viable and generate their own livelihood impacts.

NOTES

- ¹ Interview with Mr. Khov Vengsong, Director, National Reserves and Biodiversity (Fish Biology) and Mr. Krun Vuti, Director, National Reserves and Biodiversity (Flooded Forests).
- ² These are the Department of Administration, Planning and Cooperation; Department of Natural Resources; Department of Exploitation Control and Conservation; and Department of Legislation and Extension.
- ³ Neither of the interviewees were aware of why the crackdown was not continued beyond 2010.
- ⁴ Interview with Mr. Lim Sokret and Mr. Seng Songley, Fisheries Administration Provincial Office, Pursat Province.
- ⁵ Interview with Mrs. Seang Soten, Provincial Fisheries Officer, Battambang Province.
- ⁶ Interview with Mr. Ung Sinat, Deputy of the Sof Nrkum District Fisheries Office, Siem Reap Province.
- ⁷ Interview with Mrs. Seang Soten, Provincial Fisheries Officer, Battambang Province.
- ⁸ Interview with Mr. Ung Sinat, Deputy of the Sof Nrkum District Fisheries Office, Siem Reap Province.
- ⁹ Interview with Mr. Ung Sinat, Deputy of the Sof Nrkum District Fisheries Office, Siem Reap Province.
- ¹⁰ Interview with Mrs. Seang Soten, Provincial Fisheries Officer, Battambang Province.
- ¹¹ Interview with Mrs. Seang Soten, Provincial Fisheries Officer, Battambang Province.
- ¹² Interview with Mr. Lim Sokret and Mr. Seng Songley, Fisheries Administration Provincial Office, Pursat Province.
- ¹³ Interview with Mrs. Seang Soten, Provincial Fisheries Officer, Battambang Province.
- ¹⁴ Interview with Mr. Ung Sinat, Deputy of the Sof Nrkum District Fisheries Office, Siem Reap Province.
- ¹⁵ Interview with Mr. Khai Soad, Deputy Director, Provincial Department of Water Resources and Meteorology, Battambang Province.
- ¹⁶ Interview with Mr. Ket Phat, Deputy Director, Provincial Department of Water Resources and Meteorology, Pursat Province.
- ¹⁷ Interview with Mr. Khai Soad, Deputy Director, Provincial Department of Water Resources and Meteorology, Battambang Province.
- ¹⁸ Interview with Mr. Khai Soad, Deputy Director, Provincial Department of Water Resources and Meteorology, Battambang Province.
- ¹⁹ Interview with Mr. Khai Soad, Deputy Director, Provincial Department of Water Resources and Meteorology, Battambang Province.
- ²⁰ Interview with Mr. Khai Soad, Deputy Director, Provincial Department of Water Resources and Meteorology, Battambang Province.

- 21 Interview with Mr. Bunthum, Sub-Deputy of Biodiversity, Kampong Chhnang Province.
- 22 Interview with Mr. Long Sokham, secretary to the commune council, Chnok Tru village.
- 23 Interview with Ms. Vy Vanndy, commune council member, Muk Wat village.
- 24 Interview with Mr. Nheab Ruth and Mr. Sok Sopheak, commune council members, Noren Commune, Rohal Suong village.
- 25 Interview with Ms. Vy Vanndy, commune council member, Muk Wat village.
- 26 Interview with Mr. Nheab Ruth and Mr. Sok Sopheak, commune council members, Noren Commune, Rohal Suong village.
- 27 Mr. Nheab Ruth and Mr. Sok Sopheak are members of the Cambodia National Rescue Party (i.e. the opposition).
- 28 Interview with Ms. Vy Vanndy, commune council member, Muk Wat village.
- 29 Interview with Mr. Nheab Ruth and Mr. Sok Sopheak, commune council members, Noren Commune, Rohal Suong village.
- 30 Interview with Ms. Vy Vanndy, commune council member, Muk Wat village.
- 31 Interview with Ms. Vy Vanndy, commune council member, Muk Wat village.
- 32 Interview with Mr. Nheab Ruth and Mr. Sok Sopheak, commune council members, Noren Commune, Rohal Suong village.
- 33 To which Rohal Suong village belongs.
- 34 Interview with Ms. Vy Vanndy, commune council member, Muk Wat village.
- 35 Interview with Mr. Nheab Ruth and Mr. Sok Sopheak, commune council members, Noren Commune, Rohal Suong village.
- 36 Interview with Ms. Vy Vanndy, commune council member, Muk Wat village.
- 37 Interview with Mr. Nheab Ruth and Mr. Sok Sopheak, commune council members, Noren Commune, Rohal Suong village.
- 38 Details of this source are withheld in the interests of confidentiality.
- 39 Interview with Ms. Vy Vanndy, commune council member, Muk Wat village.
- 40 Interview with Mr. Sem Chhet, medium-scale fisher.
- 41 Interview with Mr. Pan Saveng, Deputy of the Fisheries Administration Station, Phat Sanday.
- 42 Interview with Mr. Um Meng, community fishery chairperson.
- 43 A medium-scale fisher.
- 44 Interview with Ms. Kun Srei, small-scale fisher and community fishery member.
- 45 Interview with Mr. Pan Saveng, Deputy of the Fisheries Administration Station, Phat Sanday.

- ⁴⁶ Interview with Mr. Pan Saveng, Deputy of the Fisheries Administration Station, Phat Sanday.
- ⁴⁷ Interview with Mr. Khan Von, community fishery enforcement officer.
- ⁴⁸ Interview with Mr. Khan Von, community fishery enforcement officer.
- ⁴⁹ Interview with Mr. Sem Chhet, medium-scale fisher.
- ⁵⁰ Interview with Mr. Khan Von, community fishery enforcement officer.
- ⁵¹ Interview with Mr. Khan Von, community fishery enforcement officer.
- ⁵² Interview with Mr. Khan Von, community fishery enforcement officer.
- ⁵³ Interview with Ms. Kun Srei, small-scale fisher and community fishery member.
- ⁵⁴ Interview with Mr. Khan Von, community fishery enforcement officer.
- ⁵⁵ Interview with Mr. Um Meng, community fishery chairperson.
- ⁵⁶ Interview with Mr. Um Meng, community fishery chairperson.
- ⁵⁷ Interview with Mr. Um Meng, community fishery chairperson.
- ⁵⁸ Interview with Ms. Kun Srei, small-scale fisher and community fishery member.
- ⁵⁹ This is a class of protected area established and administered by the Fisheries Administration to provide fish breeding refuges. Many of these have been created or superimposed on pre-existing habitation and resource use patterns in the Tonle Sap Lake as resource conservation has been pushed up the agenda in recent decades. The removal of private fishing lots has increased the number of conservation areas, which appear to be often placed adjacent to one or more villages or indeed in an area that encompasses villages within its boundaries. There are two kinds of conservation areas: one covers deep water areas, while the other focuses on preserving the remaining flooded forests, which are vital for fish breeding and other biodiversity.
- ⁶⁰ Only about 10 families in this village own land according to Mr. Chun Kimlang, the village head.
- ⁶¹ Interview with Mr. Chun Kimlang, village head.
- ⁶² Interview with Ms. Per Sophat, fish trader.
- ⁶³ Many families interviewed included three or four children, with one medium-scale fisher household having nine children.
- ⁶⁴ Mr. Mot Seanghang, head of the Fisheries Administration's commune office, Kampong Chhnang Province. Interviewed at Chnok Tru village.
- ⁶⁵ Source withheld to maintain confidentiality.
- ⁶⁶ Mr. Mot Seanghang, head of the Fisheries Administration's commune office, Kampong Chhnang Province. Interviewed at Chnok Tru village.
- ⁶⁷ Mr. Mot Seanghang, head of the Fisheries Administration's commune office, Kampong Chhnang Province. Interviewed at Chnok Tru village.
- ⁶⁸ Interview with Mr. Chun Kimlang, village head.

- ⁶⁹ Mr. Long Sokham, secretary to the commune council.
- ⁷⁰ Mr. Long Sokham, secretary to the commune council.
- ⁷¹ Interview with Mr. Sok Mum, village head, and Mr. Thoum Thien, chairperson of the community fishery.
- ⁷² Interview with Mr. Sorn Bun, farmer and seasonal fisher.
- ⁷³ Interview with Mr. Chem Khenluong, farmer and former fisher.
- ⁷⁴ Interview with Mr. Chem Khenluong, farmer and former fisher.
- ⁷⁵ Interview with Mr. Sok Mum, village head, and Mr. Thoum Thien, chairperson of the community fishery.
- ⁷⁶ Interview with Mr. Hien Keun, farmer.
- ⁷⁷ Interview with Mr. Sok Mum, village head, and Mr. Thoum Thien, chairperson of the community fishery.
- ⁷⁸ Interview with Mr. Sok Mum, village head, and Mr. Thoum Thien, chairperson of the community fishery.
- ⁷⁹ Interview with Mr. Sam Roem, farmer.
- ⁸⁰ Interview with Ms. Song Yeath.
- ⁸¹ Interview with Mrs. Sun Ki, small-scale farmer and fisher.
- ⁸² Interview with Mr. Ket Phat, Deputy Director, Pursat Province.
- ⁸³ Interview with Mr. Ket Phat, Deputy Director, Pursat Province.
- ⁸⁴ Interview with Mr. Sok Mum, village head, and Mr. Thoum Thien, chairperson of the community fishery.
- ⁸⁵ Interview with Mr. Ket Phat, Deputy Director, Pursat Province.
- ⁸⁶ Interview with Mr. Ket Phat, Deputy Director, Pursat Province.
- ⁸⁷ Interview with Mr. Sorn Bun, farmer and seasonal fisher.
- ⁸⁸ Interview with Mr. Sorn Bun, farmer and seasonal fisher.
- ⁸⁹ Interview with Mr. Eng Yoeun, small-scale farmer in the seasonally flooded part of the village.
- ⁹⁰ E.g. Mr. Sorn Bun, farmer and seasonal fisher.
- ⁹¹ Interview with Mr. Sorn Bun, farmer and seasonal fisher.
- ⁹² Interview with Mr. Ket Phat, Deputy Director, Pursat Province.
- ⁹³ It was not possible to cross-check this with the village head of Tramper, as this was the final interview at the end of the second day in town.
- ⁹⁴ Informal conversation with fishers.

- ⁹⁵ Informal conversation with fishers.
- ⁹⁶ Interview with Mr. Thoum Thien, community fishery chairperson.
- ⁹⁷ Interview with Mr. Sorn Bun.
- ⁹⁸ Interview with Mr. Chun Pou, village head.
- ⁹⁹ Interview with Mr. Chun Pou, village head.
- ¹⁰⁰ Interview with Mr. Chun Pou, village head.
- ¹⁰¹ Interview with Mr. Mao Vu, police officer.
- ¹⁰² Interview with Mr. Chun Pou, village head.
- ¹⁰³ Interview with Mr. Chun Pou, village head.
- ¹⁰⁴ Interview with Mr. Mao Vu, police officer.
- ¹⁰⁵ Interview with Mr. Mao Vu, police officer.
- ¹⁰⁶ Interview with Mr. Mao Vu, police officer.
- ¹⁰⁷ Interview with Mr. Chun Pou, village head.
- ¹⁰⁸ Interview with Mr. Ly Ra, fisher who has recently adopted aquaculture.
- ¹⁰⁹ Interview with Mr. Ly Ra, fisher who has recently adopted aquaculture.
- ¹¹⁰ Interview with Mr. Chun Pou, village head.
- ¹¹¹ Interview with Mr. Ly Ra, fisher who has recently adopted aquaculture.
- ¹¹² Interview with Mr. Chun Pou, village head.
- ¹¹³ Interview with Mr. Seang Yat, one of the two rice farmers in Muk Wat.
- ¹¹⁴ Interview with Mr. Nel Phallum, Deputy Director, Provincial Department of Water Resources and Meteorology, Siem Reap Province.
- ¹¹⁵ Interview with Mr. Pak Sean, third deputy of the community fishery.
- ¹¹⁶ Interview with the village head.
- ¹¹⁷ These ponds were under water at the time of these interviews.
- ¹¹⁸ Interview with Mr. Seang Yat, one of the two rice farmers in Muk Wat.
- ¹¹⁹ Interview with the village head.
- ¹²⁰ Interview with Ms. Lam Laum, fisher and vegetable grower.
- ¹²¹ Interview with Mrs. Rai Mou, vegetable grower.
- ¹²² Interview with Mr. Seang Yat, one of the two rice farmers in Muk Wat.
- ¹²³ Interview with Mr. Seang Yat, one of the two rice farmers in Muk Wat.

- ¹²⁴ Interview with the village head.
- ¹²⁵ Interview with Ms. Vy Vanndy, commune council member.
- ¹²⁶ Interview with Mr. Pak Sean, third deputy of the community fishery.
- ¹²⁷ Interview with Mr. Ung Sinat, Deputy of the Sof Nrkum District Fisheries Office, Siem Reap Province.
- ¹²⁸ Interview with Mr. Pak Sean, third deputy of the community fishery.
- ¹²⁹ Interview with Mr. Ung Sinat, Deputy of the Sof Nrkum District Fisheries Office, Siem Reap Province.
- ¹³⁰ Interview with Mr. Pak Sean, third deputy of the community fishery.
- ¹³¹ Interview with Mr. Morn You, community fishery enforcement officer.
- ¹³² Interview with Mr. Ung Sinat, Deputy of the Sof Nrkum District Fisheries Office, Siem Reap Province.
- ¹³³ Interview with the village head.
- ¹³⁴ Interview with the village head.
- ¹³⁵ Interview with Ms. Lam Laum, fisher and vegetable grower.
- ¹³⁶ Interview with the village head.
- ¹³⁷ Interview with Ms. Lam Laum, fisher and vegetable grower.
- ¹³⁸ Interview with Mr. Seang Yat, one of the two rice farmers in Muk Wat.
- ¹³⁹ Interview with Ms. Choy Vanna, member of a savings group.
- ¹⁴⁰ Interview with Mrs. Rai Mou, vegetable grower.
- ¹⁴¹ Interview with Ms. Lam Laum, fisher and vegetable grower.
- ¹⁴² Interview with Mrs. Check Seat, village head.
- ¹⁴³ Interview with Mr. Nen Koch, farmer.
- ¹⁴⁴ Interview with Mr. Aum Choan, farmer.
- ¹⁴⁵ Interview with Mr. Teng Roeung, farmer.
- ¹⁴⁶ Interview with Mr. Nen Koch, farmer.
- ¹⁴⁷ Interview with Mr. Uk See, community fishery deputy and farmer.
- ¹⁴⁸ Interview with Mr. Nen Koch, farmer.
- ¹⁴⁹ Interview with Ms. Pher Roecy, female head of household.
- ¹⁵⁰ Interview with Ms. Pher Roecy, female head of household.

- ¹⁵¹ Interview with Mr. Nen Koch, farmer.
- ¹⁵² Interview with Mr. Teng Roeung, farmer.
- ¹⁵³ Interview with Mr. Uk See, community fishery deputy and farmer.
- ¹⁵⁴ Interview with Mr. Teng Roeung, farmer.
- ¹⁵⁵ Interview with Mr. Teng Roeung, farmer.
- ¹⁵⁶ Interview with Mr. Nen Koch, farmer.
- ¹⁵⁷ Interview with Mr. Teng Roeung, farmer.
- ¹⁵⁸ Interview with Mr. Aum Choan, farmer.
- ¹⁵⁹ Interview with Mr. Mon Khein, chairperson of the water management group.
- ¹⁶⁰ Interview with Mr. Khai Soad, Deputy Director, Provincial Department of Water Resources and Meteorology, Battambang Province.
- ¹⁶¹ Interview with Mr. Nen Koch, farmer.
- ¹⁶² Interview with Mr. Nen Koch, farmer.
- ¹⁶³ Interview with Ms. Pher Roecy, female head of household.
- ¹⁶⁴ Interview with Mr. Nen Koch, farmer.
- ¹⁶⁵ Interview with Mr. Mon Khein, chairperson of the water management group.
- ¹⁶⁶ Interview with Mr. Uk See, community fishery deputy and farmer.
- ¹⁶⁷ Interview with Mr. Uk See, community fishery deputy and farmer.
- ¹⁶⁸ Interview with Ms. Pher Roecy, female head of household.
- ¹⁶⁹ Interview with Mr. Uk See, community fishery deputy and farmer.
- ¹⁷⁰ Interview with Mr. Khai Soad, Deputy Director, Provincial Department of Water Resources and Meteorology, Battambang Province.
- ¹⁷¹ Interview with Mr. Uk See, community fishery deputy and farmer.
- ¹⁷² Interview with Mrs. Seang Soten, Provincial Fisheries Officer, Battambang Province.
- ¹⁷³ Interview with Mr. Uk See, community fishery deputy and farmer.
- ¹⁷⁴ Interview with Mr. Uk See, community fishery deputy and farmer.
- ¹⁷⁵ Interview with Mr. Nheeb Ruth, second deputy, Noren Commune Council.
- ¹⁷⁶ Interview with Mr. Uk See, community fishery deputy and farmer.
- ¹⁷⁷ Includes the seeming absence of aquaculture in Phat Sanday and Chnok Tru villages.
- ¹⁷⁸ Mr. Lim Sokret and Mr. Seng Songley were the only officers at the office at the time of the interview.

ANNEX 1: LIST OF ALL KEY INFORMANT INTERVIEWS CONDUCTED

Key informant interviews at national level

Interviewee	Organization	Designation	Date	Location
Mr. Koh Veng San	Tonle Sap Authority	Director, National Reserves and Biodiversity (Flooded Forests)	31 October 2013	Phnom Penh
Mr. Krun Vuti	Tonle Sap Authority	Director, National Reserves and Biodiversity (Fish Biology)	31 October 2013	Phnom Penh

Key informant interviews at provincial level

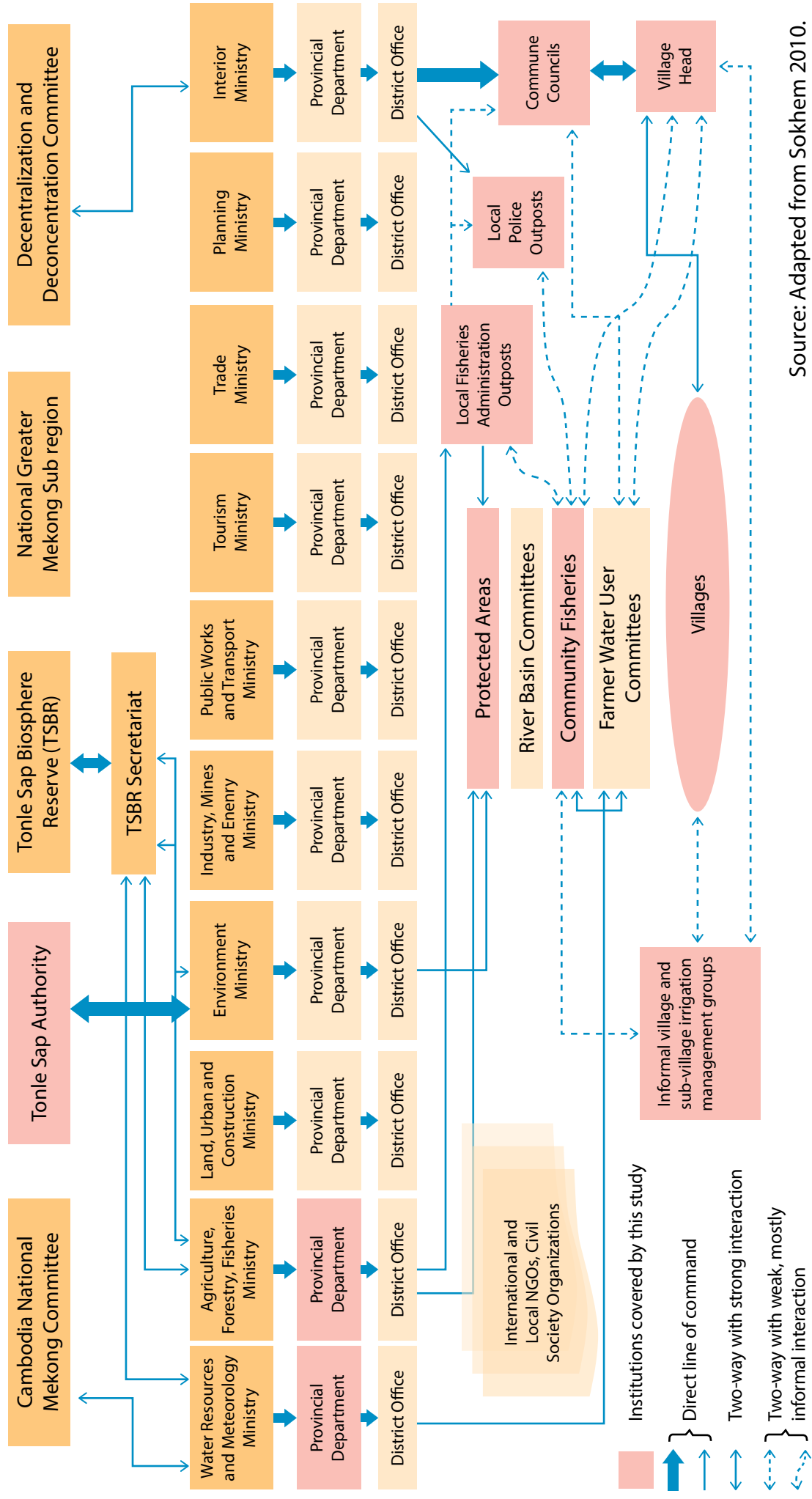
Interviewee	Organization	Designation	Date	Location
Mr. Uy Bunthum	Ministry of Environment	Sub-Deputy of Biodiversity, Kampong Chhnang Province	1 November 2013	Chnok Tru village
Mr. Lim Sokret ¹⁷⁸	Fisheries Administration Provincial Office	Fisheries Officer	4 November 2013	Pursat Province
Mr. Seng Songley	Fisheries Administration Provincial Office	Fisheries Officer	4 November 2013	Pursat Province
Mr. Ket Phat	Provincial Department of Water Resources and Meteorology Provincial Office	Deputy Director	4 November 2013	Pursat Province
Mrs. Seang Soten	Fisheries Administration Provincial Office	Fisheries Officer	6 November 2013	Battambang Province
Mr. Khai Soda	Provincial Department of Water Resources and Meteorology Provincial Office	Deputy Director	7 November 2013	Battambang Province
Mr. Nel Phallum	Provincial Department of Water Resources and Meteorology Provincial Office	Deputy Director	8 November 2013	Siem Reap Province

Key informant interviews at commune and village levels

Interviewee	Primary livelihood	Role	Village
Mr. Loch Chiron	Fishing (small scale)		Chnok Tru
Mr. Mot Seanghang		Head of the Fisheries Administration's Commune Office	Chnok Tru
Mr. Chun Kimlang		Village Head	Chnok Tru
Mr. Pean Sokheng	NGO work		Chnok Tru
Ms. Per Sophat	Fish trading		Chnok Tru
Mr. Long Sokham		Commune Secretary	Chnok Tru
Mr. Pan Saveng		Deputy, Fisheries Administration Office	Phat Sanday
Ms. Kun Srei	Fishing (small scale)	Community Fishery Member	Phat Sanday
Mr. Khan Von	Fishing	Community Fishery Enforcement Officer	Phat Sanday
Mr. Sem Chhet	Fishing (medium scale)		Phat Sanday
Mr. Um Meng	Fishing	Community Fishery Chairperson	Phat Sanday
Mr. No Samnang	Shop ownership; formerly fishing		Phat Sanday
Mr. Sok Mun	Farming	Village Head	Tramper
Mr. Thoum Thien	Fishing and farming	Community Fishery Chairperson	Tramper
Mr. Sam Roem	Farming		Tramper
Mr. Chem Khenluong	Farming; formerly fishing		Tramper
Ms. Soung Ki	Mother of migrants		Tramper
Ms. Sung Yeath	Farming	Pump Owner	Tramper
Mr. Hien Keun	Farming		Tramper
Mr. Sorn Bun	Farming		Tramper
Mr. Eng Yoeun	Farming, seasonal fishing		Tramper
Ms. Sun Ki	Farming and fishing (small scale)		Tramper
Mr. Soy Keou	Fishing	Community Fishery Secretary	Raing Til
Mr. Chun Pou	Fishing	Village Head	Raing Til
Mr. Ly Ra	Fishing (small scale)		Raing Til
Mr. Mao Vu		Police Officer	Raing Til
Ms. Pher Roecy	Farming and small-scale fishing		Rohal Suong
Ms. Check Seat		Village Head	Rohal Suong
Mr. Mon Khein	Farming	Head of Water Management Group	Rohal Suong
Mr. Uk See	Fishing and farming		Rohal Suong
Mr. Teng Roeung	Farming	Water Management Group Member	Rohal Suong
Mr. Neh Koch	Farming		Rohal Suong

Interviewee	Primary livelihood	Role	Village
Mr. Nheab Ruth		Commune Council Member, Noren Commune	Rohal Suong
Mr. Sok Sopheak		Commune Council Member, Noren Commune	Rohal Suong
Mr. Aam Choan	Fishing		Rohal Suong
		Village Head	Muk Wat
Ma. Choy Skha	Fishing and vegetable cultivation		Muk Wat
Mr. Loung Chhruuch	Aquaculture		Muk Wat
Ms. Choy Vanna		Member of a Savings Group	Muk Wat
Mr. Pak Sean		Third Deputy of the Community Fishery	Muk Wat
Mr. Ung Sinat		Deputy, Sof Nrkum District Fisheries Office	Muk Wat
Ms. Vy Vanndy	Fishing	Community Fishery Member	Muk Wat
Mr. Morm Youn	Fishing	Community Fishery Member	Muk Wat
Mr. Seang Yat	Rice farming		Muk Wat
Ms. Rai Moo	Vegetable farming		Muk Wat
Ms. LamLaum	Fishing		Muk Wat

ANNEX 2: INSTITUTIONAL LANDSCAPE LINKED TO WATER RESOURCES MANAGEMENT IN AND AROUND THE TONLE SAP LAKE



Source: Adapted from Sokhem 2010.



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Approximately 500 million people in Africa, Asia and the Pacific depend on aquatic agricultural systems for their livelihoods; 138 million of these people live in poverty. Occurring along the world's floodplains, deltas and coasts, these systems provide multiple opportunities for growing food and generating income. However, factors like population growth, environmental degradation and climate change are affecting these systems, threatening the livelihoods and well-being of millions of people.

The CGIAR Research Program on Aquatic Agricultural Systems (AAS) seeks to reduce poverty and improve food security for many small-scale fishers and farmers depending on aquatic agriculture systems by partnering with local, national and international partners to achieve large-scale development impact.

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