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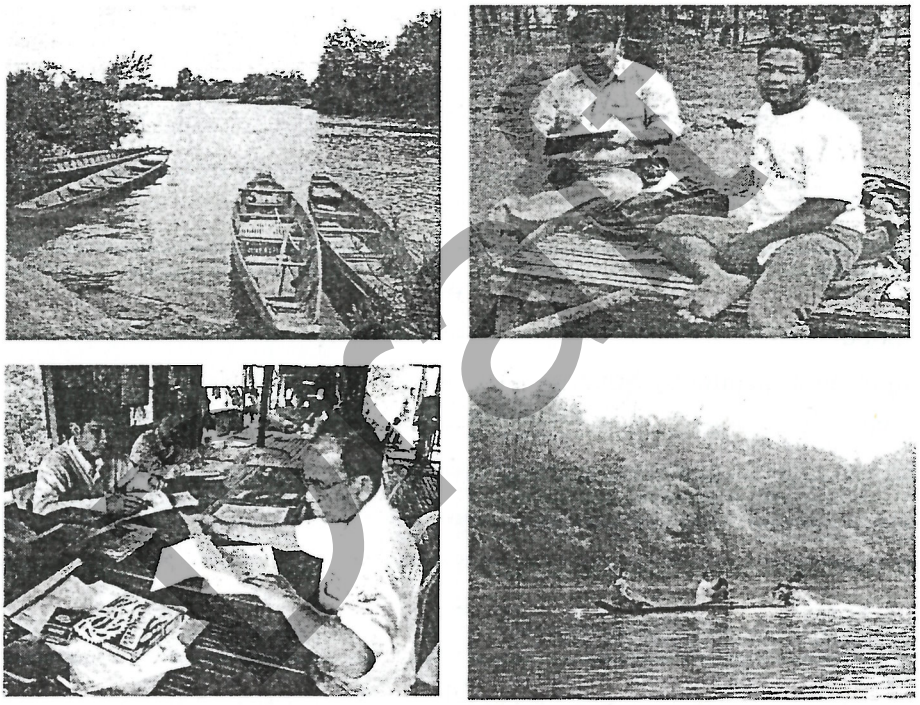
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KINGDOM OF CAMBODIA
Nation Religion King

SOCIO-ECONOMIC REPORT
for
LOWER SE SAN 2 HYDROPOWER PLANT



By May Simorn, Socio-Economist

April, 2008

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1. BACKGROUND

1.1 Description of the project area

The Se San River is widely known as one of the largest tributaries of the Mekong River. It originates in the central highlands of Gia Lia and Kon Tum provinces in Vietnam. It runs through two provinces (Ratanakiri and Stung Treng) in the northeastern Cambodia, where it finally joints with the Srepok[1], 20 km upstream, and Sekong[2] rivers before ending up in the Mekong River in Stung Treng province. In Ratanakiri province, the Se San River flows through four districts: Oyadao, Andong Meas, Traveng and Veun Sai. In Stung Treng province, it flows through only Se San district. Of the total catchment area 18570 km^2 of the river, 6960 km^2 are inside Cambodia. It has been reported that the river is the home and way of life for people and animals, especially aquatic animals for several years (SWECO 2006). The people living along the river originate from different ethnic groups, traditions, and cultures in which indigenous minority groups form the majority. The indigenous minority groups include Jarai, Lao, Kreung, Kavet, Lun, Tampuon, Kachok, Phnong, Kuoy, Khek, Stieng and Prov with Khmer forming the majority and living along the Se San River (3S Rivers Protection Network 2007). The detailed villages, the places where will be flooded by the project area, of the two districts are as shown in figure 1.

1.2 Objective of the study

The aim of the study was to create an extensive and realistic picture of the socio-economic situation of the project area. However, the main objective was to achieve a great understanding of the socio-economic and environmental factors and to help development actors understand how people in this area make a living, and in particular how they use and manage natural resources.

1.3 Scope and limitations

Due to the fact that time was limited, the study was conducted for only five months starting from February to June, 2008 which was during the dry season period. The study covered investigation of overall social-economic aspects such as population, ethnicity and religions, Age, gender and education, infrastructure, land use and ownership, agricultural productivity, livelihoods, natural resources, Water consumption and Sanitation, health. Also resettlement and its issues and impacts from lower se san 2 hydropower plant during the construction of this hydropower plant and after its operation were also discussed, extracting from previous experiences which occurs on Cambodia through upstream dams located in Vietnam.

2. METHODOLOGY

2.1 Description of obtaining data

In order to fulfill the defined objective, socio-economic information was collected through review of existing databases as well as through original data gathering via village-level expert's interview. As a result, the study is divided into two main components:

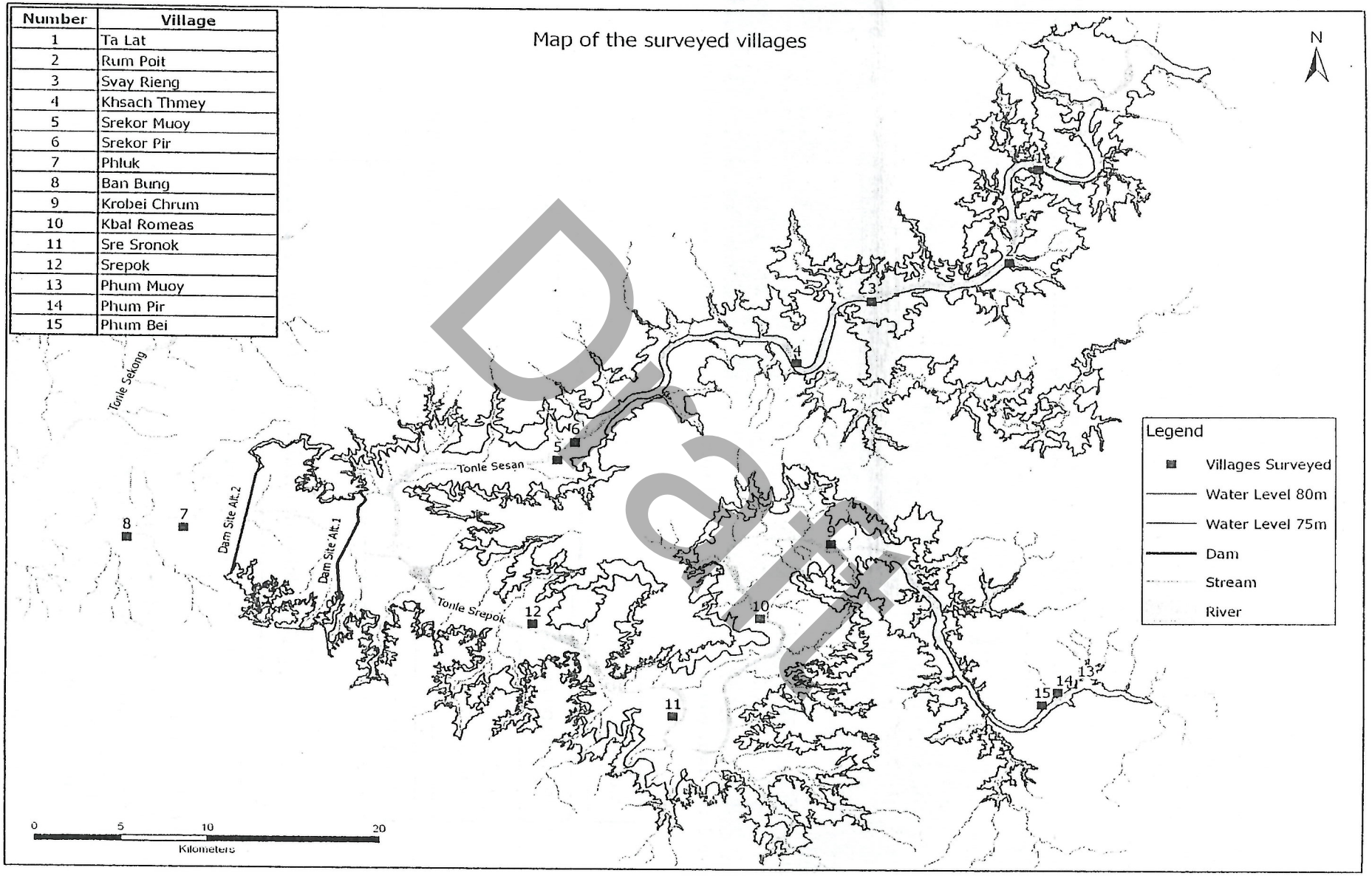
a) Review and analysis of other sources of information, consisting of literature reviews; and
b) Village-level expert's interview.

Literature reviews and other information sources completely form the secondary data source. In addition, information derived from village-level expert's interview produce mainly quantitative data (figure 2b), while public consultations focus strongly on qualitative data (figure 2a). Village-level expert's interviews provide detail information about household characteristics, occupation, daily livelihood, income status, water consumption, health and other allied aspects in family. Public consultations give overall ideas and comments on the project if those agree with such development project or disagree with it, providing their own reasons.

[1] Srepok River flows from Vietnam through first Mondulkiri and then Ratanakiri Province into Stung Treng Province.
[2] Se Kong River runs from Laos into Cambodia

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Number	Village
1	Ta Lat
2	Rum Poit
3	Svay Rieng
4	Khsach Thmey
5	Srekor Muoy
6	Srekor Pir
7	Phluk
8	Ban Bung
9	Krobei Chrum
10	Kbal Romeas
11	Sre Sronok
12	Srepok
13	Phum Muoy
14	Phum Pir
15	Phum Bei



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Figure 1 Map of the surveyed villages in the project area

Meanwhile, during the studied period, any relevant key informants in each village and commune were interviewed by the KCC's expert team in order to give more in-dept information from the project area. Of these, there are known as the primary data sources. In combination of review and analysis of other sources of information such as profile commune by commune, previous studied reports and village-level expert's interview and public consultation through analyses made both quantitative and qualitative data. As a result, such different components of socio-economic data complement each other and give a wider and firmer information for the whole study as shown in figure 3.



Figure 2 a) Public consultation in Sre Angkrorng b) An interview of household head

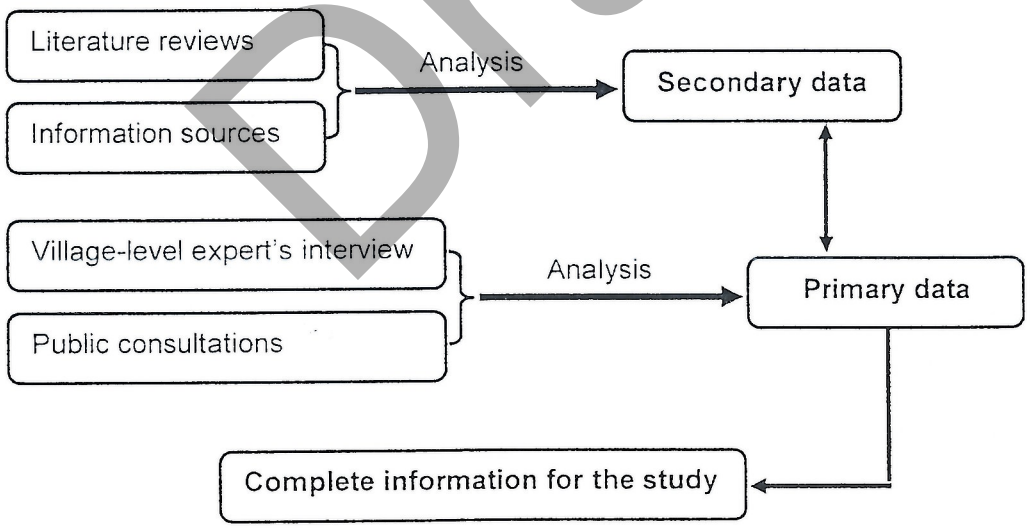


Figure 3 Flow of data processing for the study

2.2 Study process

The process of the study started from contacting relevant provincial departments, local authorities such as district governor, head of land management and urban planning office, head of environmental office, head of fishery office etc. From these contacted persons, some of the background information were obtained. Thus, such data partly gave the supports to the secondary data. At the mean time, some more important data were also collected from any other sources such as commune profiles, district profiles, and overall information of Stung Treng and Ratanakiri provinces and previous studied reports. As a result, such kinds of data were interpreted into easily understandable way. Of this, they are mainly formed the secondary data. Then, the first field-sites

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visit was conducted for one-week period. During this period, field observation and livelihood aspect of local people in the villages was observed so as to organize the questionnaire which reflects living condition in the project area. After coming back from the visit, the analysis tool was developed so as to get clear and extensive picture of socio-economic condition reflected the project area. After that, two groups of expert went to the field sites in order to conduct village-level interviews and to do public consultations in all the relevant villages. These are the major sources of primary data for real understanding the interactions between socio-economics, the river and other natural resources as well as to ensure the participation of local people. Finally, the results of the study are reflected the obviously and clearly picture of natural resources and of people living along the river. However, samples of the study was carried out in a total of 15 villages in 5 communes within 2 districts, Se San and Koun Mom districts of Ratanakiri and Stung Treng provinces as shown in table 1.

Table 1 Number of households in each village and its selected samples

District	Commune	Total household	Village	Total household	Sample
SE SAN	Talat	636	Talat	72	7
			Rum Poit	53	5
			Svay Rieng	256	25
			Khsach Tmey	255	25
	Srekor	323	Srekor Muoy	165	16
			Srekor Pir	158	15
	Phluk	264	Phluk	196	19
			Ban Bung	68	7
	Kbal Romeas	434	Krobei Chrum	177	17
			Kbal Romeas	106	10
			Sre Sronok	104	10
			Srepok	47	4
KOUN MOM	Sre Angkrorng	316	Phum Muoy	91	9
			Phum Pir	113	11
			Phum Bei	112	11
			Total	**1973**	**191**

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2.3 Data Analysis

Data analyses were set to comply with the objectives. Since there is no an in-dept analysis tool was used in this study, the data were analyzed as only average and percentage using SPSS software 14.0. Prior to analysis, those data were rechecked, arranged, and classified into groups. Finally, the output from analysis was used as the result of the study.

3. PROJECT AREA PROFILE AND SOCIO-ECONOMIC ASPECTS

3.1 Introduction

This part provides and analyzes information of general socio-economic aspects. The information described is partially generated from the commune profiles obtained in the year 2007 and other previous studied reports. However, all relevant aspects can not be derived comprehensively from only these sources. That means that these sources just give important background information of the project area. Thus, it is necessary to additionally analyze primary data obtained from the interviewed households and public consultation in order to get overall relevant picture representing the overall aspects. Since the project area consists of five communes within two districts, the subtitles here like Population, Age, gender and education, Ethnicity and religions, Infrastructure, Land use and ownership, Agricultural productivity, Natural resources, Livelihood, Water

consumption and sanitation, Health, Resettlement and Issues, and Impacts from the Hydropower Plant are described as commune by commune so as to get clear aspects of the project area. This kind of approach allows independent review of each commune and comparison between them.

3.2 Population

In Talat commune, there are four villages: Talat, Rum Poit, Svay Rieng, and Khsach Tmey. The population is 636 families with total people of 2915 persons. Of the total population, women contributed about 51% or 1477 persons.

In Srekor commune, there are two villages: Srekor Muoy and Srekor Pir. There are 323 families with total population of 1477 persons. Of the total population, women contributed 50.6% or 748 persons.

In Phluk commune, there are two villages named Phluk and Ban Bung. The population is 264 families with total population of 1092. Of the total population, women contributed 50% or 549.

In Kbal Romeas commune, there are four villages: Krobei Chrum, Kbal Romeas, Sre Sronok and Srepok[3]. The population is 434 families with total population of 2060. Of the total population, women contributed 49% or 1014.

In Sre Angkrong commune, there are three villages: Phum Muoy, Phum Pir and Phum Bei. The population is 316 families with total population of 1610. Of the total population, women contributed about 51% or 819 persons. Furthermore, the average family size in the project area ranged from 4.1 to 5.2 persons. All of the above-described statistics are summarized in table 2.

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Table 2 Population in the project area in the year 2007

Commune	Village name	Total family	Population	Female	Family size
Talat	Talat	72	359	180	5.0
	Rum Poit	53	221	111	4.2
	Svay Rieng	256	1172	601	4.6
	Khsach Tmey	255	1163	585	4.6
Srekor	Srekor Muoy	165	749	376	4.5
	Srekor Pir	158	728	372	4.6
Phluk	Phluk	196	803	402	4.1
	Ban Bung	68	289	147	4.3
Kbal Romeas	Krobei Chrum	177	798	407	4.5
	Kbal Romeas	106	538	265	5.1
	Sre Sronok	104	529	245	5.1
	Srepok	47	195	97	4.1
Sre Angkrorng	Phum Muoy	91	448	225	4.9
	Phum Pir	113	582	312	5.2
	Phum Bei	112	580	282	5.2

Source: Commune profiles, 2007

3.3 Ethnicity and religions

This part provides information about religions and ethnicity as derived from profiles of the communes and household survey by experts respectively. It is reported by 3S Rivers Protection Network, 2007 that there are nine ethnic minority groups known as indigenous people. Although there are several different ethnic groups living in the villages along the Se San River, there are very

[3] In Chrop village, there are two villages combined together: Srepok and Ousangkruos. Since the project area will flood only on Srepok village, resulting this village was selected as one of the studied villages.

few found in the project area, all of them are Jarai, Lao, Kreung, Phnong and Prov. Figure 4 shows the percentage of the ethnic minority groups interviewed in the project area.

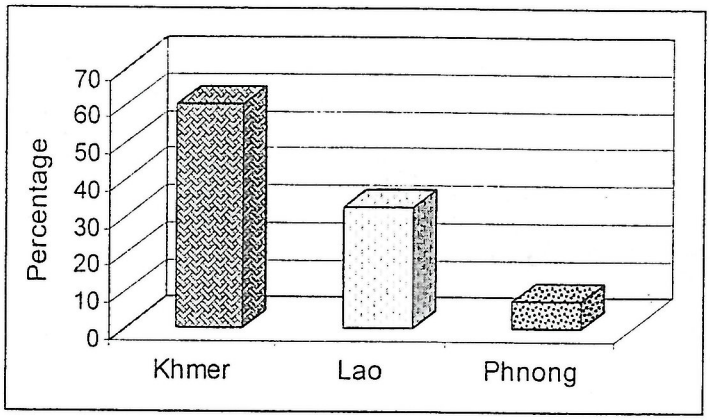


Figure 4 Ethnicity in the project area

Although few ethnicities like Jarai, Lao, Kreung, Phnong and Prov were reported by 3S Rivers Protection Network 2007 as described above, but some of those were not met so that they could not be interviewed during the field study. Therefore, the interviewed persons were only Khmer, Loa, and Phnong. The highest percentage in the project area is Khmer, contributing around 60% of the total interviewed people, followed by Lao living almost all in Srekor (contribute about 33%), and Phnong living mostly in Kbal Romeas village (contribute approximately 7%).

3.4 Education

Education sector is being improved, resulting of growing slowly. The education level and literacy rates amongst women are usually much lower than that of men. Also, differences between urban and rural areas have been found to be significantly different (CIPS 2004). Since education is one of the most important sectors, it is necessary to highlight it, reflecting back from the project area.

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However, prior to providing a description of illiteracy rates, it should be focused attention on school facilities. In view of this, no high school was found in the project area. However, there are two secondary schools were found in Sre Angkrorng and Srekor communes. In Srekor, the secondary school is close to its villages, and it will be impacted by the dam if constructed. On the other hand, in Sre Angkrorng, the distance from its villages to the Trapaingkrahom secondary school is approximately 22 km. This school will not be likely to be impacted by the dam, but it is mentioned here just acknowledge about the educational facility in the project area. In all communes, there are primary schools (Table 3). The number of primary schools depends on the location of those villages. For instance, in Kbal Romeas; since the distance from one village to another is far, primary school is consecutively constructed in all villages in order to facilitate education facilities in the commune.

Table 3 Number of schools and teachers

Commune	Primary School	# of classroom	Secondary School	# of classroom
Talat	4	21	0	0
Srekor	1	7	1	5
Phluk	2	12	0	0
Kbal Romeas	4	32	0	0
Sre Angkrorng	1	4	0	0

Source: Stung Treng provincial department for education, 2007

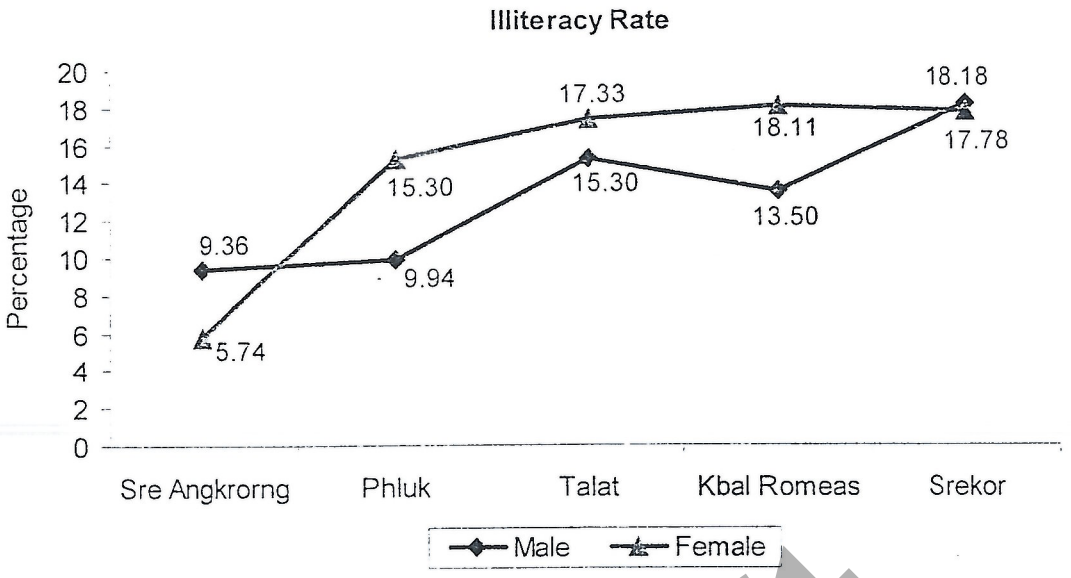


Figure 5 Illiteracy rates according to gender and the communes

Figure 5 presents information on illiteracy and level of education according to genders. The illiteracy rates were calculated from the male and female population having ages 15 - 60 years in each village, respectively. However, the percentage of female illiteracy is higher than male one in three communes: Phluk, Talat, and Kbal Romeas. The percentage of both male and female is similar in case of Srekor since this commune is mostly Lao population, resulting has no significantly different illiteracy between male and female. However, it is quite different in Sre Angkrorng that male illiteracy is higher than female. On the country basis, the education level and illiteracy rates among women are in the whole country very much higher than those among men. Average percentage of illiteracy rates in all communes is explained in figure 6.

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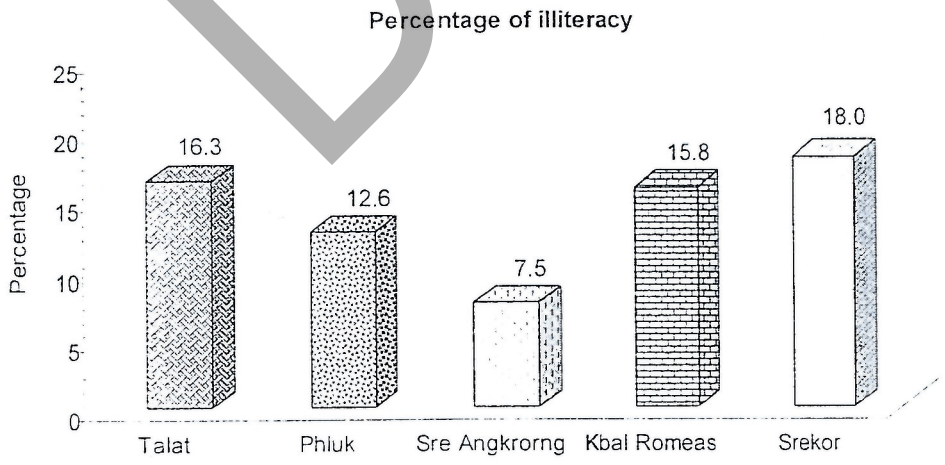


Figure 6 Percentage of illiteracy in the project area

Although there are many primary schools in the project area, the number of students continuing their education in secondary school and high one are very few. Generally they dropped down the schools when they finished grade 1-5 or only primary school. As a result, percentage of illiteracy is high (figure 6). The figure 6 shows average percentage of illiteracy rates of male and female in each commune. In Sre Angkrorng, the percentage is so small 7.5% compared to that of others. On one side, it may be due to the fact that the commune is close to the Trapaingkrahom secondary school in Koun Mom district center, the place where is about 22 km from the commune. On the

other side, it may indicate that parents have valued their children's study since the early time so that children are able to study more. In addition, after graduating primary school, school boys/girls are able to continue their studying at secondary level. Obviously, many school boys/girls are studying at the secondary school. In Phluk, the average percentage is 12.6%. This may be due to this commune is near provincial town, the place where is many schools located. Thus, education facilities may be better than that of other communes in the project area so that literacy rate is high. In Kbal Romeas, the percentage of illiteracy is 15.8% higher than the two communes as described above. This is due to the fact that basic facilities of education is lower than that of those two communes, while the other reason may be due to parents pay less attention on study of their chidren, and poverty. Some of families within the commune are minority groups such as Phnong, Prov, Kreung, Kavet, and Tampuon, respectively. This may contribute to higher illiteracy in the commune. In Talat, the percentage of illiteracy is also high 16.3%. This is because of the commune has only primary schools. One of the major aspects is that parents have never valued and cared of their children's study. Also, irregular teaching and lack of teachers are key roots of high illiteracy rate. In Srekor, the percentage of illiteracy is higher 18% than that of other communes in the project area. This is due to the fact that almost all families are Lao so that they prefer not to learn Khmer. On the other hand, the educational levels of respondents are as expressed in figure 7.

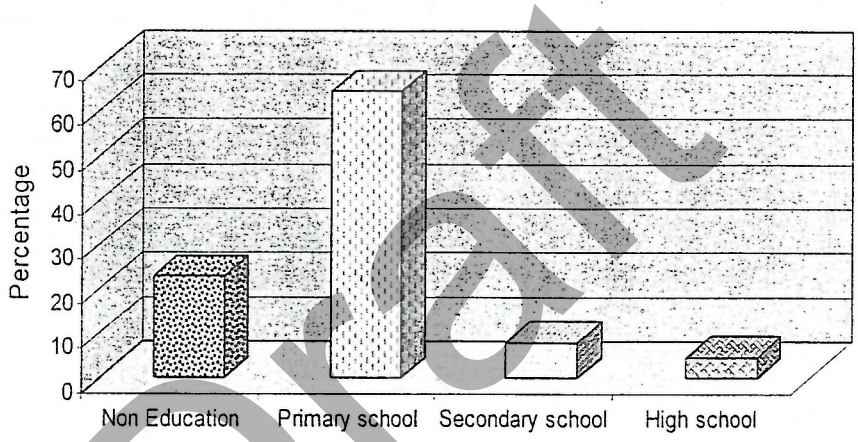


Figure 7 Percentage of educational levels of respondents

The figure 7 shows that very few respondents, mostly household head, studied only in secondary schools and high ones. However, the percentage of their educational levels is high in primary school. Even so, most respondents used to study just only grade 1-2. This indicates that although they used to study in such levels, they could not read and/ or write as well. Thus, it is quite similar to non-education respondents.

The high illiteracy rate can be explained by several reasons. One of the most important reasons is the tradition. It is conventional that in most cases parents don't value and/or care of their children's study, while the other reasons include poverty, irregular teaching due to lack of teachers, and long distances to secondary school and high school. Poverty is considered as one of the root causes. This is due to the fact that those children were always involved in some forms of work, even if they were studying in order to support family's works and/or to earn extra income to supplement daily livelihood. Of this, it significantly contributes to the low level of education in the project area.

3.5 Infrastructure

The infrastructure in the project area is being improved, but road network to some villages is still poor (the road to Svay Rieng, Rumpoit, and Talat). This means that roads in some villages are completely inaccessible during the rainy season. There is, however, a main laterite road to each commune center (figure 8b). Since lack of road network connected from one village to another in some communes, the Se San River is frequently used for travel and transportation by some

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villagers. In Khsach Tmey village, there is a ferry across the Se San River, connecting from one side to another of the village. Motorbikes are mainly used in transportation of people and in transporting goods wherever road access to villages is available.



Figure 8 a) Bridge is being constructed in Phluk b) Main laterite road to Kbal Romeas commune

Access to electricity is quite good. In Talat, all people use firewood for cooking and use torch about 50% and kerosene and/or diesel lamps about 40% for lighting. The remaining percentage 10% is electricity. This means that within this commune, people in Khsach Tmey mainly use electricity for lighting. In Srekor, people also use firewood for cooking and use torch about 10% and kerosene or diesel lamps about 80% for lighting. The remaining households around 10% use their own battery and/ generator. In Phluk, it is not different from the above-two communes. People completely use firewood as a source of cooking, while sources of lighting are torch 15%, kerosene or diesel lamps 65%, own battery and/ generator around 10% and electricity about 10%. In Kbal Romeas, People also use firewood 100% as a source of cooking. . while sources of lighting are torch 10%, kerosene or diesel lamps 25%, own battery and/ generator around 15% and electricity about 50%. The relatively more affluent households use electricity is high within this commune. This is due to the fact that 3 out of 4 villages have electric generators and also price for its consumption is affordable for local people. In Sre Angkrorng, it is the same to other communes in the project area. People also use firewood 100% as a source of cooking, while sources of lighting are torch 10%, kerosene or diesel lamps 60%, own battery and/ generator around 10% and electricity about 20%. It seems to be high for electric consumption within this commune. Of the explanations are summarized in table 4.

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Table 4 Basic infrastructure

Commune	Use firewood for cooking	Use torch for lighting	Use kerosene and/or diesel lamps for lighting	Use battery and/or generator for lighting	Use electricity for lighting
	Percentage				
Talat	100	25	40	15	20
Srekor	100	10	70	10	10
Phluk	100	15	65	10	10
Kbal Romeas	100	10	25	15	50
Sre Angkrorng	100	10	60	10	20

Source: Key informants by commune, 2007

3.6 Land use and ownership

Paddy field per household varies from commune to another. Based on the field research, it is found that paddy field holdings ranged from 0.5 ha to 12 ha. All of the interviewed households reported that they have their own land holdings, not belonged to parents or rent from others. Table 5 presents the distribution of households owning paddy field by different sizes, and inequality of land ownership. Altogether, in the project area, 2.8 percent hold 0.5 hectare or less, 21 percent hold from more than 0.5 to less than 2 hectare, 59.1 percent hold 2 and 4 hectares and 17.1 percent hold more than 4 hectares. The other 10 households don't occupy paddy field because they are new comers or settlers as shown in Table 5. Regarding to ownership, based on the field study, mostly land ownerships occupied have no official land title. However, they are duly recognized by local authorities at village, commune and district levels.

Table 5 Paddy field holdings

The project area	>0-0.5ha	>0.5-<2ha	2-4ha	>4ha	Total
	Family				
Number of household	5	38	107	31	181
	Percentage				
All the communes	2.8	21	59.1	17.1	100

Table 6 presents the distribution of households owning different size of crop plant land. As a result, 13.7 percent hold 0.5 hectare or less, 44 percent hold from more than 0.5 to less than 2 hectare, 34.2 percent hold 2 and 4 hectares and 7.7 percent hold more than 4 hectares. The other 74 households don't occupy crop land. It is similar to paddy field, almost all the crop land have no ownership certification. Regarding to ownership, based on the field study, mostly land ownerships occupied have no official land title. However, those kind of lands are also duly recognized by local authorities at village, commune and district levels.

Table 6 Crop plant land holdings

The project area	>0-0.5ha	>0.5-<2ha	2-4ha	>4ha	Total
	Family				
Number of household	16	52	40	9	117
	Percentage				
All the communes	13.68	44.44	34.19	7.69	100

Beside these lands use as described above, Land use type can basically be classified as forestry land, and residential land, while the other types detailed are depicted in table 7.

Table 7 Land use in the project area

Commune	Land Use Type	Area (ha)
Kbal Romeas	Bamboo and Secondary forests	3,533.76
	Deciduous forest	41,568.57
	Dry Deciduous (Open) forest	3,029.42
	Evergreen broad leafed forest	7,942.41
	Grassland (undifferentiated)	57.92
	Lakes (<8 ha)	1.90
	Marsh and swamp	277.61
	Mixed forest from evergreen and deciduous species	9,295.68
	River	1,563.73
	Paddy field	896.13
	Riparian forest	4,808.34

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	Sand bank	5.15
	Swidden agriculture (Slash and burn)	3.01
	Village garden crop	271.64
	Woodland and scattered trees (C < 10%)	484.89
	Total	**73,740.15**
Phluk	Abandoned field covered by grass	15.30
	Bamboo and Secondary forests	602.26
	Deciduous forest	13,740.82
	Dry Deciduous (Open) forest	2.22
	Evergreen broad leafed forest	3,221.86
	Grassland (undifferentiated)	39.92
	Marsh and swamp	304.04
	Mixed forest from evergreen and deciduous species	14,651.24
	River	967.11
	Paddy field	341.39
	Riparian forest	1,518.48
	Sand bank	27.03
	Swidden agriculture (Slash and burn)	30.57
	Woodland and scattered trees (C < 10%)	143.57
	Total	**35,605.81**
Srae Angkrong	Bamboo and Secondary forests	108.19
	Deciduous forest	28,975.37
	Dry Deciduous (Open) forest	771.90
	Evergreen broad leafed forest	2,013.31
	Flooded shrub	4.23
	Grassland (undifferentiated)	19.75
	Lakes (<8 ha)	7.23
	Marsh and swamp	70.84
	Mixed forest from evergreen and deciduous species	81.84
	River	578.74
	Paddy field	679.55
	Riparian forest	3,492.93
	Woodland and scattered trees (C < 10%)	100.93
	Total	**36,904.79**
Srae Kor	Abandoned field covered by grass	111.15
	Bamboo and Secondary forests	1,711.49
	Deciduous forest	5,742.21
	Dry Deciduous (Open) forest	80.72
	Evergreen broad leafed forest	4,764.93
	Flooded shrub	3.38
	Grassland (undifferentiated)	30.75
	Marsh and swamp	765.04
	Mixed forest from evergreen and deciduous species	24,511.22
	River	821.18
	Paddy field	762.09
	Riparian forest	485.14
	Sand bank	26.41

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	Shrubland (undifferentiated)	9.56
	Woodland and scattered trees (C < 10%)	44.95
	Total	**39,870.20**
Ta Lat	Abandoned field covered by grass	756.26
	Bamboo and Secondary forests	5,075.44
	Barren land	3.38
	Deciduous forest	303.99
	Dry Deciduous (Open) forest	53.80
	Evergreen broad leafed forest	18,279.18
	Grassland (undifferentiated)	555.86
	Marsh and swamp	342.99
	Mixed forest from evergreen and deciduous species	10,714.28
	River	1,561.96
	Paddy field	1,269.45
	Riparian forest	446.74
	Sand bank	53.79
	Shrubland (undifferentiated)	119.47
	Swidden agriculture (Slash and burn)	163.14
	Woodland and scattered trees (C < 10%)	3,527.89
	Total	**43,227.60**

Source: JICA, 2000

3.7 Agricultural Productivity

Along the Se San River, people are engaged in rice production, known as upland rice, and crop production for a season per year. Thus, no rice and/or any crop productions are cultivated during the dry season period. This doesn't mean that there is no irrigation facility during the dry season, but rather lack of means to irrigate their fields or it may be their customs, just cultivate only one season, that's enough. On the other hand, the practices of upland rice are generally divided into categories: shifting and permanent cultivation. Shifting cultivation involves clearing forest to plant rice and other crops for 2-5 years before rotating/moving to another place. In most cases, farmers clear areas that were previously cultivated but have been left fallow for several years. Permanent cultivation involves growing rice in the same area every year, typically a small plot of land located nearby farmer's houses (McKenney B. and Prom T. 2003).

Rainfed upland rice is considered as the dominant crop, transplanting from June and harvesting from October to December. The harvesting period is dependent on rice varieties. For instance, early rice is normally harvested after planting for a three-month period, while the late rice is always harvested after planting for a six-month period. The secondary crops are planned in the form of mixed farm. Such kinds of crops are grown without irrigation. This means that although the rice fields are close to the Se San River, but they completely depend on rainwater. Due to its dependence on rainfall, upland rice is transplanted during the wet season and harvested during the end of rainy season or when the rains end, depending on rice varieties and other factors such as rainfall regime, climate conditions. In most upland fields, mixed crops are the planting of rice and a range of other crops including corn, sweet potato, cassava, mung bean, sesam, vegetables and others.

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Table 8 Rice yields by commune

Commune	Rainy season rice yields (Ton/Ha)
Talat	2.0
Srekor	1.5
Phluk	1.8
Kbal Romeas	1.5
Sre Angkrorng	1.0

Source: Commune profiles, 2007

The rice yields vary from commune to another as shown in table 8, depending rice species, agricultural practice, types of soil and others. The high rice yields in any commune imply rice soil in that commune. Agriculturally, the darker soils are more fertile than red soils, locating further away from the river, most likely once covered by forest, are better for rice paddies and fruit orchards. Riverside villagers mostly reported that their paddy land was enough to provide them with adequate food in most years. Field observations found a general pattern and distribution of mixed crops throughout the landscape in association with the Se San River. Fruit orchards were quite far from the river and they are more common among villages near the Se San River, providing additional source of income, while home gardens were nearby homesteads and between houses and the river (SWECO 2006). Those crop plants are classified into three categories: plants grown in the home gardens, crop/food plants located behind the houses (backyards), and plants that used to be cultivated nearby river bank and/or along river bank slopes (Table 9).

Table 9 List of crop plants and fruit trees in the project area

Plants grown in the home gardens		Crop plants and fruit trees located behind the houses (backyards)		Plants that used to be cultivated nearby river bank and/or along river bank slopes	
Local Name	Name	Local Name	Name	Local Name	Name
Ampel	Tamarind	Ampel	Tamarind	Ampov	Sugar cane
Chek	Banana	Ampov	Sugar cane	Kh'toem Sor	Spring onion
Chi Angvong	Mint	Chek	Banana	L'mut	Species of Sapotaceae
Chi Kraham	Basil	Chi Angvong	Mint	L'ngo	Sesame
Chi Vansuy	Coriander	Damlong Chhvea	Sweet potatoes	Lpov	Pumpkin
Doerm Dong	Coconut tree	Damlong Kor	Cassava	Mnors	Pineapple
Doerm Ko	Bombax	Doerm Dong	Coconut tree	Mtesh	Chili
Doerm Toekdoh Ko	Milk fruit	Deum Ko	Bombax	Ov Loek	Water melon
Kh'nol	Jackfruit	Doerm Toekdoh Ko	Milk fruit	Pot	Corn
Kh'toem	Spring onion	Kh'nhei	Ginger	Sla	Betel nut
Kroch Chhma	Lemon (lime)	Kh'nol	Jackfruit	Spey	Lettuce
Kroch Pursat	Orange	Kroch Pursat	Orange	Svay	Mango
Kroch Thlong	Pomelo	L'hong	Papaya	Svay Chanti	Cashew
L'hong	Papaya	L'mut	Species of Sapotaceae	Thnam Chuok	Tobacco
L'mut	Species of Sapotaceae	L'ngo	Sesame	Trab Kdeb	Aubergine
Mien	Longan	Mien	Longan	Trakuon	Morning

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					glory
Mlou	Peper betel	Sandaek Bay	Mung bean	Trav	Taro
Mtesh	Chili	Seda	Pomelo		
Nonong	Long gourd - 2 (smooth surface)	Sloek Krey	Lemon grass		
Rumchek	Pandan	Speu	Corambole		
Rum dénh	Galanga	Spey	Lettuce		
Sandaek Kuo	Long bean	Svay	Mango		
Sla	Betel nut	Svay Chanti	Cashew		
Sloek Krey	Lemon grass	Thnam Chuok	Tobacco		
Speu	Corambole	Trav	Taro		
Spey	Lettuce				
Svay	Mango				
Svay Chanti	Cashew				
Trob	Species of Solaneaceae				
Trabaek	Guava				
Trab Kdorko	Aubergine				
Tralach	Long gourd - 1 (hairy)				
Trasak	Cucumber				

Note: These crop plants and fruit trees were reported by villagers, recorded during the field studies and compiled here as alphabetically local name order. However, some crops were difficult to determine its names because they were called in Lao language.

3.8 Livelihood

Prior to going into more detail in livelihood, it is necessary to introduce such term in advance. A livelihood is defined as consisting of the capabilities, assets, including both material and social resources, and activities required for a means of living. A livelihood is however sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resources (DFID, 1999). Livelihood diversification is regarded as the ways in which individuals and households change their ways of earning an income and surviving (IMM, CFDO and CBNRM LI. 2005).

In Cambodia, livelihood diversification is the most important and a part of life in rural areas. It not only provides earnings to supplement family's usually inadequate main income source but also reduces the risks arising from relying on single source of earning (Ellis 2000). People in the project area are however not different from rural areas elsewhere in the country. That means that they have traditionally engaged in agriculture, depending on a range of activities to secure food and income which include rice, other field crops, home gardening, and livestock production, fishing, forest product collections, wage labour, and small-scale traders and others. Table 10 shows in details both main and secondary occupations in the project areas.

Table 10 Main and secondary occupations of people

Main occupation	Percent
Worker at private companies / factories	0.5
Government employee	11.0
Small shop owner	0.5
Farmer	88.0

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Second occupation	
Worker at Private Companies / Factories	1.0
Government Employee	5.8
small-scale trader	3.7
Farmer	5.8
Fishermen	41.9
Motor taxi driver	0.5
Construction worker	2.6
Palm Clamber	0.5
Non timber product	9.9
Hunter	5.8
Businessman	7.9
fish trader	1.6
Rice mill operation	3.1
Timber logging	3.7
Transportation service	4.7
Other	1.6

In this context, this part aims to identify different sources of main income generation and to quantify incomes from them.

3.8.1 Household Income by Source

Apart from regular cultivations on rice and crops and raising animals, villagers are dependent on (i) Salary or wage, (ii)Fishing, (iii) Manual labor, (iv) Income from selling livestock, (V) Income from selling rice and/or grain (vi) Non-timber forest products such as collecting resin and other forest resources (NTFP), (vii) Transportation service provider by boat, power tiller and with a few cases by car, and (viii) Other miscellaneous incomes from other means, such as renting out assets. Total income for a full year period was thus calculated from each source as defined above and combined them together. However, Income has been considered as one of the most difficult variables to calculate from household surveys. In most cases, expenditure is used as a proxy (Chan S. and S. Acharya, 2003). Since expenditure data here cannot be used for analysis of incomes from different sources, income data were still generated for this study. Interviewees were asked to recall their incomes from all possible sources during the past twelve months since a clearly identified reference point (January to December 2007). As a result, it is found that:

- **Salary or Wage**: Salary or wage is defined as those working as governmental officer and or NGO/company staff, obtaining monthly income or salary. In the project area, income from this source is from those working for government or as governmental officer. On the average basis, the annual income from such source is approximately 1,000,000 riel or US$ 250. In Talat, it is found to be lower than that of others. The variations of income suggest the difference numbers of people working as civil servant or other works obtained monthly salary.

- **Rice Milling**: Rice milling is one of the income-earning activities in rural areas. Almost all rice mills are family owned and operated. Spouses and relatives form the main workers. Much of the rice has historically been processed for only domestic consumption. However, this activity now provides low income due to the fact millers operate it and, in return they keep the bran and husk rather than charge a cash fee. Obviously, in all communes of the project area, income from such source is low, which is around 260,000 riel or around US$ 65 per year, compared to most of the income-earning sources.

- **Transportation Service**: The source of this income is considered to be one of the higher income-generating sources in the project area since it provides substantial incomes to supplement their livelihoods. Transportation service here included motor-taxi driver, boat-based transportation service provider, and transportation by ox-cart, car. In Sre Angkromg and Phluk communes, on the average basis, the income from such source is very similar, which is around 600,000 riel or US$

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150. In Talat and Kbal Romeas communes, the income from this source is also similar but higher than the two communes as described above, where is approximately 950,000 riel or US$ 237.5. In Srekor, the income from this source is around 1,400,000 riel or US$ 350. This indicates transportation service within this commune is higher than that of the others. Based on the field study found it is richest one of amongst the communes in the project area.

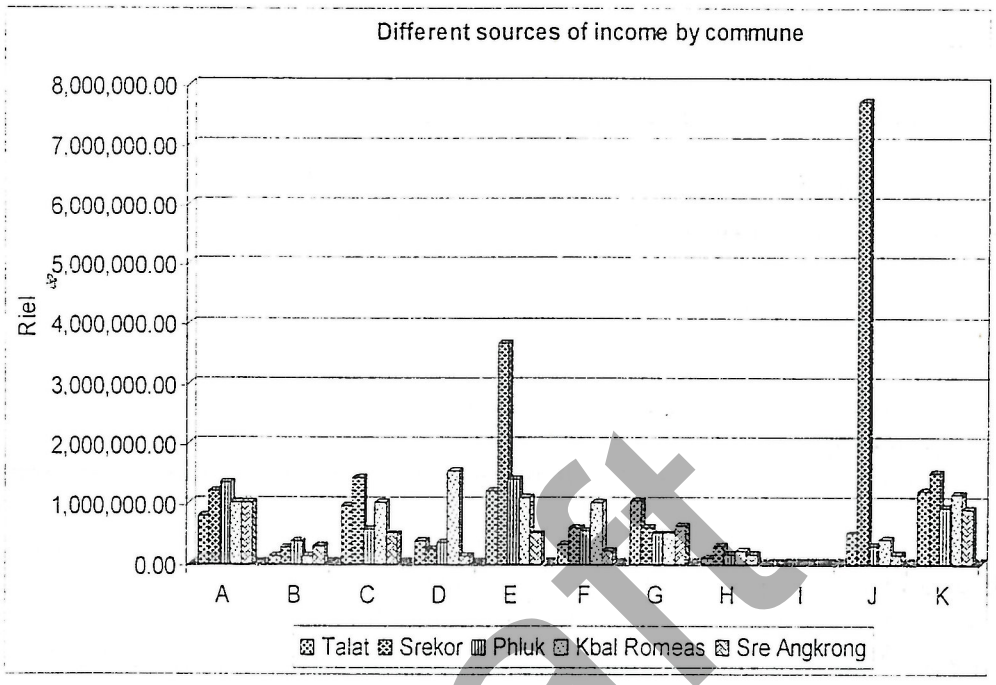


Figure 9 Sources of Income in the project area

A = Salary or Wage, B = Rice Milling, C = Transportation Service D = Manual Labor, E = Selling Livestock, F = Selling Fish, G = Selling Rice, H = Selling Grains, I = Selling Fruits, J = Non-Timber Products, K = Miscellaneous Income

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- **Manual Labor**: Income from manual labor refers to those working as construction worker, daily and/or seasonal worker to obtain daily wage and salary. Income from this source varies from commune to commune, while the highest income was found in Kbal Romeas. This may reflect work force within this commune higher than that of the others. On the average basis, the income generating from such source is about 340,000 riel or around US$ 85.

- **Selling Livestock**: Selling livestock is one of most difficult variable incomes because it only occurs when there are necessary and urgent needs, and occupation improvements which included treatment family's member, serious needs (wedding or festival in family), buying staple foods to meet family's needs, increasing business size etc. Of the five communes, income from this source was found lower in Sre Angkrorng. This may imply that necessary and urgent needs are not major concerns and/or lake of livestock for sale. However, it is found to be highest one in Srekor compared to the other communes. This may reflect livestock in this commune is more than that of others, especially buffalos. In addition, it is likely to increase their business size rather than urgent and necessary needs since the commune considered to be richest in the project area.

- **Selling Fish:** it is one of the most commonly income-generating activities, which mostly occurs in rural areas in Cambodia. Although this activity is usual to consider it within the category of agriculture and relevant activities, but it is classified separately because of its importance to the economy since its income contributes around 7 percent of GDP (Sarthi A. et al., 2003). In the project area, the only sources of fish are from the inland water bodies like Se San and Srepok rivers. Fishing is largely carried out in these two sources. On the other hand, fishing is carried out year round. Many do this activity on a seasonal basis (after the harvesting of the wet season crop). The

technology for fishing is completely conventional, which means fishermen simply sailing out in small boats to catch fish using nets. Based on field study found that fishing is still a family-scale productivity activity and most of those people do not earn much more than subsistence. The higher income was found in Kbal Romeas, which is approximately 1,000,000 riel or US$ 250. This may reflect local people within this commune, the place where is widely known as almost all Phnong living, do fishing more than that of the others. Then, such activity of income generation is followed by Srekor, Phluk, Talat, and Sre Angkromg respectively. The higher income imply that there are two man reasons: 1) Many people do fishing more than other communes, 2) There is different between fisheries resource. There is no different between fisheries resource since those live on the same condition (along Se San and Srepok rivers), the higher income may imply the human activity absolutely involved more than other communes.

- Selling Rice, Grains and Fruits

Selling rice, grains (corn, mung bean, sesame…), and fruits are another income sources, These sources are only generated as income whenever there are lack of basic and/or urgent needs or after it is estimated to remain from year round consumption. Some sell these staple crops after their harvesting period although they are going to be lack at the middle or at the end of the year. This is due to there are more basic and also urgent needs in the family. Instead, they try to make income from other sources to supplement their family during food shortage. In case of selling rice, it is found that on the average basis, there is around 1,000,000 riel or US$ 250 in Talat, while there are similar between the four communes, ranging from 500,000 to 630,000 riel or from 125 to US$ 158. For selling grains, since the staple crops is dominant by upland rice, grains such as mung bean, corn, sesame contribute very small amount. As a result, income from selling these crops is very low (ranging from 100,000 to 300,000 riel or from 25 to US$ 75) compared to other income-earning sources in the project area. However, there are no fruits for selling for income since those fruits are only for family consumption.

- Non-Timber Products Collection

Non-timber forest product collections are one of the most important secondary occupations. It contributes around 10 % after fishing activity. After ending of harvesting period, many go to collect resin and others so as to supplement their subsistence livelihoods. Of the communes, only in Srekor, the income from selling such kind of products is highest compared to that of the others. This implied that in the commune there are more activities related to non-timber products collection.

3.8.2 Poverty Assessment

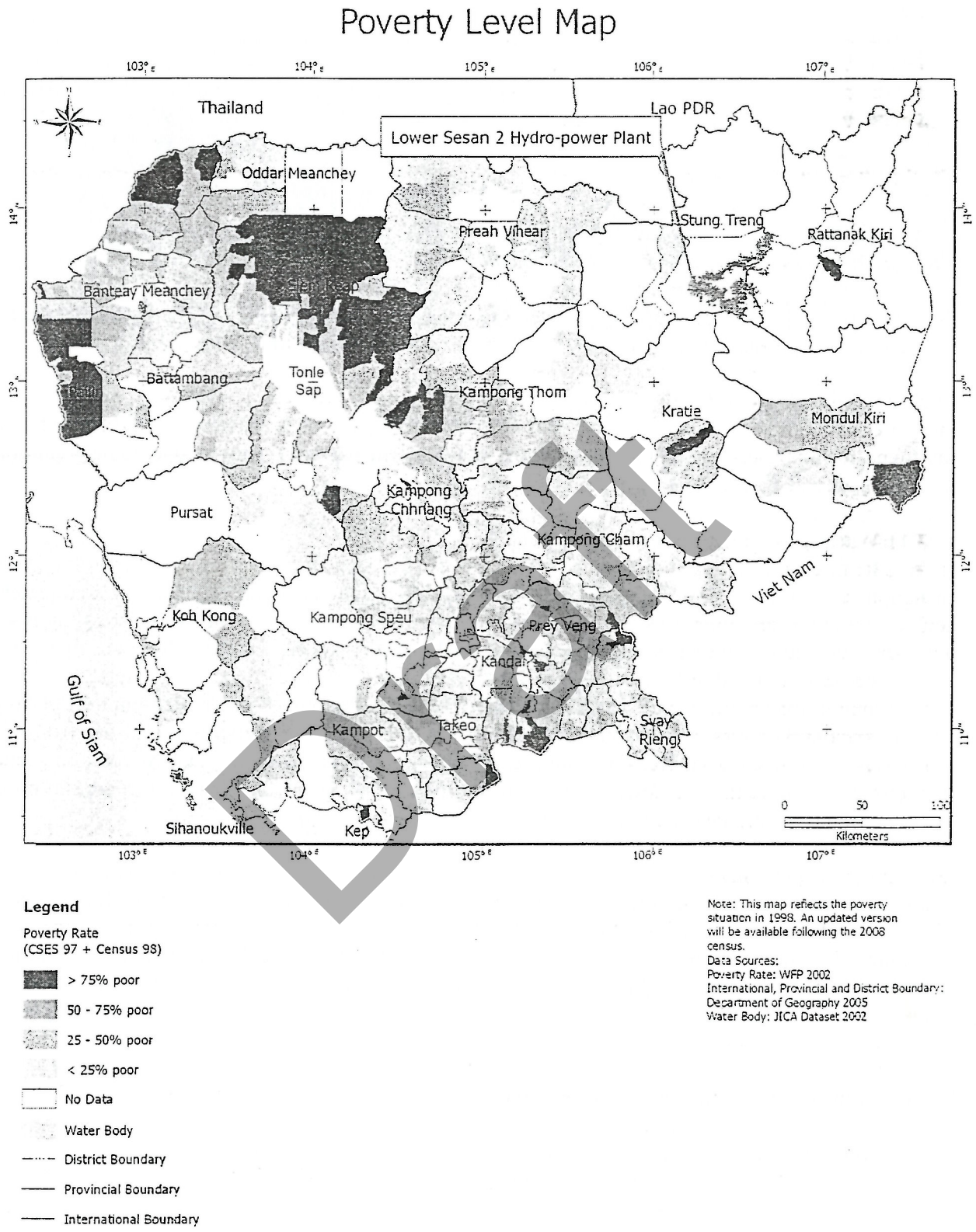
There are, up to now, no sources of information regarding the exact number of level of poverty in Cambodia. However, based on the poverty map produced by the United Nation World Food Programme in collaboration with the Ministry of Planning, the poverty rate in the project area is lower than 25% poor (Figure 10).

3.9 Natural resources

Geographically, Cambodia's main features include the Mekong River, Tonle Sap Great Lake, extensive floodplain and lowland areas, and the southwestern and northeastern uplands. These features provide plenty to natural resources for Cambodians, especially for rural livelihoods. One of the well-recognized resources is fisheries. Inland fisheries are approximately the fourth most productive in the world. Mostly, households along the Se San River fish year-round, while others fish on a seasonal basis. Either these activities are just for family consumption, or sell for extra income. The second important one is forest resource, which reportedly cover more than half of the country. It thus plays a major role in the wet season by stabilising watersheds and regulating flooding and sedimentation levels. Also, many households living within or near forests typically benefit from forest resources such as resin tapping and fuelwood collection year-round. Generally forest product collection increases during the dry season since those households are not busy with rice cultivation and roads are easier than rainy season (Bruce M. and Prom T. 2003). Some households earn income together from these main resources: fisheries and forest product collection

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to supplement their daily livelihoods. Since other natural resources a parts from the two as described above are not so important so that they would not be mentioned here.



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Figure 10 Poverty Map of Cambodia (Source: United Nation World Food Programme, 2003)

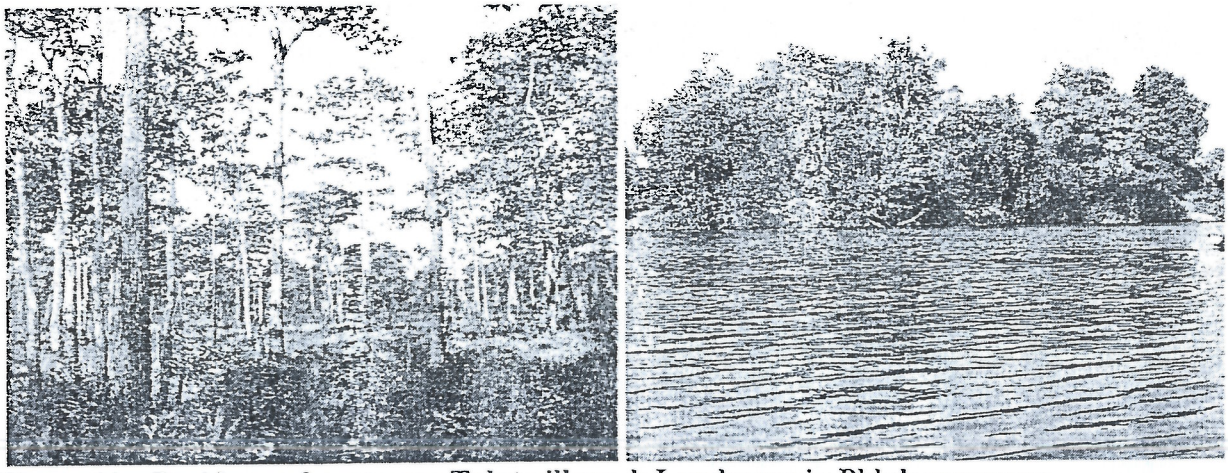


Figure 11 a Deciduous forest near Talat village b Landscape in Phluk commune

3.10 Archaeological/ Cultural site

There are many archaeological/cultural sites in Stung Treng province. However, no any such site was found in the project area. This indicates that there will not affect any archaeological/cultural site if the dam will be constructed.

3.11 Water consumption and Sanitation

All the families in the project area use the rivers (Se San and Srepok) as source for daily consumption. However, very few families use hand-dug wells and borehole wells to supplement their consumption for sometimes. The quantity of water consumption per capita is approximately 47 liters per day which included drinking, cooking, washing and bathing. Meanwhile, more than 95% boiled water prior to drinking. Pig raising is considered as one of major water consumptions if there is any planning for resettlement. On the average basis, the amount of water consumption per pig per day is about 31 liters. Of the total population, there is 41.3% households raised pig from1-2, 24.1% raised 3 pigs and more. The number of pigs raised is based on family economic and traditions. Some animals like cow, ox, and buffalo here don't get involved in water consumption because of the fact that these animals are released to graze freely without any care.

The number of pour flush latrines in each commune is shown in table 11. Of the communes, only Srekor has a lot of pour flush latrines, 38.4% of total families, followed by Talat 5%, Kbal Romeas 4.1%, Sre Angkrorng 0.6% and Phluk 0.4%, respectively. High percentage of the latrines in communes indicates better living standards and knowledge about health care in their families. Meanwhile, people normally dispose household wastes around the house compound. Also, No drainage and solid waste management were found in the project area. Thus, sanitation facilities are still considered to be poor and are in need of development.

Table 11 Flush latrines in the subproject area

Commune	Pour flush latrine	
	Total	% of total family
Talat	32	5.0
Srekor	124	38.4
Phluk	1	0.4
Kbal Romeas	18	4.1
Sre Angkrorng	2	0.6

Source: Commune profiles, 2007

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3.12 Health

In Talat commune, there is no health center. If there are patients in the commune, they must come with a very long distance to provincial health center. On the average basis, the average distance from the commune to the health center is about 128.25 km (Talat commune profile 2007). This indicates that no health facility provide for this commune. In Srekor commune, there is also no commune health center. On the average basis, the distance from the commune to the provincial health office is approximately 90 km (Srekor commune profile 2007). In Phluk commune, there is no health center in this commune; it is a nearby Kampun commune health center. On the average basis, the distance from Phluk commune to the health center is just only 8.5 km (Phluk commune profile 2007). It is thus quite easy for people there to find out health service. In Kbal Romeas commune, it is not so different from the above-two communes (Talat and Srekor). The distance from the commune to health center is far. On the average basis, it is about 83.5 km (Kbal Romeas commune profile 2007). Finally, one of the communes with the project area is Sre Angkrorng located in Ratanakiri. There is a health center in this commune, but it seems to be hard for people to find out health service here. Thus, in case of there are patients, those must be brought to Koun Mom district health center located approximately 22 km or to directly provincial health center, where is approximately 54 km from the commune (Sre Angkrorng commune profile 2007).

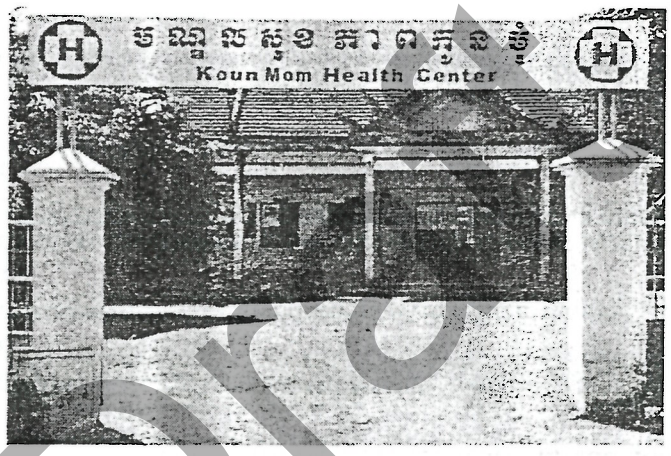


Figure 12 Health center in Koun Mom District, Ratanakiri Province

All the communes in project area, it is difficult to find out health service. In stead, some people use locally medical plants for their treatments. Meanwhile, women delivering a birth depend mostly on traditional birth attendants. Since there is no any commune health center in the project area, many key informants such as village chiefs, deputy village chiefs, and village elders were interviewed for such matter. As a result, it is found that there are water-related diseases and mosquito borne ones occurred. Water–related diseases refer to simple diarrhea, severe diarrhea, Dysentery, and skin infection etc, while mosquito borne ones include malaria, and eye diseases. Illnesses are reported to be experienced by the households throughout the year.

Table 12 Major diseases recorded in the project area

No	Disease	Health center	
		Kampun	Koun Mom
1	Simple diarrhea	80	249
2	Severe diarrhea	0	0
3	Malaria	78	10
4	Dengue fever	0	0
5	Skin infection	102	15
6	Eyes diseases	43	21

Source: Health center, 2007

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Of the communes, available data was obtained in Kampun and Sre Angkromg communes, where data on major diseases was recorded as shown in Table 1.12. However, in Kampun, the data on major diseases couldn't represent health condition in Phluk, but it just gives background of what was health status. Thus, the major diseases in Phluk are absolutely lower than what is shown in the table 1.12. As a result, the most common diseases are Skin infection, followed by simple diarrhea, malaria and eyes diseases, respectively. Although the data present Koun Mom health center, but it was duly data recorded only in Sre Angkromg. The most occurred diseases are simple diarrhea. Eyes diseases, skin infection, and malaria are less contributed in the commune as well. Simple diarrhea is generally attributed to the lack of sanitation and clean water source.

Based on data from the survey found that the most occurred diseases are dysentery followed by skin diseases, typhoid, malaria, and cholera respectively. Basically, the dysentery infection is often passed on through improper hygiene. One of the most common causes of dysentery is not washing the hands after defecating in toilet or around bush located not far from houses. Skin diseases were also high at the time of study. It seems to be hard to conclude the cause of such diseases whether from daily use of water or something else, but one of the most reliable causes is lack of hygiene. The other diseases were common occurring everywhere throughout the country.

3.13 Resettlement and Issues

Prior to discussing about resettlement and its relevant issues, it is necessary to firstly introduce one of the most common questions: who are the Affected Persons by the hydropower dam? Affected Persons are referred to those who stand to lose, as a consequence of the project, all or part of their physical and non-physical assets, including homes, communities, productive lands, resources such as forests, range lands, fishing areas, or important cultural sites, commercial properties, tenancy, income-earning opportunities, social and cultural networks and activities, although impacts are permanent or temporary (ADB 1998). Thus, reflecting back to the project site, it provides overall aspects that people will absolutely be affected by the dam if constructed since those will face the loss of both physical and non-physical assets as described above.

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Based on the results from socioeconomic survey found that people in the project area settle for a long time ago, but no any record showed the exact period of their earlier settlement. When asked about the reference period during the last 10 years only 9.9 % or 19 households settled in their current villages. Although very small portion of those used to move, but they moved around their communes not moved from somewhere else. This implies that most of the people living in the project area are indigenous habitants.

Regarding to the hydropower dam information in their communities, 149 households or 78 % have been aware of that there is the hydropower dam will be constructed, while the others not knowing if there is a hydropower dam will be constructed or not. Such information was obtained from multiple sources such as local authority 47%, followed by Vietnamese working groups 35.5%, neighbor 16.8% and relatives 0.7% respectively. Those people mostly (around 93.2%) knew of the information from 1-3 months, counting back from the period of this study. However, almost all people (175 households or 91.6 %) already made a refusal or disagreed with such kind of this dam. They provided various reasons during household interviews that:

- If constructed, the hydropower dam will affect to their current places, the ones where are harmonized, heritage sites, and also affect their current livelihoods. One of the most concerns of those people is the difficulty in making new income-earning opportunities. Thus, such issue should carefully be focused on prior to staring up resettlement. If project development will still necessitate them to relocate their current living locations, and also no choice for them; they needed acceptable compensations on appropriate properties lost in advance. Furthermore, the places, where they are willing to move, are similar to their present locations and also can cultivate rice and other crops.

4. IMPACTS FROM LOWER SE SAN 2 HYDROPOWER PLANT IF CONSTRUCTED

This part provides some information on impacts of Lower Se San 2 Hydropower Plant if constructed. Such information included an assessment from the field reconnaissance and the synthesis from various studies (Fisheries Office 2000, McKenney B. 2001, and revised by SWECO 2006). Thus, it is critically assessed based on the synthesis by comparing with the information from and discussions with key informants and interviewees during the field study. In this context, two major impacts of the hydropower plant here are discussed include downstream impacts and upstream ones. Both the downstream and the upstream impacts are included: i) During the construction of hydropower plant and ii) After its operation.

4.1 During the construction of this hydropower plant

During the construction of the hydropower plant, people living downstream will have impacts due to the deterioration in water quality. This means that during the dam construction, many chemical compounds will release into the river. Such cases were already experienced in Ratanakiri. During and after several hydropower plants at upstream the Se San located in Vietnam constructed, villagers living along the Se San and the Srepok downstream reported that water quality at the downstream area is poorer than ever and turbid and sediments have been found. As a result, many water borne diseases and skin ones were noticed since then. Not only human but also domestic animals drinking river water are exposed to such diseases. People normally boil river water prior to drinking it. Scientifically, this method just only kills bacteria but does not weaken or completely destroy the effectiveness of chemical composition (toxics) causing poisoning risk (Fisheries Office 2000).

4.1.1 Upstream Impacts

Since there is no any study focused on upstream impacts, it is hard to provide detail picture. Rough aspects here are thus described as follows:

A. Impacts on feeling

Although acceptable compensation for overall property losses will be provided in advance, it is difficult to explain how bad feelings they will encounter. Based on the field study found villagers report that if there is any resettlement due to constructing the hydropower plant, they will have nothing remained, included loss of their villages, lost the residential land that their houses were located on along with their plantations and paddy fields, lost household property, lost income-earning sources etc.

B. Clearing of forest for new plantations

Local people depend on current plantations and paddy fields, river-based resources and other non-timber forest products for their subsistence livelihoods. Thus, forests will have been severely impacted as people move away from nearby river villages to their upland new resettlement area. All of people who move depend on growing rice in their paddy fields to sustain their livelihoods, so as they move they must clear forest to make a new plantation in order to grow rice and vegetables for their families.

4.2 After its operation

After the operation of the proposed hydropower plant, there will have several impacts. The main impacts that should be focused on is only downstream impacts, while the upstream impacts already described during the construction of the hydropower plant.

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4.2.1 Downstream Impacts

Although the root cause is water surges, daily fluctuations in water levels, change in seasonal flows, or other factors, the ecosystem along the Se San river has been reported to be altered drastically by Ialy falls and dams located in Vietnam site. As a result, this has brought consecutively to largely reflecting impacts on the communities, many of which are indigenous groups and rely mainly on the river and its surrounding environment for their livelihoods and their cultural way of life. Villagers along the river acknowledged serious harms from the upstream dams, starting from loss of life, livelihood, and property to declines in food supplies, health, and nutrition (NGO Forum on Cambodia, 2005).

A. Loss of Life

It has been reported the dams in Vietnam have led to some deaths in communities in Cambodia. Both officials in Vietnam and Cambodia acknowledged that water releases from such dams have seriously impacted the lives of few numbers of villagers. However, the estimates varied between official sources and villagers to the number of deaths caused by the dams' operation. Based on Vietnamese government report acknowledged that a February 2000 water release, there were several villagers died caused by the dams, but not specifically quantitative data. Specific data was determined to be seven dam-related deaths. Meanwhile, the 2000 study found 32 villagers died due to water release directly. The 2002 study found that three deaths from water releases. Additional studies conducted in Stung Treng province, where locate downstream from Ratanakiri, also found losses of lives, but no quantity was determined. Based on field visits conducted in March and April of 2005 by NGO Forum on Cambodia's an international expert team did confirm that surges and fluctuations of water levels in the river killed many people (NGO Forum on Cambodia 2005). All of the studies as described above may be concluded that if the proposed hydropower dam will be constructed, it is necessary to take more measures in advance in order to completely prevent local people from deaths prior to operation.

B. Loss of Property and Livelihood

Communities along the Se San River reported that the river has ruined much of property due to water surges from upstream since earlier operation. On the other hand, villagers mentioned that since the operations such kinds of dams, Vietnam has not compensated any property lost. Thus, it has seriously affected to their subsistence livelihoods of local communities along the river (NGO Forum on Cambodia 2005). Regarding to loss of livelihood, experiences from the Ialy Hydropower plant on parts of Cambodia revealed that the overall impacts have deeply reduced human livelihoods system along the Se San River, resulting to the lack of river bank use and reduction in fisheries resources. Local people increased wildlife hunting, non-timber forest products collection, exploitation from forest products and encroachment since those had encountered problems with rice and other crops cultivation which are close to the river due to flooding and rapid water level changes (Fisheries Office 2000). Based on recent study found villagers living along the Se San have adversely affected their daily livelihoods for income-earning sources either in the rainy season or in the dry season. An economic valuation report comparing data from 1999 with the information provided on pre-dam conditions clearly found an average decline in household income of 57%, from US$ 109 to $ 46 per month. The overall economic loss in Ratanakiri in 1999 was over US$ 2.5 million (McKenney B. 2001). This is just only one year in one province, and how about Stung Treng? How much villagers living along the Se San should be compensated since 1999 and from now onwards? Prior to river changes, fishing, animal trading and other income-generating activities were all means of earning surplus wealth. Such activities have subsequently been reduced based on current river condition and its surrounding environment.

C. Health Deterioration

The dam's construction and deterioration in water quality are associated. It is reported that the deteriorating water increases in illnesses, resulting numbers of deaths in recent years. These cases

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have been found in Ratanakiri province. However, the relationship between dam, water quality and health remains undetermined. Up to now, there were no any baseline studies of such relevant sickness to water quality; it is thus difficult to make assumption of causality to the dam's operation (NGO Forum on Cambodia 2005). Since many hydropower dams at upstream constructed, water quality in the Se San and the Srepok have seriously deteriorated. This means that these rivers have become more turbid and sediments than ever, and also bad smell in some parts of the rivers. Based on the field study found all of the villagers in the project area, however, lack of fresh water wells or other sources of potable water, thus they mainly rely on the Se San and the Srepok rivers to provide water for drinking, cooking, and bathing. As a result, local villagers have suffered from water-quality associated ailments including itchiness, eye irritation after bathing in the water, as well as stomach problems, respiratory problems, throat and nostril irritation, dizziness and vomiting after drinking the water. Furthermore, a great number of domestic animals have also died since the water quality first deteriorated, but it is hard to quantify to animal deaths have resulted from deteriorating in water quality. Of this, villagers suggested that most domestic animal deaths are completely involved in bad water quality in the river. In addition, wild animals have also been found dead near the Se San River (Fisheries Office 2000).

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បញ្ជីសំនួរលេខ: .....

Socio-economic Characteristics Survey

1- General Information

Village ភូមិ: ..... Commune ឃុំ: .....

District ស្រុក: ..... Province ខេត្ត: .....

1.1 Distance from house to school for children ចំងាយពីផ្ទះទៅសាលារៀនសំរាប់កូន: .....ម៉ែត្រ

1.2 Distance from house to commune health center for family ចំងាយពីផ្ទះទៅមណ្ឌលសុខភាពឃុំរបស់គ្រួសារអ្នក: .....ម៉ែត្រ

1.3 Household type ប្រភេទផ្ទះ

- ☐1- Concrete/wooden wall with tile roof ផ្ទះថ្ម/ឈើប្រក់ក្បឿង
- ☐2- Wooden wall with zinc roof ផ្ទះឈើប្រក់សង្កសី
- ☐3- Wooden wall with thatch roof ផ្ទះឈើប្រក់ស្លឹក
- ☐4- Thatch/wooden leave wall with thatch roof ខ្ចមស្លឹក

1.4 Other major assets and utilities ទ្រព្យសម្បត្តិសំខាន់ៗដែលមានដឹទៃទៀត

- ☐1- Motorbike ម៉ូតូ
- ☐2- TV ទូរទស្សន៏
- ☐3- Power tiller គោយន្ត
- ☐4- Water pump ម៉ាស៊ីនបូមទឹក
- ☐5- Engine boat កាណូត
- ☐6- Tractor ត្រាក់ទ័រ
- ☐7- Rice mill ម៉ាស៊ីនកិនស្រូវ
- ☐8- Other (please specify) របស់ប្រើប្រាស់ដឹទៃទៀត (សូមបញ្ជាក់): _____

2- Information of Respondent and Family ពត៌មានពីគ្រួសារ និងអ្នកផ្តល់ចំលើយ

2.1 Name ឈ្មោះ .....

2.2 Position in Family ឋានៈក្នុងគ្រួសារ: ☐1- Household head មេគ្រួសារ ☐2- Spouse of household head ប្តីឬប្រពន្ធមេគ្រួសារ
☐3- Son/Daughter of household head កូនប្រុស/ស្រីមេគ្រួសារ ☐4- Parents of household head ឪពុកម្តាយមេគ្រួសារ
☐5- Other (please specify) ផ្សេងទៀត (សូមបញ្ជាក់): .....

2.3 Sex: ភេទ ☐1- Male ប្រុស ☐2- Female ស្រី

2.4 Age: អាយុ .....ឆ្នាំ

2.5 Ethnicity: ☐1- Khmer ខ្មែរ ☐2- Chinese ចិន ☐3- Vietnamese វៀតណាម
☐4- Lao ឡាវ ☐5- Other ដឹទៃទៀត: .....

2.6 Religion សាសនា: ☐1- Buddhism ព្រះពុទ្ធ ☐2- Islam ចាម ☐3- Christian គ្រីស្ត

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2.7 Education of the respondent ការសិក្សាអ្នកផ្តល់ចំលើយ

☐1- Non Education មិនបានរៀន

☐2- Primary School បឋមសិក្សា (ថ្នាក់ទី១ - ថ្នាក់ទី៦ថ្មី) / (ថ្នាក់ទី១២ - ទី៧ជំនាន់ដើម)

☐3- Secondary School អនុវិទ្យាល័យ (ថ្នាក់ទី៧ - ទី៩ថ្មី) / (ថ្នាក់ទី៦ - ទី៣ជំនាន់ដើម)

☐4- High School វិទ្យាល័យ (ថ្នាក់ទី១០ - ទី១២ថ្មី) / (ថ្នាក់ទី២ - ទី១ជំនាន់ដើម)

☐5- Bachelor Degree and Above បរិញ្ញាបត្រឡើងទៅ

2.8 Occupation មុខរបរ: Main ចំបង: ..... Secondary បន្ទាប់បន្សំ: .....

☐1- Worker at Private Companies / Factories កម្មករក្រុមហ៊ុនឯកជន/កម្មកររោងចក្រ

☐2- Government Employee បុគ្គលិករដ្ឋ

☐3- Shop Owner ម្ចាស់ហាង

☐4- Farmer កសិករ

☐5- Fishermen អ្នកនេសាទ

☐6- Motor taxi រត់ម៉ូតូឌុប

☐7- Construction worker កម្មករសំណង់

☐8- Transportation service provider អ្នកស៊ីឈ្នួលដឹកទំនិញ

☐9- Non timber product អនុផលព្រៃឈើ

☐10- Hunter អ្នកចាប់.ដាក់អន្ទាក់ ឬបរបាញ់សត្វលក់

☐11- Other (Please specify) ផ្សេងៗ (សូមបញ្ជាក់) .....

2.9 How many members are there in your family? ចំនួនមនុស្សក្នុងបន្ទុកគ្រួសារ: .....នាក់

2.10 Have you had any member do migration for seeking a job ?

តើអ្នកមានសមាជិកក្នុងគ្រួសារធ្វើចំណាកស្រុកដើម្បីស្វែងរកការងារធ្វើដែឬទេ ? ☐1- Yes មាន ☐2- No ទេ

2.10.1 If Yes, how many members? ប្រសិនបើមាន តើមានសមាជិកប៉ុន្មាននាក់? ..... នាក់

2.10.2 If yes, where did they go? ប្រសិនបើមាន តើពួកគាត់ទៅធ្វើការនៅឯណា?

☐1- In the current living province នៅតែក្នុងខេត្តដែលកំពុងរស់នៅសព្វថ្ងៃ

☐2- Other province/town ទៅខេត្ត/ក្រុងដទៃ

☐3- Outside country (specify) ទៅធ្វើការនៅក្រៅប្រទេស (សូមបញ្ជាក់): .....

2.10.3 If yes, what kind of job do they do? ប្រសិនបើមាន តើពួកគាត់ទៅធ្វើអ្វី ?

☐1- Fishing worker កម្មករនេសាទ

☐2- Motor taxi អ្នករត់ម៉ូតូឌុប

☐3- Construction worker កម្មករសំណង់

☐4- Worker at Private Companies / Factories កម្មករក្រុមហ៊ុនឯកជន/កម្មកររោងចក្រ

☐5- Other (Please specify) ផ្សេងៗ (សូមបញ្ជាក់) .....

2.10.4 If yes, how much money in Riel do they get per month?

ប្រសិនបើមាន តើពួកគាត់ទទួលបានប្រាក់ចំនួលប៉ុន្មាន ជាមធ្យមក្នុងមួយខែ ? ..... រៀល

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2.11 AVR Household Income & Expenditures in year 2007: ចំណូល-ចំណាយគ្រួសារប្រចាំឆ្នាំជាមធ្យម

2.11.1	Average Total household incomes per year ប្រាក់ចំណូលជាមធ្យមប្រចាំឆ្នាំក្នុងគ្រួសារ - Salary or wage ប្រាក់ខែ រឺប្រាក់ថ្ងៃ: ..... រៀល/ Riel - Operate rice mill ចំណូលពីម៉ាស៊ីនកិនស្រូវ: ..... រៀល/ Riel - Transportation services ចំណូលពីសេវាដឹកជញ្ជូន: ..... រៀល/ Riel - Manual labor ចំណូលពីការលើកដាក់លីសែង: ..... រៀល/ Riel - Income from selling livestock ចំណូលពីលក់សត្វស្រុក: ..... រៀល/ Riel - Income from Fishing ចំណូលពីផលនេសាទ: ..... រៀល/ Riel - Income from selling rice yield ចំណូលពីការលក់ផលស្រូវ: ..... រៀល/ Riel - Income from selling rice ចំណូលពីការលក់ធញ្ញជាតិផ្សេងៗ: ..... រៀល/ Riel - Income from fruits ចំណូលពីការលក់ផលិតផលដើមឈើគ្រប់ប្រភេទ: ..... រៀល/ Riel - Miscellaneous income ចំណូលផ្សេងៗទៀតក្នុងរយៈពេល១ឆ្នាំ: ..... រៀល/ Riel Total Income for the Whole Year of 2007 **ចំណូលសរុបក្នុងឆ្នាំ២០០៧**: ..... រៀល/ Riel
2.11.2	Average Expenses of household per year ប្រាក់ចំណាយជាមធ្យមប្រចាំឆ្នាំក្នុងគ្រួសារ Food/ Beverage/ Tobacco អ្នបអាហារ-ភេសជ្ជៈ-ថ្នាំជក់: ..... រៀល/ Riel Medical care/ Health expenses ថ្នាំពេទ្យ: ..... រៀល/ Riel Education សិក្សាអប់រំ: ..... រៀល/ Riel Kerosene Battery (ប្រេងកាត/អាគុយ): ..... រៀល/ Riel Clothes សំលៀកបំពាក់: ..... រៀល/ Riel Telephone ទូរស័ព្ទ: ..... រៀល/ Riel Transport ដឹកជញ្ជូន: ..... រៀល/ Riel Wedding ceremonies and Festivals ចំណាយទៅលើបុណ្យទាន និងមង្គលការ: ..... រៀល/ Riel Others ផ្សេងៗ: ..... រៀល/ Riel Total Expenses for the Whole Year of 2007 **ចំណាយសរុបក្នុងឆ្នាំ២០០៧**: ..... រៀល/ Riel

2.12 Amount of Debt បំណុលសរុប

- Total Amount of Debt as of December 200- បំណុលសរុបគិតត្រឹមខែធ្នូ ២០០៧: ..... រៀល/ Riel

3- Land Owned by the Family ដីកម្មសិទ្ធ/ដីប្រើប្រាស់ដោយគ្រួសារ

No.	Land Use ដីប្រើប្រាស់	Size (ha) ទំហំ	Ownership Document ឯកសារបញ្ជាក់កម្មសិទ្ធ	Present Value (US$) តំលៃបច្ចុប្បន្ន (ដុល្លា)
1	ដីភូមិ		☐1-Yes មាន ☐2-No ទេ	
2	ដីស្រែ		☐1-Yes មាន ☐2-No ទេ	
3	ដីចំការ		☐1-Yes មាន ☐2-No ទេ	

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4- Crops Grown ការដាំដំណាំ

Crops ឈ្មោះដំណាំ	រដូវវស្សា			
	Cultivated Area (ha) ផ្ទៃដីដាំដុះ (ហ.ត)	Production (ton) បរិមាណផល (ត)	Price per kg (Riel) តំលៃក្នុង១ គ.ក(រៀល)	Total Price in 2007 (Riel) តំលៃសរុបក្នុងឆ្នាំ ២០០៧(រៀល)
1-				
2-				
3-				

Crops ឈ្មោះដំណាំ	រដូវប្រាំង			
	Cultivated Area (ha) ផ្ទៃដីដាំដុះ (ហ.ត)	Production (ton) បរិមាណផល (ត)	Price per kg (Riel) តំលៃក្នុង១ គ.ក(រៀល)	Total Price in 2007 (Riel) តំលៃសរុបក្នុងឆ្នាំ ២០០៧(រៀល)
1-				
2-				
3-				

5- Total cost for growing crops ចំណាយសរាប់ការដាំដុះ

Expenses for crop grown	Unit ឯកតា	# of Unit ចំនួនឯកតា	Price in Riel/Unit តំលៃក្នុង១ឯកតា	Total Price in Riel តំលៃសរុប
1. Seed គ្រាប់ពូជ				
	kg			
-				
-				
-				
- Total seed cost សរុបចំណាយទៅលើគ្រាប់ពូជ				
2. Fertilizer ជី				
- Urea ជី អ៊ុយរ៉ែ	kg			
- DAP ជី ដេ អា ប៉	kg			
- 16.20.0 ជី ១៦.២០.0	kg			
- 15.15.15 ជី ១៥.១៥.១៥	kg			
- Manure ជីធម្មជាតិ/ជីអាចម៍សត្វ/ជីកំប៉ុស្ត	Ox-cart			
- Others ជីផ្សេងៗទៀត	kg			
Total cost of fertilizer use សរុបចំណាយទៅលើការប្រើប្រាស់ជី				
3. Pesticide ថ្នាំសំលាប់សត្វល្អិត				
- Folidol ថ្នាំ ហ្វូលីដុល				
- 2,4-D ថ្នាំ ២.៤-ដេ				
- Other ផ្សេងៗ				
Total cost of pesticide use សរុបថ្នាំសំលាប់សត្វល្អិត				
4. Pumping & Water Costs ការបូម និង ថ្លៃប្រើប្រាស់ទឹក				
- Total Pumping & Water Costs ការបូម និងថ្លៃប្រើប្រាស់ប្រភពទឹក				
5. Labor កំលាំងពលកម្ម				
- Land preparation ការងាររៀបចំដីថ្ងាលសំណាប				
- Sowing rice seed ការងារសាបព្រោះ				

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- Seedling ការងារដកសំណាប/ដកទៅដាំ	
- Plowing field by animals ភ្ជួរលុប/ភ្ជួរស្នងដោយគោក្របី	
- Transplanting ស្នង	
- Weeding បោចស្មៅ	
- Fertilizer broadcasting បាច/ដាក់ជី	
- Pesticide application បាញ់ថ្នាំសំលាប់សត្វល្អិត	
- Harvesting ច្រូតកាត់	
- Threshing បោកបែន	
- Transportation ដឹកជញ្ជូន	
- Other ផ្សេងៗ.....	
ង Total labor cost **សរុបចំនាយលើកំលាំងពលកម្ម**	
6. Lunch provided for hiring/ Sharing labor ចំណាយទទួលបាយទឹក	
7. Rent tractor/ Hand tractor ចំណាយជួលត្រាក់ទ័រ/គោយន្ត/ជួលម៉ៅការភ្ជួរ	
8. Rent threshing machine ចំណាយជួលម៉ាស៊ីនបោក	

Total expenses for growing crops in the year 2007 សរុបចំណាយការដាំដុះក្នុងឆ្នាំ ២០០៧ _____ Riel

6- Livestock Raised ការចិញ្ចឹមសត្វ

No.	Name ឈ្មោះសត្វ	Number (heads) ចំនួន (ក្បាល)
1	គោ	
2	ក្របី	
3	ជ្រូក	
4	មាន់ទា	
5	ផ្សេងៗទៀត:	

7- Resettlement Issues បញ្ហាចំពោះការតាំងលំនៅដ្ឋានឡើងវិញ

7.1 How many time have your family moved the house in the past 10 years?
តើគ្រួសារអ្នកផ្លាស់លំនៅដ្ឋានប៉ុន្មានដងក្នុងរយៈពេលដប់ឆ្នាំកន្លងទៅនេះ ?

☐1- Yes បាទ, ធ្លាប់ផ្លាស់ទីលំនៅ ☐2- Never Move មិនដែលសោះ

7.1.1 If yes, how many times? ប្រសិនបើ បាទ, ឬធ្លាប់ផ្លាស់ទីលំនៅ តើមានចំនួនប៉ុន្មានដង? ..... times ដង

7.2 Have you been aware of there will be a project to construct a hydropower plant in this vicinity?
តើអ្នកបានដឹងមានគំរោងសាងសង់គំរោងវារីអគ្គិសនីនៅក្បែរនេះដែរទេ ?

☐1- Yes បាទដឹង, ☐2- No មិនដឹងទេ

7.2.1 If Yes, From whom ប្រសិនបើដឹង, តើដឹងពីអ្នកណា?

☐1- Relatives សាច់ញាតិ ☐2- Neighbor អ្នកជិតខាង ☐3- Local authority អាជ្ញាធរដែនដី ☐4- Other ផ្សេងៗ: .....

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7.2.2 If Yes, when did you hear about this ប្រសិនបើដឹង, តើដឹងពីពេលណា?

☐1- Less than one month តិចជាងមួយខែ ☐2- From one to three months ពីមួយខែទៅបីខែ

☐3- More than 3 – 6 months ច្រើនជាងបីខែទៅ៦ខែ ☐4- From one to three months ច្រើនជាង៦ខែ ទៅ១ឆ្នាំ

7.3 What is your opinion on those project development? តើអ្នកមានមតិយ៉ាងណាលើគំរោងអភិវឌ្ឍន៍នេះ?

☐1- Agree យល់ព្រម ☐2- No Opinion គ្មានយោបល់ ☐3- Disagree មិនយល់ព្រម ☐4- Other ផ្សេងៗ

Reasons មូលហេតុ: .....

.....

.....

7.4 If such project development will necessitate relocation of your house to somewhere else, are you willing to relocate?
ប្រសិនបើគំរោងអភិវឌ្ឍន៍នេះ តំរូវអោយអ្នកធ្វើការផ្លាស់ប្តូរទីលំនៅទៅកាន់កន្លែងផ្សេងទៀត តើអ្នកមានបំណងផ្លាស់ប្តូរទីលំនៅដែរទេ ?

☐1- Yes បាទ ☐2- No ទេ ☐3- Other ផ្សេងៗ: .....

Reasons មូលហេតុ: .....

.....

.....

7.5 Description of the place that you prefer to move to រៀបរាប់ពីទីកន្លែងដែលអ្នកចង់ប្តូរទៅ

Location ទីតាំង: _____

Approximate Area ទំហំប៉ុន្មាន: _____

8- Water Uses ការប្រើប្រាស់ទឹក

8.1 What source of water you are normally using for various purpose at present ?
តើសព្វថ្ងៃអ្នកប្រើប្រាស់ប្រភពទឹកអ្វីខ្លះសំរាប់គោលបំណងផ្សេងៗ ?

A- Type of Water Use ប្រភេទទឹកប្រើប្រាស់	B-Source (name) ប្រភព (ឈ្មោះ)	C-Disinfection ការសំអាត	Distance from Home (km) ចំងាយពីផ្ទះ	Quality គុណភាព	Availability ប្រើបានប៉ុន្មានខែ	Quantity Use (l/capita) បរិមាណ ប្រើប្រាស់

A: 1 = Drinking/cooking ផឹក/ដាំស្ងួ 2 = Washing clothes/cleaning ដុសលាង/បោកគក់ 3 = Others ផ្សេងៗ

B: 1 = House connection ទឹកតង់ផ្ទះ 2 = Public stand post កន្លែងត្រងទឹកសាធារណៈ 3 = Yard connection តង់ក់ពាង

4 = Shallow well អណ្តូងរាក់/ជិក 5 = Deep well អណ្តូងជ្រៅ 6 = Rain water tank អាងទឹកភ្លៀង

7 = Surface water ទឹកលើដី 8 = Other (specify) ផ្សេងៗ (បញ្ជាក់) _____

C: 1 = No 2 = Boiling ដាំ 3 = Alum សាច់ជូរ 4 = Chlorinating ក្លរ

5 = Other (specify) ផ្សេងៗ (បញ្ជាក់) _____

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8.2 What is the present utilization of other water source in the vicinity?

តើមានការប្រើប្រាស់បច្ចុប្បន្ននៃប្រភពទឹកដទៃទៀត នៅជិតខាងដែរទេ ?

Present Utilization ការប្រើប្រាស់បច្ចុប្បន្ន	Name of Water Source **ឈ្មោះប្រភពទឹក** (rivers / irrigation / drainage channels / lake / swamps) ទន្លេ/ប្រឡាយ/បឹង	Daily consumption L/day ការប្រើប្រាស់ទឹកប្រចាំថ្ងៃ លីត្រ/ថ្ងៃ
- Irrigating rice field/crop ស្រោចស្រពដំណាំ/ស្រូវ		
- Feeding animal ចិញ្ចឹមសត្វ		
- Handicraft/industrial ឧស្សាហកម្ម/សិប្បកម្ម		

8.3 Problem related to other water uses បញ្ហាទាក់ទិននឹងការប្រើប្រាស់ទឹកក្នុងវិស័យដទៃទៀត

8.3.1 Quality គុណភាព: .....

.....

8.4 Water borne disease happened in your family in the year 2007 ជំងឺឆ្លងដោយសារទឹកនៅក្នុងគ្រួសារអ្នកក្នុងឆ្នាំ ២០០៧

❒1- Cholera អាសន្នរោគ ❒2- Typhoid គ្រុនពោះវៀន ❒3- Dysentery រាគមូល

❒4- Malaria គ្រុនចាញ់ ❒5- Skin infection ជំងឺស្បែក ❒6- Other ផ្សេងៗ

Surveyed by ធ្វើអង្កេតដោយ: _____ Date កាលបរិច្ឆេទ: _____

Starting Time ពេលចាប់ផ្តើម: _____ Completion Time ពេលបញ្ចប់: _____

Checked by ត្រួតពិនិត្យដោយ: _____ Date កាលបរិច្ឆេទ: _____

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