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Cambodian Center for Human Rights



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Report of Environmental and Social Impact Assessment

Impact of Development Projects On Marine Environmental Resources

Kampot and Kep Province



ACKNOWLEDGEMENT

This Environmental and Social Impact Assessment, “Impacts of Development Projects on Marine Environmental Resources in Kampot and Kep,” is the evidence of an analysed and compared cost benefits (economy, social, physical, and environmental) of development projects versus community-led fishery resources management. It illustrates the information, gives recommendations on the sustainable economic and environmental consequences from the approved development projects, and provides conclusive messages to community members, community fisheries, networks, and relevant CSOs to draw appropriate advocacy agendas and actions with relevant stakeholders.

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This report shall be used free of charge with appropriate references. Data from the research is also available upon request to ActionAid Cambodia. We hope this report could provide additional gender-sensitive evidence for policymakers, decision-makers, community leaders and practitioners to build community-led fishery resources management sustainably.

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Chapter 1: Introduction

1.1. Introduction

Kampot is located along the coastal region of Cambodia and is among one of the largest seagrass beds in the South China Sea. Out of the 435km of Cambodian coastline, Kampot covers 66.5km of it and has a total area of 4,873km². Mangroves fringe the coastline, and small patches of coral reefs can be found. The seagrass bed in Kampot is among the most extensive coastal ecosystems and stretches approximately 50km along the Kampot coastline, extending through Kep and further past the Vietnamese border in Hat Yien. Some of the seagrasses extend along the coastline of Phu Quoc. Overall, the seagrass along this stretch of coastline and Phu Quoc island is growing as large patchy areas within close proximity to each other, which are all ecologically interrelated and can be considered as parts of the same seagrass ecosystem.

Seagrass meadows are incredibly important coastal ecosystems. They provide spawning and nursery areas for many species, sequester large amounts of carbon and provide significant support to local livelihoods. Its importance and value to local livelihoods and its significance in terms of climate change mitigation and adaptation are not properly understood and are consequently not sufficiently considered in development planning. Referring to the seagrass surveys in Kampot made by the International Union for Conservation of Nature (IUCN) during the monsoon season (May-July) 2013 found that 11 seagrass species and covers an area of 8,435.80 hectares and is relatively healthy with a moderate to good status. Anthropogenic threats to the seagrass bed include destructive fishing practices, coastal development, sedimentation, pollution and mariculture. The most significant threat is the construction of a seaport directly on the seagrass bed, which could cause severe sedimentation throughout the whole seagrass bed, destroying large habitat areas. Without immediate long-term monitoring and conservation efforts to mitigate the threats, the seagrass bed may be under too poor conditions to adapt to the future impacts of climate change or largely wiped out before climate change impacts become noticed. Coastal livelihoods will be at risk if action is not taken soon.

Furthermore, with increased CO₂ released into the atmosphere influencing global warming, it has been estimated that seagrass worldwide fixates 1% of the total carbon fixed in the ocean but store 12% (UNEP, 2004 & Mat Bjork et al, 2008). This is largely because seagrass decomposes at a slow rate. Seagrass beds are economically valued as one of the most important ecosystems in the world, approximately \$3.8 trillion USD worldwide. As a whole, seagrass beds are vital to sustaining biodiversity and the economy of the region (UNEP, 2004).

In Kampot and Kep province, the livelihood of Community Fisheries depends on access to and control over their land and natural resources; in particular, fisheries were threatening by the new state-led and commercial development projects. With the confirmation of OMNI Kampot Development and CHING KOR Project, both projects will cover 4,550 hectares of new fill-up land as an artificial island in Kampot (Teuk Chhou district) and Kep city of Kep province. OMNI Project will cover 3,910 hectares, which overlaps with five community fisheries (2 in Kampot and 3 in Kep provinces), while the CHING KOR project will cover 640 hectares, which overlaps with two community fisheries in Kampot Province.

Should the construction start, the new artificial island will affect more than 6,000 hectares of marine resources, most of which are the sources of livelihoods of more than 5,504 families (1,455 female), especially members of the five coastal Community Fisheries – out of 14 in Kampot and Kep provinces. There are a number of other ongoing projects.

Large-scale development projects without properly and transparency of the Environmental and Social Impact Assessment will have direct negative impacts underway and rapidly destroy and degrade significant areas of this precious resource before its real value to the people in Kampot and Kep provinces and the rest of Cambodia are fully understood. Based on these concerns, and after the discussion with the Community Fisheries since February 2019, community members, as well as communes and sub-national authorities required stronger evidence to prove and support related impacts on sustainable livelihood, environmental sustainability, and tenure security, which are aligned with a matter of food security and sustainable development over land and natural resources.

An Environmental and Social Impact Assessment (ESIA) assignment responds to a pressing need for coordinated community and civil society action to challenge ongoing and new state-led and commercial development on the Kampot and Kep province coastlines that threaten the access to and control over land and natural resources of coastal Community Fisheries. Children and Women Development Centre in Cambodia (CWDC), Cambodian Center for Human Rights (CCHR) in collaboration with ActionAid Cambodia (AAC) for implementation of the project “Securing access to and control over land and natural resource for vulnerable Community Fisheries in the coastal areas of Cambodia”, funded by the European Commission (EC) for 36 month period (2020-2022) has proposed this assessment to serve as evidence to challenge the finding of the official EIA reports and if necessary, advocate for sustainable community-led fishery resources management, which is protected under the Constitution of Cambodia, 2001 Land Law, Law on Fisheries, Law on Protected Areas and other relevant provisions and land policies.

1.2. Objective of the Study

The ESIA will serve as the basis for evidence-based advocacy for communities, CBOs and networks to shadow the findings from official SEIA Reports (public or non-public reports) to plan and conduct advocacy for sustainable community-led fishery resources management and resilient livelihood of the community members. The research shall maximise the participation of the community and CBO/CSO as well as competent local authorities.

The research aims at assessing the following:

- Analyse and compare cost benefits (economy, social, physical, and environmental) of development projects versus community-led fishery resources management.
- Provide information and recommendations on the sustainable economic and environmental consequences from the approved development projects.
- Provide information and concluding messages to community members, community fisheries, Networks and relevant CSOs to draw appropriate advocacy agenda and actions with relevant stakeholders.

1.3. Relevant Investment Projects

There are two main investment projects located on the study site. The first one is CHING KOR Project is located in Preaek Kreng Village, Preaek Tnoat Commune, Toek Chhou District, Kampot Province. This project occupies a total land area of approximately **640** hectares. The second project is OMNI Project is located in Toek Chhou District, Kampot Province. This project occupies a total land area of approximately **3,910** hectares. Importantly, the project will create artificial islands which are overlapping with the current community fisheries in both Kampot and Kep Provinces. The investment projects aim to develop the areas into recreational areas, golf areas, resorts, restaurants and others.

1.4. Current Community Fishery (CFi)

There are seven key community fisheries located at the project sites, which has significant impacts from the investment projects (**Figure 1.1**). Those CFis includes Preaek Tnoat CFi, Trapeang Ropov CFi, Trapeang Sangke CFi, Kampong Samaky CFi, Kampong Tralach CFi, Phum Thmey CFi, and Ou Krasar CFi.

Table 1.1: Community fisheries in both Kampot and Kep provinces

N.o	Name of CFi	Establishment Year	Member (2013)	Member (2021) *	Size of Fishing domain (ha)	Conservation site	Total Area (ha)	Province
1	Preaek Tnoat	2000	248	282	702	1	1,168.34	Kampot
2	Trapeang Ropov	2000	155	538	1,251	2	1,251	Kampot
3	Trapeang Sangke	2009	734	758	337	2	301.35	Kampot
4	Kampong Samaky	2006	396	403	537	1	577.38	Kampot
5	Kampong Tralach	2005	116	155	422	3	422.03	Kep
6	Phum Thmey	2005	103	110	198	2	224.27	Kep
7	Ou Krasar	2005	236	236	446	2	445.51	Kep
Remarks: - Sources: Fisheries Administration Cantonment (2013) - * Based on the interview with chief of CFis								



Figure 1.1: The location of Study site

Chapter 2: Current Marine Environmental Resources

Cambodia has an approximately 435 Km coastline composed of coral reef, seagrass, and mangrove habitats that are rich in biodiversity and include threatened wildlife and species (Kim et al., 2004). Marine resources play a significant role in supporting the socio-economic condition of local people and the national economics. The marine resources, including the coral, mangrove and seagrass, are the key habitat for fisheries in terms of food, migration, breeding, etc. The higher fishery production is a good indicator for richness in the marine natural resources. In this study, the secondary data of seagrass, coral and mangrove are used to assess marine resources potentiality.

1.4.1. Seagrass bed

Seagrass is a kind of plant growing seabed in coastal areas, where the soil is composed of rich nutrient silt and sand. There are variety of seagrass species of more than 60 species on a global scale, in which they are mostly found in the tropical region (UNEP/GEF, 2004). In Cambodia, there are approximately 12 species of seagrass and Kampot, and Kep provinces have the largest seagrass area in Cambodia (Ouk et al., 2010). Figure 1.2 shows the seagrass map, which has total areas of **11,530 ha**, which comprised of **8,435 ha** in Kampot (IUCN, 2014), and **3,095 ha** in Kep (DoF, 2004a). The annual economic value of seagrass in Cambodia has been estimated to be around 1,186 USD per hectare. However, this value is most likely a gross undervaluation of the actual benefit provided by seagrasses, as it only takes into account captured fish, shrimp, crabs, shellfish/molluscs and seaweed production. It does not account for the values of beach protection, nursery functions, carbon sequestration, oxygen release and nutrient removal etc. It is, therefore, highly probable that the actual monetary value of the area is double the current estimation (UNEP, 2007).

The total overlapping area between the seagrass and the development projects is approximately **967ha**, which is comprised of **601 ha** for CHING KOR Project Area and **365 ha** for OMNI Project. By Considering the 5km surrounding both development projects, the seagrass area is approximately **3,260 ha**.

1.4.2. Coral coverage

Kampot and Kep Provinces supports an estimated 947 ha of coral areas, which is considered as the most extensive coverage in Cambodia. Coral has various services, including providing services (on-site fishery production), supporting services (nutrient cycling, habitat for species, etc.), regulating services (coastal protection, carbon sequestration, etc.) and cultural services (tourism, fishing leisure, and research activities, etc.). The coral is threatened by development, overfishing, coral harvesting, water quality degradation, and destructive fishing practices such as dynamite. Inside the investment projects, there is not coral coverage. However, in 5km radius, 32 ha of coral coverage is found, particularly inside Kampot Province (Table 1.2).

1.4.3. Mangrove forest

The area of mangrove forests along the coastline of Cambodia has declined significantly over the last two decades. Mangrove forests play a significant role in the survival of some fish species and other marine organisms and serving as spawning grounds or nursery grounds for a wide range of commercially significant fish species. Mangrove forest has many key services, including providing services (support local livelihood), regulating services (regulation of climate, carbon sequestration, coastal protection, storm surge protection, tidal protection, etc.), supporting services (nutrient cycling, habitat for rare species, etc.) and cultural services (tourism, and research activities, etc.). Recently mangrove forests in Cambodia are under increasing threats from several main anthropogenic and natural activities such as coastal aquaculture, salt pans, climate change, inappropriate development activities, unsustainable collection of coastal aquatic resources, and other uses (Nasuchon, 2009). Kampot and Kep Provinces have a mangrove forest area of approximately **2,905 ha** (Table 1.2). However, inside the investment projects, there is no mangrove forest, which is mostly covering the nearby areas.

Table 1.2: Marine resources in the study site

N.o	Marine Resources	Total Area (Kampot and Kep) (ha)	Overlapping Area with Investment Projects (ha)	References
1	Inside the Investment Projects			
1.1	Seagrass resources	11,530	967	IUCN, 2014 & DoF, 2004a
1.2	Coral resources	1,005	0.00	DoF, 2004b
1.3	Mangrove resources	2,905	0.00	Giri et al, 2011
2	Surrounding the Investment Projects (5km buffer)			
2.1	Seagrass resources	28,335	3,260	IUCN, 2014 & DoF, 2004a
2.2	Coral resources	1,005	32	DoF, 2004b
2.3	Mangrove resources	2,905	1,260	Giri et al, 2011



Figure 1.2: Natural resource surrounding the project site (Source: Department of Fishery, 2004a,b, IUCN Report, 2014 and Giri et al., 2011).

1.5. Seawater Quality inside the study site

Seawater quality in the project site was obtained from the previous EIA studies, which were conducted nearby the investment project (Table 1.3). In all locations, some parameters such as TDS, Oil and Grease are above the standard of MOE. The excessive parameter of TDS is due to a salt substance (NaCl-TDS) in the sea, which occurs naturally from the sea. Total dissolved solids (TDS) are classified in level 3 of surface water with saline water. These occur naturally and will not affect natural fish and bio-diversity in the sea. Parameter oil and grease can be caused by company activities of dredging to construct port (other company) and nearby areas which cause debris in the water; oils spill from boat engines of fishermen or from dirt transporting trucks. Excessive parameters of oil and grease in water can affect people’s lives, fish and biodiversity in seawater, cause them to become polluted or migrate to other areas. High Total Coliform in some locations is due to the flow of liquid waste into the water from urban areas and people’s houses along the tributary.

Table 1.3: Current Seawater quality inside and surrounding the study site.

No	Parameters	Unit	CHING KOR Project Area*		OMNI Project Area**			Standard
			SW1	SW2	SW1	SW2	SW3	
1	pH	-	8.02	7.66	7.66	7.92	7.83	7 – 8.3
2	Temperature	0C	27	27				<45
3	Total Dissolved Solid (TDS)	mg/l	38,300	26,600	11,800	11,960	11,590	<1000
4	Total Suspended Solid (TSS)	mg/l	71	52	47	38	45	<60
5	Dissolved Oxygen (DO)	mg/l	7.20	5.40	7.2	6.80	7.00	2 – 7.5
6	Biological Oxygen Demand (BOD5)	mg/l	1.40	1.80	1.80	2.79	2.94	<30
7	Chemical Oxygen Demand (COD)	mg/l	2.73	2.99	2.56	9.72	10.19	2 – 5
8	Oil and Grease	mg/l	4.89	5.85	14.90	15.20	16.60	0
9	Nitrate (NO3)	mg/l	0.80	1.10				<10
10	Sulphate (SO4)	mg/l	300	260	0.36	0.69	0.88	<300
11	Phosphate (PO4)	mg/l	0.63	2				<3
12	Total Nitrogen (TN)	mg/l	0.55	0.59	0.88	1.80	1.95	0.1 – 1
13	Total Phosphorus (TP)	mg/l	0.04	0.12	1.08	0.16	0.24	0.02 – 0.09
14	Arsenic (As)	mg/l	0.03	0.09	0.002	0.004	0.001	<0.01
15	Iron (Fe)	mg/l	6.54	6.22	0.24	0.27	0.36	<1
16	Mercury (Hg)	mg/l	ND	ND	0.0002	0.0004	0.0002	<0.0005
17	Total Coliform	MPN/100	36	4600	350	920	1200	<1000

Remarks:

- Results of the tests were compared against standard of maximum vibration as described in Prakas 116 (Ref) dated 11 April 2018 on the Launching of Work Condition Model for Creation of Factories and Handicrafts.
- ND Mean Not Detected (Lower than LDL)

*The data is obtained from a previous project located in Changhoan village, and the samples were collected at coastal water on 27 December 2019

**The data is obtained from the presentation of the preliminary result of the EIA study for OMNI Kampot Development Project, and the samples were collected on 30 January 2019.

1.6. Climate and Weather

Cambodia's climate is governed by tropical monsoon with warm and humid temperature and has two seasons: 6 months of the dry season from November to April with the wind blowing from northeast to southwest. The rainy season will cover another six months, starting from May to October, bringing the wind from the southwest back to the northeast.

The climate in Kampot is slightly different from climates from other parts of Cambodia due to geological conditions and seasons. Because of these factors and the presence of the project, the climate study was organised basing on climate data from the Ministry of Water Resources and Meteorology from the last five years. The meteorological station is located at the Provincial Department of Water Resources and Meteorology. The data includes temperature, humidity, rainfall, wind direction and wind speed to provide baseline information in the area and use it as climate history. The study can also contribute to the preparedness for natural disasters or prevention against negative impacts from the project and mitigation measures (Eg. Erosion due to rainfall).

1.6.1. Temperature

The minimum temperature during the last five years changes from 20.6 to 24.4 °C. The lowest temperature was 16.2 °C in December 2017, and the highest temperature was 30.4 °C in March 2018 (Table 5.7). Maximum temperature changes between 33 to 34.9 °C and the lowest temperature was 25.5 °C in May 2015, and the highest temperature is 36.7 °C in June 2016 (Table 1.4). During the last five years, the average minimum temperature was 23 °C, while the average maximum temperature during the last five years was 34.2 °C. These areas have normal temperatures as with other parts of the country. Therefore, it does not severely affect the livelihood of local people and the bio-diversity of the area.

Table 1.4: Minimum Temperature of Kampot (in °C)

Year	Minimum Monthly Variation (in °C)												
	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Average
2015	19.4	19.9	23	23	24.6	23.4	24.1	24.3	23.9	23.5	23	22.4	22.9
2016	21	19.4	23.8	23.6	25	23.4	24.2	24.2	23.12	24.1	23.2	22.6	23.1
2017	21	20.7	22.5	24.2	24	23.3	23.2	23.4	24.3	23.2	23.3	16.2	22.4
2018	21.9	19.1	30.4	24.2	23.2	23.6	24.2	22.6	23.6	20.6	23.4	23.6	23.4
2019	19.8	22.7	20.5	24.0	25.4	21.7	21.1	24.3	24.7	25.8	24.6	21.9	23.0
Average	20.6	20.4	24.0	23.8	24.4	23.1	23.4	23.8	23.9	23.4	23.5	21.3	23.0

Source: Ministry of Water Resources and Meteorology Year 2020

Table 1.5: Maximum Temperature of Kampot (in °C)

Year	Maximum Monthly Variation (in °C)												
	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Average
2015	32.5	33.7	35.2	35.2	25.8	36.5	33.8	34.1	34.2	33.5	33.7	33.3	33.5
2016	33.3	35.5	33.3	34.9	35.3	36.7	34.2	33.9	35	33.8	32.9	34	34.4
2017	34.7	35.4	36.6	36	34.2	34.9	32.9	33.9	33.7	33.7	32.6	32.9	34.3
2018	34.7	35.4	36.6	36.0	34.2	34.9	32.9	33.9	33.7	33.7	32.6	32.9	34.3
2019	34.1	34.5	33.8	35.2	35.3	35.3	34.9	34.0	34.0	33.9	33.5	33.4	34.3
Average	33.9	34.9	35.1	35.5	33.0	35.7	33.7	34.0	34.1	33.7	33.1	33.3	34.2

Source: Ministry of Water Resources and Meteorology Year 2020

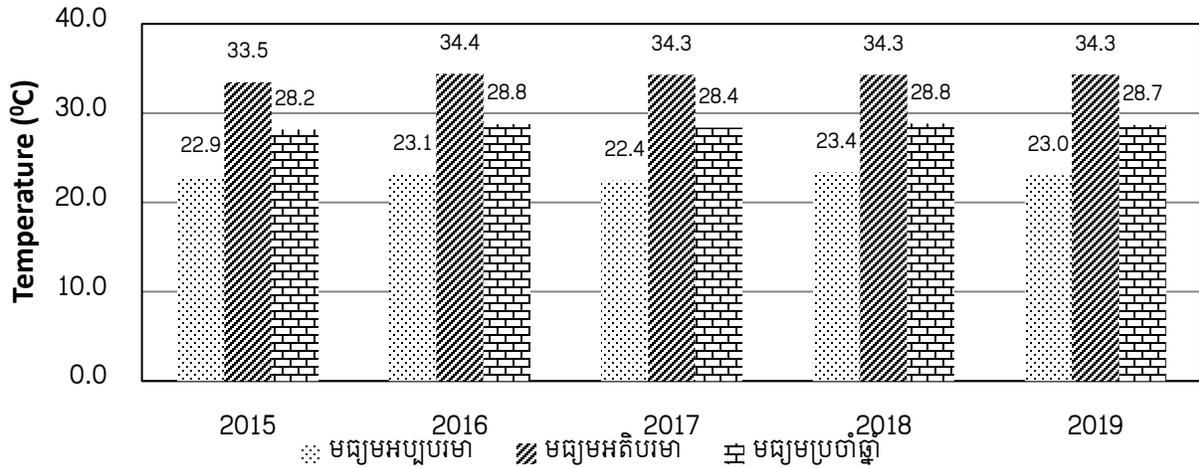


Figure 1.3: Minimum, Maximum and Annual Temperature (Year 2015-2019)

1.6.2. Humidity

Kampot is located in the coastal area and has high humidity throughout the year both in dry and rainy season. The average humidity for the last five years is between 73 to 79.6. The minimum monthly humidity is 69.1%, and the maximum monthly humidity is 82%. The highest humidity was in October 2018) 86.9% (which was during rainy season. The lowest humidity was in January 2017 (61%) which was a dry season. The average humidity for the last 5 years is 75.7%.

Table 1.6: Humidity in Kampot (in %)

Year	Variations Between Month												Average
	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	
2015	66.1	69.3	70.3	72.4	67.8	74.3	76.0	77.0	79.3	76.8	76.4	70.1	73.0
2016	71.3	63.3	70.0	66.7	73.3	78.0	76.8	77.5	74.7	80.9	75.3	72.1	73.3
2017	61.0	65.7	70.2	73.5	78.1	73.5	78.0	78.6	78.3	78.3	76.8	67.4	73.3
2018	74.8	74.3	73.5	73.9	73.5	77.5	80.8	82.5	85.2	86.9	85.3	82.8	79.2
2019	74.1	72.7	73.5	75.3	79.9	80.4	79.1	85.3	87.4	87	84.6	76.3	79.6
Average	69.5	69.1	71.5	72.4	74.5	76.7	78.1	80.2	81.0	82.0	79.7	73.7	75.7

Source: Ministry of Water Resources and Meteorology Year 2020

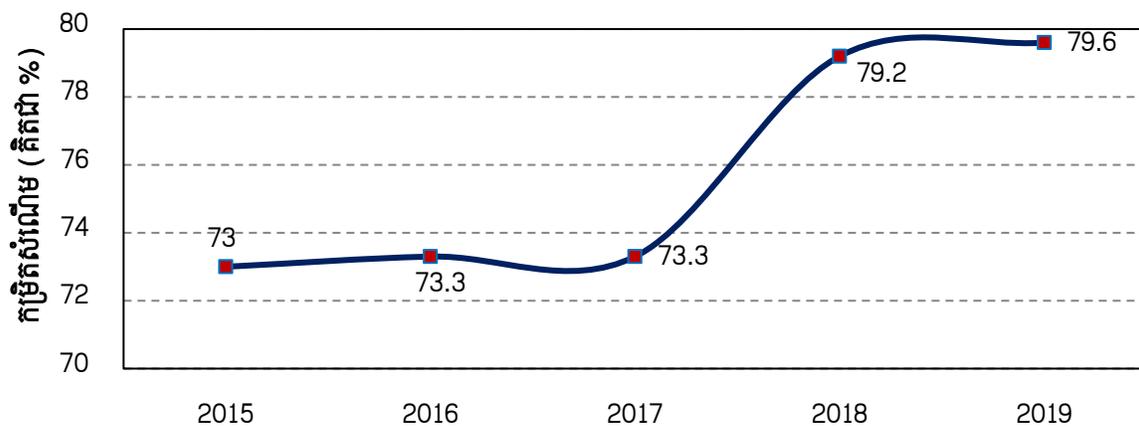


Figure 1.4: Average Annual Humidity)Year 2015-2019(

1.6.3. Rainfall

According to data from the Ministry of Water Resources and Meteorology, Kampot has rainfall between 130.7mm and 302.6 mm. The average annual total rainfall for the last five years is 183 mm. The precipitation seems higher than in 2018 (302.6mm) but became low in 2019 (188.4 mm).

Table 1.7: Rainfall of Kampot for last 5 Year)in mm(

Year	Monthly Variation												
	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2015	0.0	4.6	43.8	73.2	6.6	310.5	298.6	172.8	336.6	117.0	203.8	1.0	130.7
2016	58.0	10	25.8	0.4	241.0	139.8	201.8	305.9	170	380.1	124.7	144.7	150.2
2017	4.5	4.7	36.6	128.3	160.4	149.2	360.6	394.5	126.3	113.5	184.6	56.0	143.3
2018	206.3	72.7	185.8	102	62.9	294.5	1562.9	429.3	284.7	331.7	40.2	57.9	302.6
2019	51.2	0.9	91.7	209.1	87.9	212.2	196.5	711.4	362.2	190.8	146.4	1	188.4
Ave.	64	18.6	76.7	102.6	111.8	221.2	524.1	402.8	256.0	226.6	139.9	52.1	183.0

Source: Ministry of Water Resources and Meteorology Year 2020

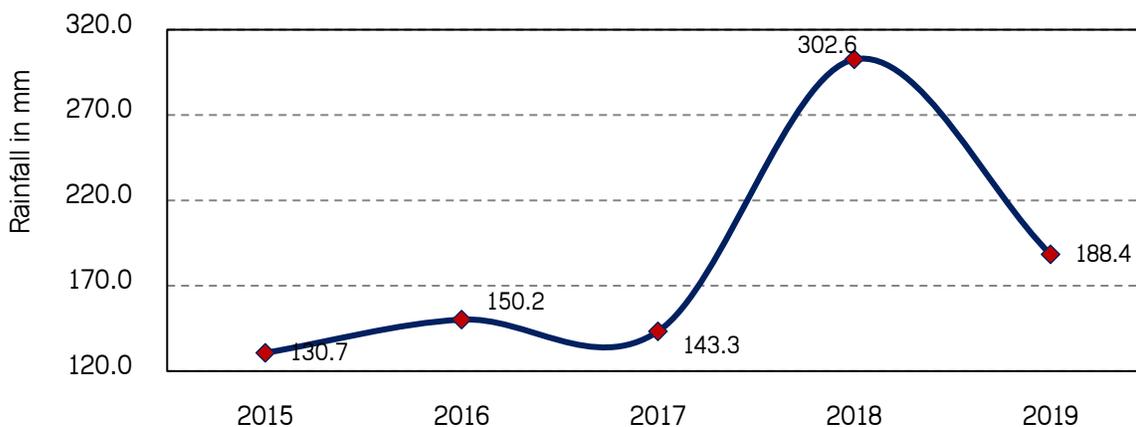


Figure 1.5: Average Annual Rainfall (Year 2015 - 2019)

1.6.4. Wind Directions and Speed

Cambodia has two wind directions: Northeast to the southwest during the rainy season and southwest to northeast during the dry season. According to the Ministry of Water Resources and Meteorology, wind directions and speed in Kampot change every month. The fastest wind speed of 16 meters per second occurred in September 2016.

Table 1.8: Monthly Wind Speed and Directions for the Last 5 Years

Year	Month	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
	2013	Direction	NNE	S	S	WSW	NE/SW	WSW	W	W	WSW	W	NE
Speed		8	5	9	10	9	10	10	10	16	9	8	8
2014	Direction	WNW	SW	W	NW	W	W	WNW	NW	WNW	WSW	W	SSW
	Speed	8	6	4	5	5	4	9	8	10	5	8	3
2015	Direction	NE	S	NNE	E	SSW	E	SW	NW	SW	SSW	SW	N

	Speed	7	5	5	6	8	7	10	8	8	5	8	8
2016	Direction	WSW	W	SSW	SSW	SW	W	WSW	SW	SSW	SSW	SE	ENE
	Speed	9	9	7	8	6	6	6	9	7	5	7	9
2017	Direction	E	NE	NNE	SW	WSW	SW	SW	SE	E	N	NE	N
	Speed	6	12	5	6	5	5	7	9	7	5	5	7

Note: Windspeed in meters per second, W = West, S = South, N = North, E = East, SW = South West, NE = North East, WSW = West South West, ENE = East North East, SSW = South South West, NNE = North North East, ESE = East South East

Source: Ministry of Water Resources and Meteorology Year 2018

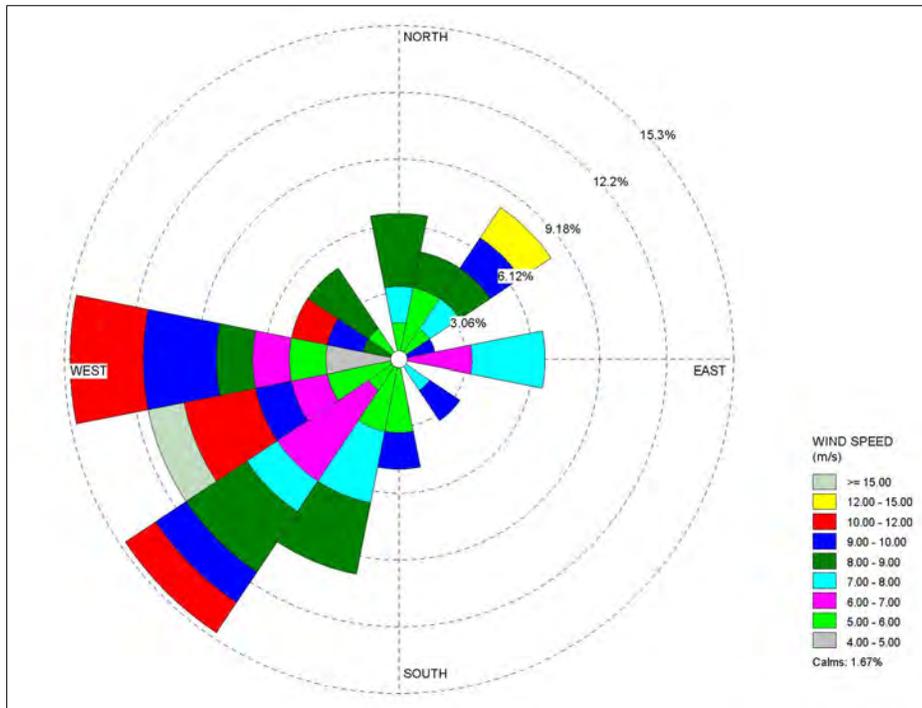


Figure 1.6: Average Annual Wind Directions and Speed

Chapter 2: Socio-Economics

2.1. Socio-economic study

The study of the socio-economic situation is required following the guideline of Environmental and Social Impact Assessment (ESIA) in Cambodia (2009). Primary data was gathered via household and key informant interviews. Fishery household interviews provided detailed information about fishery, occupations, income status, and other aspects in fishery household. Key informant interviews gave overall aspects in the villages and comments on the project. In combination of the secondary data and the primary one made both quantitative and qualitative data. As a result, such different components of socio-economic data complement each other and give wider and firmer information for the whole study.

2.1.1. Scope of the study

The scope of the study is conducted in the relevant communes inside the project site and its surrounding areas. Based on the targeted communes set by the project, there are 7 Community fisheries in Kompot and Kep Provinces (CFis in Kep: Kampong Tralach, Phum Thmey, and Ou Krasar; CFis in Kompoot: Kampong Samaky, Trapeang Sangke, Trapeang Ropov, and Preaek Tnoat).

2.1.2. Study Methodology

The process of the study started from contacting local authorities such as a commune chief and village chiefs in the survey area in order to inform regarding the survey. For the primary data, a survey team was assigned and went to the site in order to conduct household interviews and key informant interviews. About 326 fishery-household samples were assigned and carried out in the survey area. A number of the samples is as in Table 2.1.

Household survey

To obtain both qualitative and quantitative data, the household survey was conducted in targeted Community Fishery. The interview was carried out following the Stratified Random Sampling method in order to increase the information of local people. However, the selected sample will be followed by the formula of Yamane, 1967 as follows:

$$n = \frac{N}{1 + Ne^2} = \frac{1763}{1 + 1763(0.05)^2} = 326 \text{ sample}$$

Where:

N : is the population size (total number of household)

n : is the selected sample size (number of households to be interviewed)

e : is the error limit, which will be equal 0.05 (confidential level of 5%)

Table 2. 1: Number of households in targeted villages

Name of CFis	Total Number of Fishery Households	Actual selected sample during survey
Kampong Samaky	339	62
Trapeang Sangke	212	36
Kampong Tralach	95	18
Phum Thmey	127	23
Ou Krasar	109	20
Trapeang Ropov	756	101
Preaek Thnot	124	23
Total	1763	283

2.1.3. Data analysis

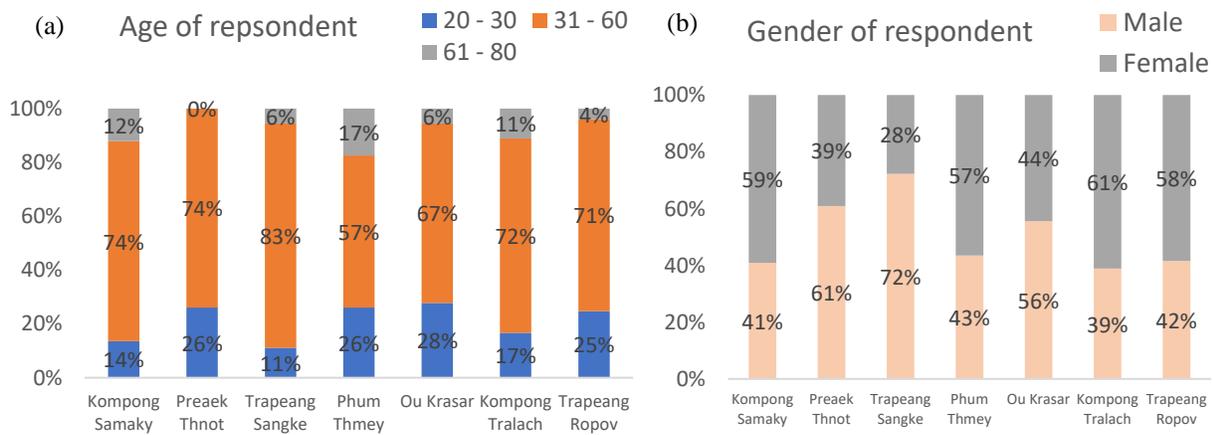
All information acquired from the household survey was analysed using Microsoft Excel to obtain the qualitative and quantitative analysis. That information was then described as table, graphic, and statistics.

2.1.4. Results

a. Age Gender Religion and Education

The age of interviewees ranges from 20 to 85 years old. Based on the results from the survey in 7 CFis, most of the respondents are of age between 31 to 60 years old (Figure 2.1a), with about 20-60% are female, and about 40-70% are male (Figure 2.1b). Regarding religion, they are mostly Khmer and Khmer Islam (Figure 2.1c).

Literacy level is the main focus in any discussion regarding to education. As a result, from the survey, the enrollment rates of primary school and literacy rate for both genders in the 7 CFis are shown in Figure 2.1d. It shows that most of the respondents in these 7 CFis complete their primary school, and others completed their secondary and high school. However, about 56% of respondents living in Kompong Tralach are illiterate, and less than 30% of respondents in the other 5 CFis are illiterate.



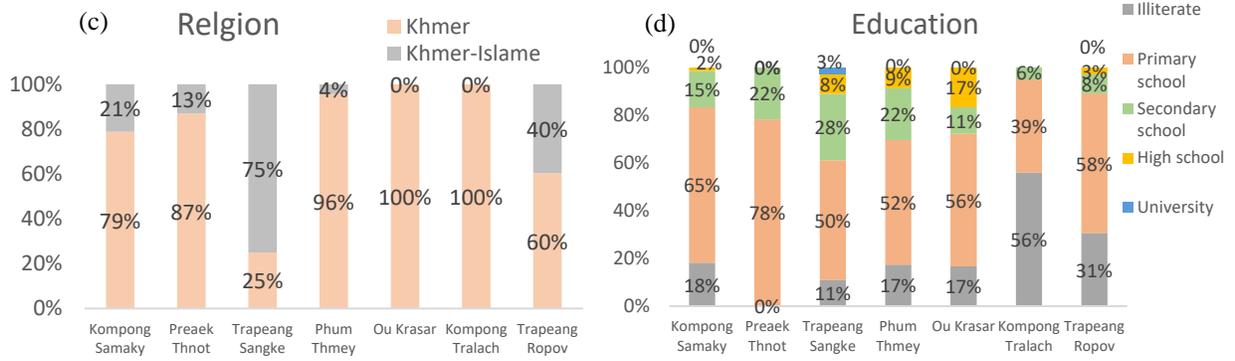
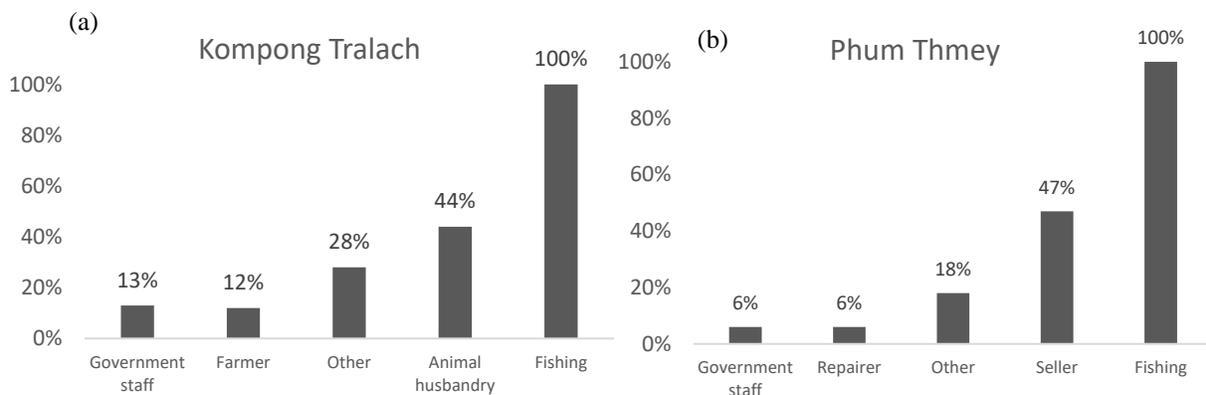


Figure 2.1: Percentage of respondents in term of (a) Age, (b) Gender, (c) Religion and (d) education in each CFis

b. Main Occupation

Occupation is one of the key indicators in the evaluation process of their income. Figures 2.2 (a)-(g) shows types of the main and secondary job of respondents in the 7 CFis in Kompot and Kep Provinces. Fishery households were interviewed, and it was identified that most families rely on the main job as fishermen and other types of secondary jobs with less percentage. The results from the survey in Kompot and Kep Provinces show that 100% of respondents have the main job as fishermen while other secondary jobs are government staff, farmer, worker, seller, and animal husbandry. As mentioned in the methodology, the fishery households were only targeted households for the interview, resulting in 100% of the main job is fishery. However, in some CFis, the small business can also be considered as the main occupation with a percentage of approximately 40%.



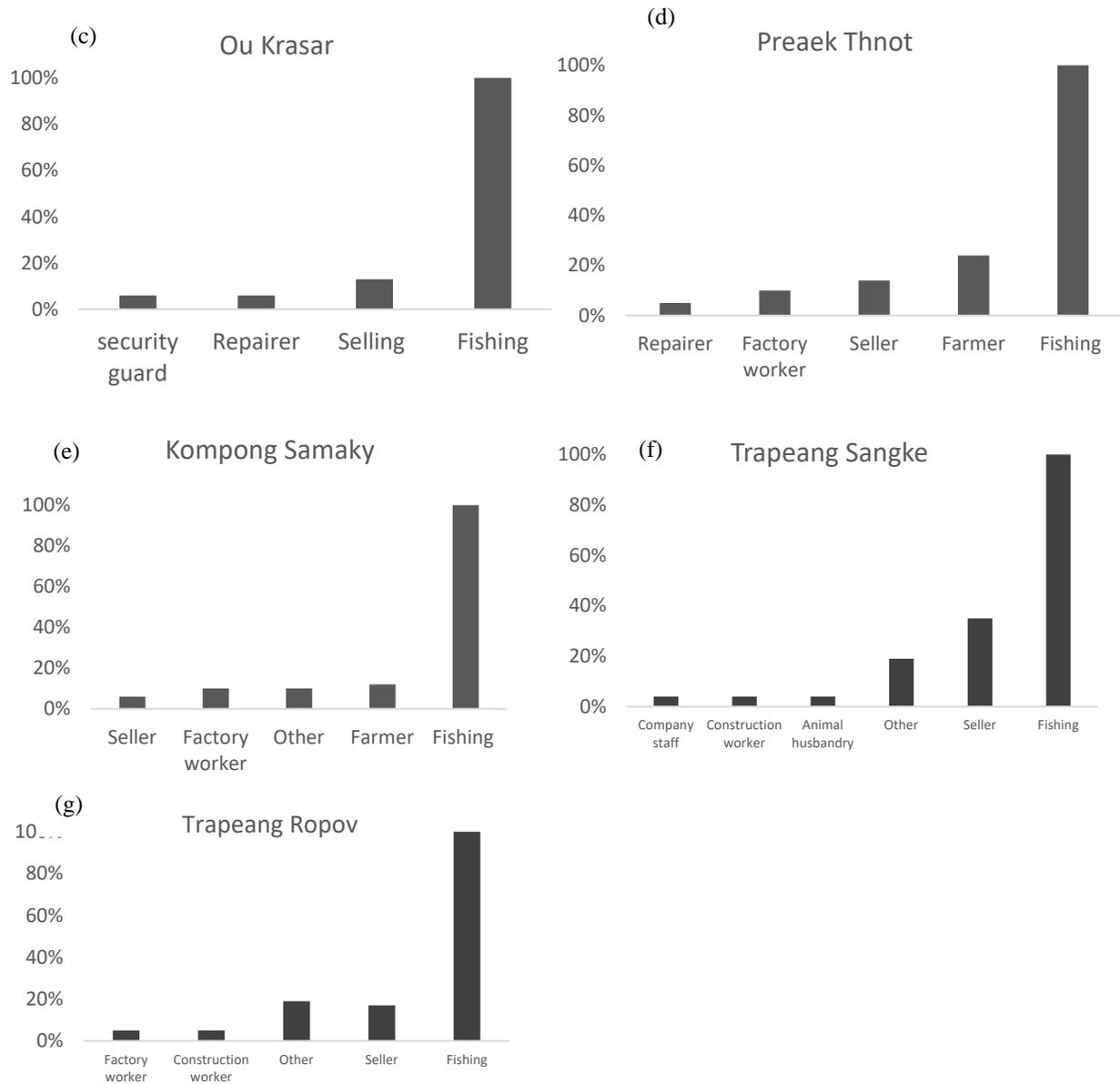


Figure 2.2: Type of main and secondary occupation in each Community Fishery (CFi) in both Kampot and Kep provinces

Figure 2.3 shows the role of women as heads of their families. The results show that the highest rate of women being as heads of households was found in Ou Krasar of 28%, while the lowest rate was found in Phum Thmey of only 4%. Additionally, 7% and 9% of women are heads of households in Trapeang Ropov and Preaek Thnoat, respectively. Similarly, 11%, 13%, and 17% of them were found in Trapeang Sangkae, Kampong Samaky, and Kampong Tralach, respectively.

Woman as head of household

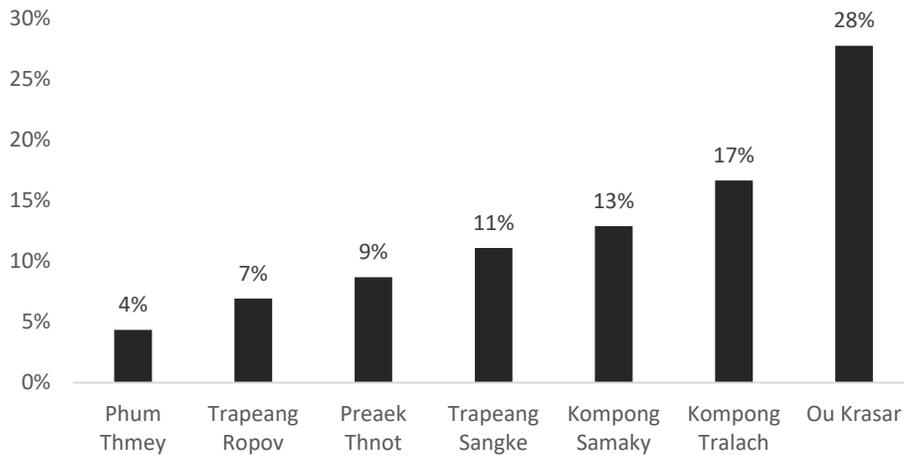


Figure 2.3: Women as head of household with fishery-related job in each FCIs

c. Annual Income and Expenditure

Income is one of the key indicators of how important of their current occupation. Figure 2.4 shows the average annual income of each CFs in Kompot and Kep province. The sources of their annual income possibility mainly come from their main while less income comes from the secondary job. Based on the fishery household survey results, the average annual income of CFIs in Trapeang Ropov and Kampong Samaky are \$10,195 and \$5,480, respectively. However, the annual income of CFs in Trapeang Sangkare and Preaek Thnoat are \$7,650 and \$12,155, respectively. It is observed that the average annual income was higher in Phum Thmey of \$21,623 and Ou Krasar of \$16,448. In Ou Krasar, most of the respondents are doing business in fishing. In Kampong Tralach, the average annual income was \$8,516. This data was obtained from a direct interview with fishery households, during which the monthly incomes were the only answers.

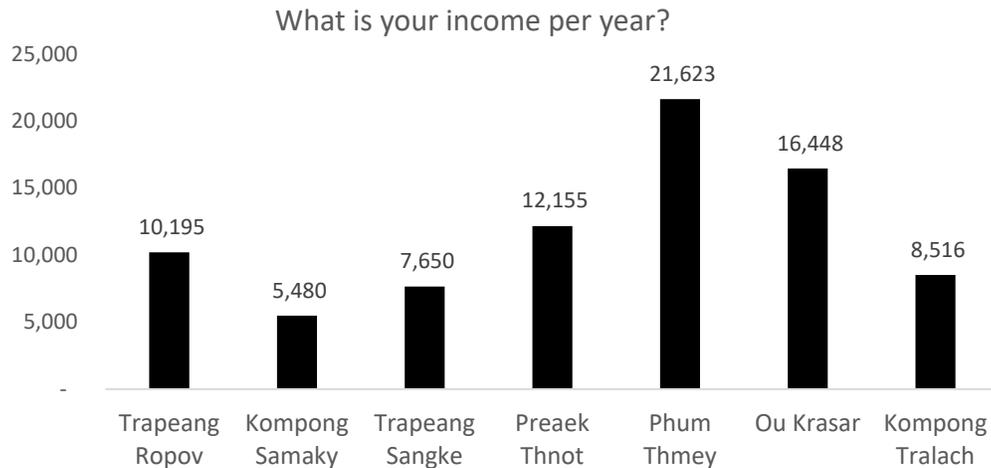


Figure 2.4: Average annual income of respondents of each Community Fisheries

Figures 2.5(a)-(d) and 2.5(a)-(c) shows the expenditure of respondents in the 7 CFIs in Kompot and Kep Provinces, respectively. The result from the survey in Kompot Province shows that their expense is for their daily food and other needs such as electricity-water, transportation, ceremony, medicine, children education, and equipment repair. Most of them cannot save some money from their income because all of their income was spent.; however, some of them can save some money from their income.

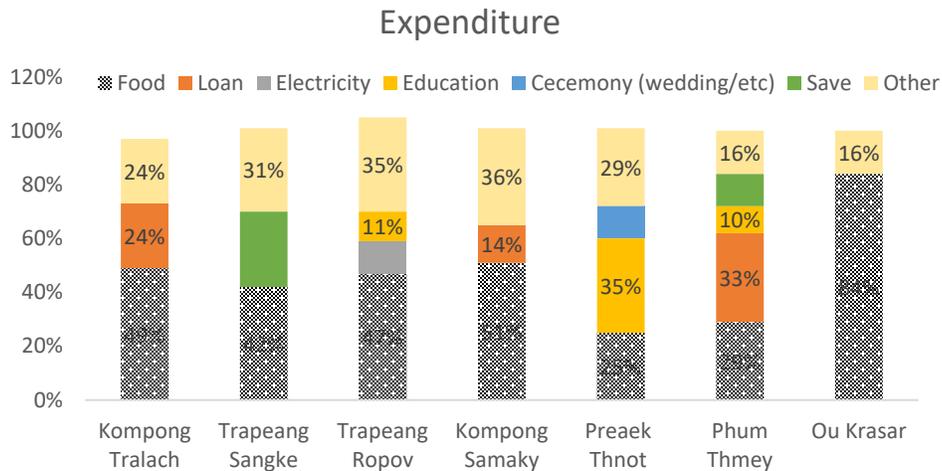


Figure 2.5: Expenses of each fishery household in each CFI in both Kampot and Kep Provinces

Figure 2.6 shows the loan status of respondents in each Community Fishery in Kep and Kompot Provinces. The survey result shows that 100% of fisherfolks' households in Kampong Tralach are taking loans, whereas only 2% in Trapeang Ropov. This may be because most fisherfolks households in Trapeang Ropov are Islam, and they rarely take a loan from the bank based on what they answer during the survey. In addition, 56%, 48%, 44%, 21%, and 6% of fisherfolks' households in Ou Krasar, Phum Thmey, Preaek Tnoat, Kampong Samaky, and Trapeang Sangke, respectively, take at least a loan from the banks. The respondents take loans from the bank to build their house, buy a boat, etc.

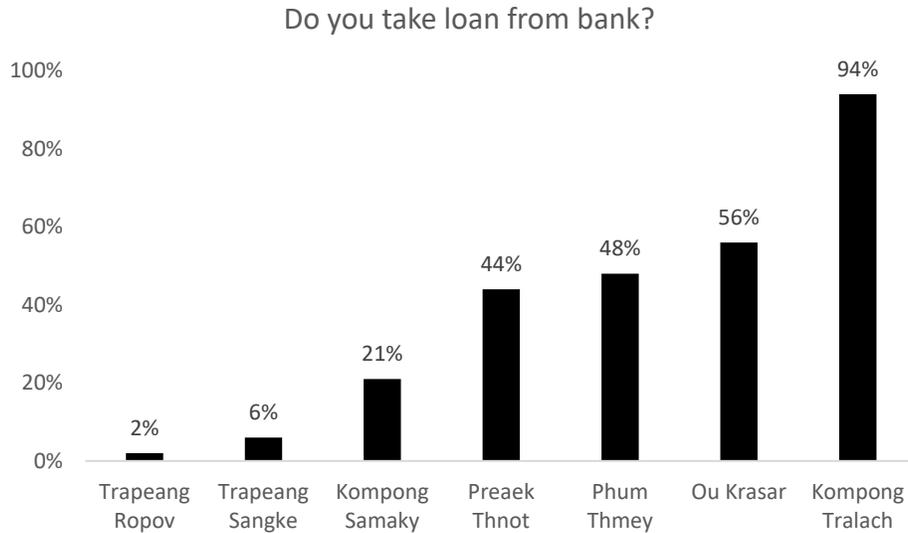


Figure 2.6: Loan status of household in each in Kep and Kompot Provinces

d. Marine Fishery Resources

There are many species of marine fish in Cambodia. In some respects, mangroves are also considered as a “fishery” resource in Cambodia. This is partly due to the fact that the present fisheries law covers the harvest of mangroves. In Kompot Province, the rich type of marine fishery depends on the location of the coastal area. Figure 2.7 (a)-(c) show the different types of marine resources existing in different locations (Trapeang Sangke, Kampong Samaky, Trapeang Ropov, Kampong Tralach). In Trapeang Sangke, according to respondents during the survey, there are eight types of marine fishes (ត្រីឆ្មារ ត្រីកន្ទួង ត្រីអណ្តែងពុយ ត្រីសេក ត្រីកាម៉ុង ឬត្រីប្លាធុ ត្រីក្បក ត្រីបំបែល ត្រីកាតាំង). However, the most abundant marine fish is Trout of 29% and Catfish of 29% (Figure 2.7a). The most abundant marine resources are squid of 33%, fish of 22% and shrimp of 26.7% in Kampong Samaky and Trapeang Ropov, respectively. Within these locations, there are also other species (Figures 2.7b-c). In Kampong Tralach, it is recognised that shrimp and squid are an abundant marine resource of 25% and 16.7%, respectively. Other marine resources are fish, ត្រីចម្រុះប្រភេទ, crab, and សប្បីជាតិ)ឱ្យង ត្រី ត្រែង((Figures 2.7d).

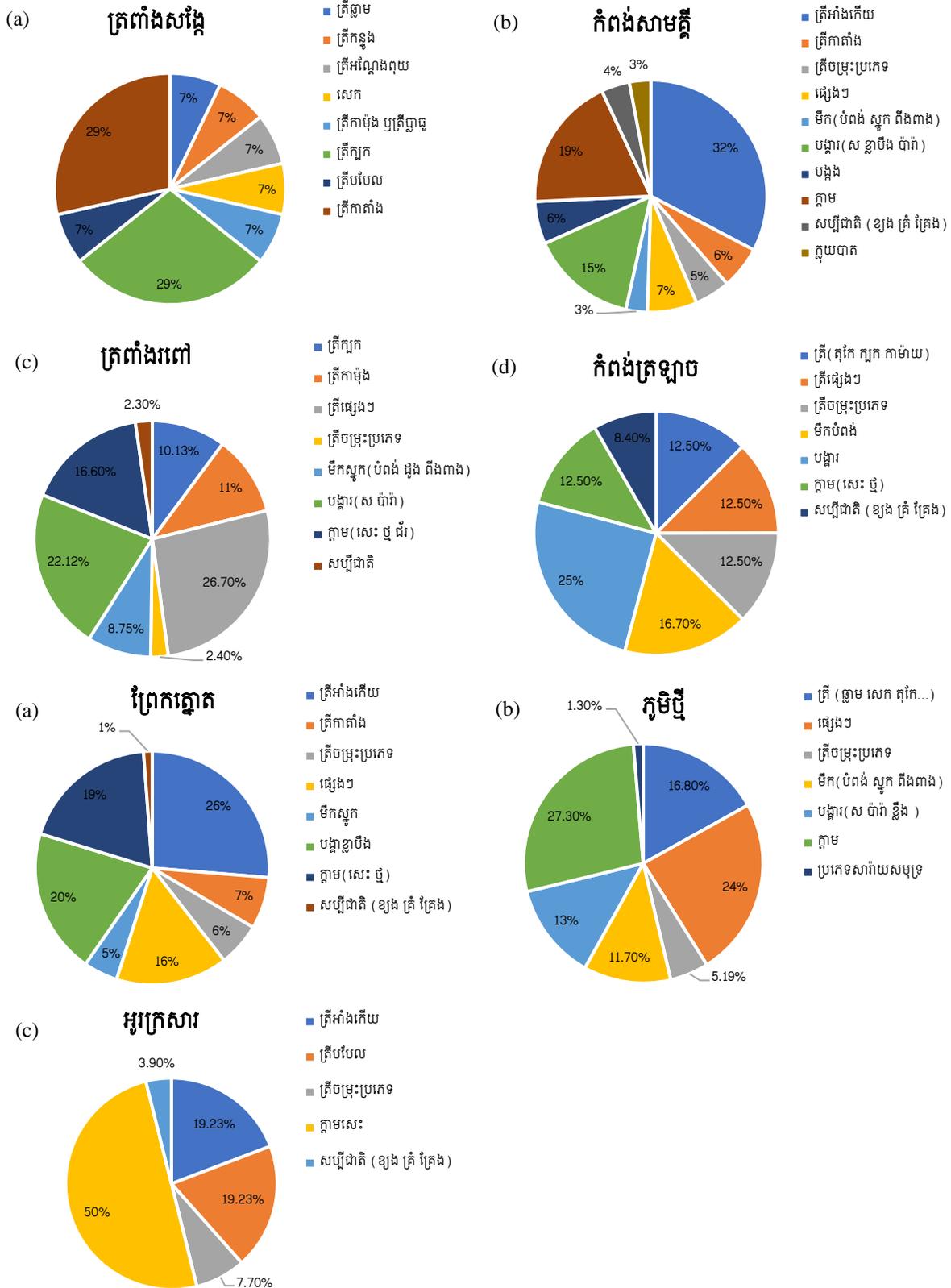


Figure 2.7: Fishery resources in each community fishery in both Kampot and Kep Provinces.

On the other hand, there are also many species of marine resources in Kep Province. Based on respondents living in Preaek Tnoat, Phum Thmey, and Ou Krasar, stated that they could find different types of marine resources such as ត្រី (ត្រី) សេក ត្បិត (ត្រីផ្សេងៗ ត្រីចម្រុះប្រភេទ មីក) បំពង់ ស្លុក ពីងពាង (បង្ការ) ស ប៉ាក ខ្លីង (ក្តាម and ប្រភេទសារាយសមុទ្រ. However, shrimp, squid and fish are most often found in Preaek Tnoat and Phum Thmey (Figure 2.6 a-b). In contrast, the most abundant marine resource in Ou Krasar is crab, while other species can be found such as ត្រីអាំងកើយ ត្រីបបែល ត្រីចម្រុះប្រភេទ សប្បីជាតិ (ខ្យង ត្រី គ្រែង).

The respondents stated that marine fisheries cite a wide variety of threats to the resources. These mainly fall under the categories of excess fishing effort and habitat destruction. Excess fishing effort and associated declines in abundance of target species is thought to be a serious problem for most of Cambodia’s marine fisheries. The key causes appear to be population increases (many people become interested in fishing) and also the use of trawling gear which they believe in having a negative impact on marine resources.

e. Perception of respondents on development project

The survey questionnaire was designed to understand the perception of fishery families in Kompot and Kep provinces. Overall view from this result, it is shown that CFis family in Kampong Tralach, Trapeang Sangke, Trapeang Ropov, Kampong Samaky, and Preaek Tnoat has a different perception of the development project while people in Ou Krasar has only two perceptions on the development project such as agreed with the condition and disagreed perceptions. As shown in Figure 2.8, more than 60% of CFis families in Kompot and Kep Provinces disagreed with the development project. Most of them stated that if the development project occurs, they will lose their daily income from fishing, and the immigration to other cities may also increase. However, less than 10% of people have no idea about this development project. In addition to this, less than 30% of them support the development project with conditions as follows:

- Conserve all the FCI’s benefit as normal conditions;
- Provide job opportunities for the younger generation during the project development;
- Provide job opportunities regarding tourism or eco-tourism;
- Provide the parking areas for the fishery-related activities.

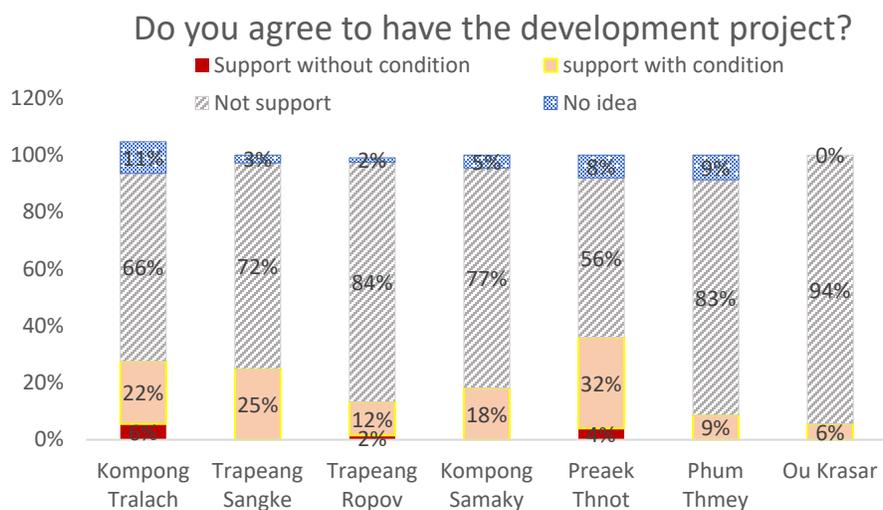


Figure 2.8: Overall perception of household on the development project in Kompot and Kep Province

Table 2.2: Pictures during field survey from 16-20 December 2020.

CFi	Picture (date: 16-20 December, 2020)	Picture (date: 16-20 December, 2020)
Preaek Tnaot and Trapaeng Rovpov Community Fisheries		
Trapeang Sangkae Community Fishery		
Kampong Samaky Community Fishery		

CFI	Picture (date: 16-20 December, 2020)	Picture (date: 16-20 December, 2020)
Kampong Tralach Community Fishery		
Phum Thmey Community Fishery		
Ou krasar Community Fishery		

2.2. Public Consultation

Public participation in EIA provides an opportunity to comprehend stakeholders concerns and expectations. This may ensure a better decision. Overall, it has a moderate influence on the project design and environmental approval conditions. The public consultation was conducted with the key stakeholders, which are considered to be the most impacted parties due to the investment project. Due to the Covid-19 community transmission event, the public consultation can be conducted for the limited stakeholders. In this study, the public consultation was conducted from 3 to 18 December 2020 with the key community fisheries located closed to development projects in both Kompot and Kep Provinces. Those key community fisheries are Kampong Tralach, Ou Krasar, Phum Thmey, Trapeang Sankae, and Kampong Samaky communities located in Kep Province and Preaek Tnoat, and Tropeang Ropov communities located in Kampot Province. There will be a presentation to stakeholders; the public consultation can be carried out more during the presentation of finding. The key results from the public consultation are as follows:

2.2.1. Publication Consultation with Community Fisheries

- Preaek Tnoat Community Fishery

The consultation was conducted on 3 December 2020 with the chief and members of the community in the community office. First, the study team introduced the project development (CHING KOR Resort Project) located in the overlapping of the Preaek Tnoat community fishery. All members of the community did not approve the presence of the investment project for the following reasons:

- Employments provided by the project are only suitable for young people who have skills in both services and construction, etc;
- Income from those employments is relatively low as compared with the income from fishery production;
- The investment project leads to the depletion and losses of the coastal resources, particularly fishery production;
- Also, the investment project will lead to the depletion of mangrove forests, seagrass beds, and other resources, which are the key habitat for the fishery.

At the same time, the chief and all members have some concerns and suggestions as follows:

- The investment project should be moved or shifted to the other area or outside the community fishery's territory;
- The investment project should not be rejected by community's members. However, the project should be executed following the approval and guidance of the governmental authorities.

- Tropeang Ropov Community Fishery

The consultation was conducted on 3 December 2020 with the members of the community in the community office. First, the study team introduced the project development (CHING KOR Resort Project) located in the overlapping of the Tropeang Ropov community fishery. All members of the community did not approve the presence of the investment project for the following reasons:

- The project will significantly provide negative impacts to the livelihood and employment of fishermen in the areas;
- The project will lead to depletion of the fishery production;
- Occupying most of the community fishery's territory will lead to the mobilisation of fishery activities. This mobilisation to deep water is likely impossible for current fishery activities since most of the fishery equipment is suitable for shallow water;
- Employments provided by the project are only suitable for young people who have skills in both services and construction, etc.;
- The monthly salary is not likely enough, and the daily basis fee is preferred.

At the same time, all members have some concerns and suggestions as follows:

- The project should be executed or implemented at another area outside the community's boundary defined by MAFF or at the deep part of the coastal areas;
- The community fishery should not be mobilised or shifted, particularly to the deeper part of the coastal areas or other areas;
- The project should involve the study of environmental impacts, which might mainly focus on biological and socio-economic resources and livelihood surrounding the project site;
- The project should publicly show all relevant legal framework and documents for clarification to avoid implementing the project without any appropriate notification.

- **Kampong Samaky Community Fishery**

The consultation was conducted on 4 December 2020 with the chief and members of the community in the community office. First, the study team introduced the project development (OMNI Resort Project) located in the overlapping of the Kampong Samaky community fishery. All chief and members of the community did not approve with the presence of the investment project for the following reasons:

- The project will significantly provide negative impacts to the livelihood and employment of fishermen in the areas;
- Low income might lead to significant immigration to abroad or other regions of the country;
- Low income might also lead to quite the education/school, particularly for children;
- There will be sediment diffusion to the surrounding area while filling up or reclamation of the coastal area, leading to losses of biodiversity in the coastal zone;
- Increase unemployment in the area because the fishermen do not have the skill or enough labour for the project activities;
- There will be increasing in the illegal fishing activities in the areas because the decrease in the fishing zone due to the coastal reclamation of the investment project;
- There is a lesson learnt from previous experiences in which a nearby area, so-called "Lot 12", has been filled up, leading to loss of fishing area and its fishermen have tried to invade into the community fishery to conduct illegal fishing.

At the same time, the chief and all members have some concerns and suggestions as follows:

- The investment project should be executed or developed at other areas (upland) or at the deeper part of the coastal zone, which is outside of the community fishery's territory.

- **Ou Krosar Community Fishery**

The consultation was conducted on 4 December 2020 with the chief and members of the community in the community office. First, the study team introduced the project development (OMNI Resort Project) located overlapping Ou Krosa community fishery. All chief and members of the community did not approve with the presence of the investment project for the following reasons:

- The investment project leads to loss of natural resources such as mangrove forest, seagrass and others;
- The investment project leads to loss of employment in the fishery;
- The investment project might possibly lead to increases in immigration to abroad or other regions of the country;
- Loss of job might lead to inability to pay the debt;
- Loss of job might also be resulting in family economic crisis, which will not allow their children to go to school or quit the school;
- The investment project may provide more job opportunities. However, those will be only of young labour with skills such as services and construction.

At the same time, the chief and all members have some concerns and suggestions as follows:

- The investment project should be executed or developed at other areas (upland) or at the deeper part of the coastal zone, which is outside of the community fishery's territory.
- Most of the people here do not have land for agriculture, only coastal areas for fishery activities. Therefore, in the case of coastal land reclamation, particularly at their community fishery, there will be a lot of negative impacts.

- **Phoum Thmey Community Fishery**

The consultation was conducted on 4 December 2020 with the chief and members of the community in the community office. First, the study team introduced the project development (OMNI Resort Project) located in the overlapping of the Phum Thmey community fishery. All chief and members of the community did not approve with the presence of the investment project for the following reasons:

- The investment project might lead to loss of local related fishery jobs, which might not be able to get profit;
- The investment project might lead to loss of natural resources such as mangrove forest, seagrass, and other biodiversities;
- The investment project might cause negative impacts on coastal pollutions in the areas and its surrounding.

At the same time, the chief and all members have some concerns and suggestions as follows:

- The investment project should be executed or developed at other areas (upland) or at the deeper part of the coastal zone, which is outside of the community fishery's territory.

- **Kampong Tralach Community Fishery**

The consultation was conducted on 4 December 2020 with the chief and members of the community in the community office. First, the study team introduced the project development (OMNI Resort Project) located overlapping the Kampong Tralach community fishery. All chief and members of the community did not approve with the presence of the investment project for the following reasons:

- The investment project has significant negative impacts on fishermen, particularly those who are relying on the resources at the shallow coastal zone;
- The investment project might lead to loss of natural resources such as mangrove forest, seagrass, and other biodiversities;

At the same time, the chief and all members have some concerns and suggestions as follows:

- If the investment project likely to happen, people, particularly fishermen, needs to learn new skills, which need to be done beforehand.

- **Trapeang Sangke Community Fishery**

The consultation was conducted on 18 December 2020 with the chief and members of the community in the community office. First, the study team introduced the project development (OMNI Resort Project) located overlapping of the Trapeang Sangke community fishery. All chief and members of the community did not approve with the presence of the investment project for the following reasons:

- The investment project might lead to a decrease in natural resources;
- The investment project might also lead to depletion of key resources such as mangrove forest, seagrass and other biodiversities;
- Also, the project might increase the immigration rate and result in the inability of children to go to school.

At the same time, the chief and all members have some concerns and suggestions as follows:

- The government should not approve on this investment project due to significant negative impacts. However, all members of the community will advocate until the end.

Table 2.3: Public consultation activities

CFis	Description	Photo (3-18 December-2020)
Preaek Tnoat Community Fishery	<p>Participants:</p> <ul style="list-style-type: none"> - 2 members from community - 3 members from study team <p>Location: in community office</p>	
Trapeang Ropov Community Fishery	<p>Participants:</p> <ul style="list-style-type: none"> - 3 members from community - 3 members from study team <p>Location: in community office</p>	
Trapeang Sangke Community Fishery	<p>Participants:</p> <ul style="list-style-type: none"> - 2 member from community - 2 members from study team <p>Location: in community office</p>	

<p>Kampong Samaky Community Fishery</p>	<p>Participants:</p> <ul style="list-style-type: none"> - 2 members from community - 2 members from study team <p>Location: in community office</p>	
<p>Ou Krosa Community Fishery</p>	<p>Participants:</p> <ul style="list-style-type: none"> - 2 members from community - 2 members from study team <p>Location: home of community's chief</p>	
<p>Phoum Thmey Community Fishery</p>	<p>Participants:</p> <ul style="list-style-type: none"> - 2 members from community - 2 members from study team <p>Location: home of community's chief</p>	

Kampong Tralach Community Fishery	Participants: <ul style="list-style-type: none"> - 3 members from community - 2 members from study team Location: home of community's chief	
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Community Fisheries in Kampot Province (Preaek Tnoat and Trapeang Ropav) have known about the investment projects, for example, CHING KOR project. Up to now, there is no other investment plan besides this CHING KOR Project. While community fisheries in Kep Province stated that there were some proposed investment project plans before, but they have not agreed. Some of them included Phalla group and Kampot Thmey Projects, said Chief of Kampong Samaky's community. Kampot Kep development organisation was another proposed project known by Kampong Tralach's community. However, Ou krosa community's chief has not heard of other projects besides the current proposed plan, OMNI project. Chief of community in Phoum Thmey stated that there were other two projects, but he does not remember the names.

Five out of six communities said that the coastal zone rich in natural resources, and another one said that there are average living resources in their FCI's boundaries. Variety of living resources in the area as shown in Table 2.4.

Table 2.4: Living resource that exists within or near to fishery association's territory.

Living resources	Location	Number of fishery families (as member of community)
ក្តាមថ្ម ក្តាមសេះ មីក ត្រី បង្កា ផ្សិត ស្មៅសមុទ្រខ្ពស់រលាង ខ្ពស់បាត ខ្ពស់មេច ខ្ពស់យុង ខ្ពស់គុម្ព ផ្កាថ្មស្នែងប្រើស ផ្កាថ្មដើមឈើ ផ្កាថ្មចៀម	Preaek Thaot	More than 300 families
ត្រីកាម៉ុង ត្រីកាតាំង ត្រីអង្រែ ត្រីបំបែល ត្រីធ្លាម ត្រីធ្លុង ត្រីកាម៉ ត្រីក្បក ត្រីអណ្តែងពុយ ត្រីក្អក	Trapeang Ropov	500 families
បង្កា មីក ក្តាមថ្ម បង្កា ត្រី ក្តាមជ័រ ស្មៅសមុទ្រខ្ពស់បាត ខ្ពស់រឹង សារាយសមុទ្រ	Kampong Samaky	-
ក្តាម ត្រី មីក បង្កា ផ្កាថ្ម ស្មៅសមុទ្រ	Ou Krasar	236 families
ក្តាមថ្ម ត្រីកាម៉ុង ត្រីកាម៉យ ត្រីផ្កាង ត្រីបាកី ក្តាមសេះ ក្តាមជ័រ ក្តាមសួរ ក្តាមគរ ខ្ពស់សមុទ្រ	Phum Thmey	110 families
ក្តាមថ្ម បង្កា ត្រីក្បក ក្តាមជ័រ ខ្យង ស្មៅសមុទ្រខ្ពស់ស្លឹកល្អិត ខ្ពស់ស្លឹកធំ សារាយសមុទ្រ	Kampong Tralach	155 families

Based on the discussion with all community fisheries, most families depend on the natural resources from the coastal areas. However, about 10 families in Preaek Tnaot have aquaculture farms (fish, crab ect.). In Trapeang Ropov, there are some aquacultures of crab as well, and the community raises some contributed funds from them. The community also conducts the crab bank in order to increase the resources for fishermen in their communities.

Community fisheries claim that fishermen families go to the coastal area almost every day except for when there are seasonal storms or bad weather conditions. They are able to go to coastal areas in the dry season rather than in the rainy season because usually rainy season, there is intensive rainfall and a strong magnitude of wind, resulting in a huge wave causing the accident. Most families need to go to the coastal area as much as possible because it is their only main occupation, and on the other hand, they do not have land for conducting agricultural activities.

There are not so many immigrants or only short-term immigrants to Sihanouk Ville for work. A few immigrants have been to Thailand for work. Some of them have been to Phnom Penh for work and study. One of the community fisheries stated that there is only about 2.9% of immigrants to both local and abroad.

Women and children significantly take part in their communities. In addition to their work as a housewife, women fishermen's families are the one who take out crabs, fish from net or fishing equipment and send or sell those resources to the market after their husbands get back from fishing. They also repair fishing nets and equipment and take out debris from nets. Some of them do processed products like dry fish, dry shrimp, fermented products, removal of crab meat. In some families, women also conduct fishing by going out to the ocean and search for shells, crabs, shrimp, etc, as extra income.

Community fisheries claim the same that if there is an investment project, they are not able to get resources like every day. Thus, it has significant negative impacts on women, children, and other vulnerable people. Both men and women may receive negative impacts equally. They will lose their job in the fishery, resulting in an increase in immigration, being not able to pay off the debt. It also has negative impacts on their children because they will not be able to afford their children education once they cannot get resources from coastal areas. It does not only affect families who conduct fishery activities in shallow water, but also those who are at deepwater because shallow water is the productive place for breeding, lay eggs, and the appropriate habitat for small species before mobilising to deep part of the coastal areas.

Community fisheries agreed that there are jobs created from this investment project; however, those jobs are only for young people, and those who have skill in services, and construction, and the income from those jobs are not highly paid like from fishery production. One among communities claims that it will take sometimes, particularly during the project execution phase, to have available jobs. Moreover, the communities agreed that if this investment project commenced, they would obviously lose their jobs, and coastal resources will significantly decrease, and other key natural resources, including mangroves, seagrass, and others will be significantly deteriorated. In addition, there will be more coastal pollution, including solid waste and wastewater, from this investment project.

Overall, the participants have not agreed with the development project because it could potentially take away the benefit from fishery families whose daily life are based on coastal resources. However, they also provide their own point of view about the concerns and suggestions as follows:

- The investment project should not fill up or reclaim the coastal area, particularly at the community fisheries and develop as in the proposed plan
- The investor may convey the investment plan to land area, but not coastal areas
- The investment project should be implemented at the deeper part of the coastal areas, which are outside of the communities' boundary defined by MAFF.

Some community fisheries also suggest having a detailed study on environmental and social impacts, which can be conducted and shown in public forums or include all key public consultations before the approval of these investment projects. Another community suggest that the investor should invest more on training to local people to have appropriate skills in order to obtain the job opportunity if these projects are approved. However, they do not want to see these investment projects happen in any case.

Chapter 3: Environmental Valuation

3.1. Valuation of Marine Resources Inside the Investment Projects

3.1.1. Direct Valuation (Valuation of Local Fisheries)

There are seven community fisheries in the study site. The total number of fishery households is 1,762 fishery households, which are comprised of Preaek Tnoat (124 fishery households), Trapeang Ropov (756 fishery households), Trapeang Sangke (212 fishery households), Kampong Samaky (339 fishery households), Kampong Tralach (95 fishery households), Phum Thmey (127 fishery households), and Ou Krasar (109 fishery households).

a. Preaek Tnoat CFi

In Preaek Tnoat CFi, there are 124 fishery households. Based on the questionnaire survey results, each household is able to obtain the total average amount of **77.06USD** per time of fishing. Moreover, the mean annual income of each household is approximately **20,344USD**. In the entire CFi, the valuation of total fishery production is approximately **2,522,664USD** (Table 3.1).

Table 3.1: The fishery production (23 sample of fishery households)

Type of Fisheries	Fishery Production (kg/day)			Per Time	
	Dry season	Rainy season	Average Production	\$/kg	Total (USD)
ត្រីអាំងកើយ	32	34	33	2.5	82.5
ត្រីអណ្តែងពុយ	4	4	4	2	8
ត្រីក្បក	7	7	7	3.8	26.6
ត្រីបែល	3	2	2.5	2.5	6.25
ត្រីកាតាំង	16	23	19.5	3.3	64.35
ត្រីឆ្កែ	3	2	2.5	5	12.5
ត្រីផ្កាង	2	3	2.5	3	7.5
ត្រីបាក់	3	2	2.5	3	7.5
ផ្សេងៗ (សរុបក្តាម និង ត្រី)	21	35	28	5	140
ត្រីបម្រុះប្រភេទ	13	15	14	1.8	25.2
មីកស្កុក	3	2	2.5	4	10
មីកពឹងពាង	9	12	10.5	4	42
បង្ការស	28	45	36.5	4	146
បង្កង	15	14	14.5	18.5	268.25
បង្កាខ្លាបឹង	23	28	25.5	3.5	89.25
បង្ការប៉ាក់	9	7	8	4	32
ក្តាមសេះ	97	87	92	7	644
ក្តាមថ្មី	10	14	12	10	120

ក្លាមស្តារ	1	2	1.5	3	4.5
សប្បិជាតិ (ខ្យង គ្រី គ្រែង)	3	1	2	3	6
សារាយសមុទ្រ	10	10	10	3	30
Total					1772.3
Total income/fishery household/per time					77.06
Mean annual income per household*					20,344
Total fishery valuation per year in entire CFI**					2,522,664
Remarks:					
*Based on the interview, each fishery household conducts fishing activities with an average of 22 times per month.					
**The total number of fishery households in Preaek Tnoat CFI is 124 households.					
Dry season (November to April) and rainy season (November to October)					

b. Trapeang Ropov CFI

In Trapeang Ropov CFI, there are 756 fishery households. Based on the questionnaire survey results, each household is able to obtain the total average amount of **65.65USD** per time of fishing. Moreover, the mean annual income of each household is approximately **18,119.55USD**. In the entire CFI, the valuation of total fishery production is approximately **13,698,385USD** (Table 3.2).

Table 3.2: The fishery production (101 samples of fishery households)

Type of Fisheries	Fishery Production (kg/day)			Per Time	
	Dry season	Rainy season	Average Production	\$/kg	Total (USD)
ត្រីអាំងកើយ	24	12	18	8.33	149.94
ត្រីឆ្មាម	10.5	12	11.25	5.83	65.5875
ត្រីកន្លង	7	6	6.5	25	162.5
ត្រីអណ្តែងពុយ	16	11	13.5	3.9	52.65
ត្រីតុកែ	102	92	97	5.3	514.1
ត្រីកម្ពុំ ឬត្រីញាតូ	361	354	357.5	2.15	768.625
ត្រីក្បក	235	194	214.5	2.44	523.38
បបែល	6	6	6	4.75	28.5
ត្រីកាតាំង	99	104	101.5	2.77	281.155
ត្រីកាម៉ាយ	236	150	193	1.87	360.91
ត្រីអង្រែ	24	24	24	2.75	66
ត្រីឆ្មង	13.5	18	15.75	4.625	72.84375
ត្រីផ្កាង	15	15	15	2.5	37.5
ត្រីបាក់	13.02	13.98	13.5	2.75	37.125
ត្រីចម្រុះប្រភេទ	39	44.22	41.61	2.28	94.8708
ផ្សេងៗ (ត្រីកាជី, ត្រីកាប៉ះ)	87	114	100.5	3.87	388.935
មីកដូង	18	30	24	2.5	60
មីកបំពង់	5	5	5	2.5	12.5

មីកស្កូក	7.86	7.5	7.68	3.56	27.3408
មីកពឹងពាង	16.3	19.8	18.05	7.5	135.375
បង្ការស	34	30	32	3.36	107.52
បង្កង	36	20	28	19.16	536.48
បង្កាស្លឹង	15	15	15	5.79	86.85
បង្ការប៉ារ៉ា	2	1	1.5	6.62	9.93
ក្តាមសេះ	351	295	323	5.33	1721.59
ក្តាមថ្មី	10	17	13.5	9.35	126.225
ក្តាមជ័រ	6	6	6	2	12
សប្បីជាតិ (ខ្យង គ្រំ គ្រែង)	29	30	29.5	6.45	190.275
Total					6,630.78
Total income/fishery household/per time					65.65
Mean annual income per household*					18,119.55
Total fishery valuation per year in entire CFI**					13,698,385
Remarks:					
*Based on the interview, each fishery household conducts fishing activities with an average of 23 times per month.					
**The total number of fishery households in Trapeang Ropov CFI is 756 households.					
Dry season (November to April) and rainy season (November to October)					

c. Trapeang Sangke CFI

In Trapeang Sangke CFI, there are 212 fishery households. Based on the questionnaire survey results, each household is able to obtain the total average amount of **42.25USD** per time of fishing. Moreover, the mean annual income of each household is approximately **9,126.24USD**. In the entire CFI, the valuation of total fishery production is approximately **1,934,762USD** (Table 3.3).

Table 3.3: The fishery production (36 samples of fishery households)

Type of Fisheries	Fishery Production (kg/day)			Per Time	
	Dry season	Rainy season	Average Production	\$/kg	Total (USD)
ត្រីផ្ទូង	15	8	11.5	6.25	71.875
ត្រីកន្ទួង	11	11	11	6.25	68.75
ត្រីសេក	21	22	21.5	1.35	29.025
ត្រីតុកែ	1	1	1	2	2
ត្រីក្បូក	55.5	42.75	49.125	3	147.375
ត្រីកាតាំង	70	86	78	3.47	270.66
ត្រីកាម៉ាយ	20	20	20	0.75	15
ផ្សេងៗ (ត្រីកាជី, ត្រីកាប៉ះ)	47	47	47	3.87	181.89
ត្រីចម្រុះប្រភេទ	65	29	47	3.87	181.89
មីកស្កូក	5	20	12.5	5.25	65.625
បង្ការស	9	8	8.5	2.25	19.125
បង្កង	5	21	13	2.5	32.5

បង្កាខ្លាបឹង	47	29	38	2.92	110.96
បង្ការប៉ាក	12	8	10	5.33	53.3
ក្តាមសេះ	35	17	26	5.4	140.4
សប្បីជាតិ (ខ្យង គ្រំ គ្រែង)	47	49	48	2.43	116.64
សារាយសមុទ្រ	15	0	7.5	1.87	14.03
Total					1,521.04
Total income/fishery household/per time					42.25
Mean annual income per household*					9,126.24
Total fishery valuation per year in entire CFI**					1,934,762
Remarks:					
*Based on the interview, each fishery household conducts fishing activities with an average of 18 times per month.					
**The total number of fishery households in Trapeang Sangke CFI is 212 households.					
Dry season (November to April) and rainy season (November to October)					

d. Kampong Samaky CFI

In Kampong Samaky CFI, there are 339 fishery households. Based on the questionnaire survey results, each household is able to obtain the total average amount of **10.59USD** per time of fishing. Moreover, the mean annual income of each household is approximately **2,289.41USD**. In the entire CFI, the valuation of total fishery production is approximately **776,110USD** (Table 3.4).

Table 3.4: The fishery production (62 samples of fishery households)

Type of Fisheries	Fishery Production (kg/day)			Per Time	
	Dry season	Rainy season	Average Production	\$/kg	Total (USD)
ត្រីអាំងកើយ	3	3	3	2	6
ត្រីកន្ទួង	20	15	17.5	1.25	21.875
ត្រីកាម៉ុង	121.5	91.5	106.5	2.5	266.25
ត្រីកាតាំង	4.8	9.78	7.29	2.45	17.8605
ត្រីចម្រុះប្រភេទ	3	5	4	2.37	9.48
បង្ការស	21	20	20.5	3.86	79.13
បង្កង	10.5	5	7.75	7.5	58.125
បង្កាខ្លាបឹង	13	11	12	2.02	24.24
បង្ការខ្លីង	2	8	5	2.83	14.15
ក្តាមសេះ	31	16	23.5	6.81	160.035
Total					657.15
Total income/fishery household/per time					10.59
Mean annual income per household*					2,289.41
Total fishery valuation per year in entire CFI**					776,110
Remarks:					
*Based on the interview, each fishery household conducts fishing activities an average of 18 times per month.					
**The total number of fishery households in Kampong Samaky CFI is 339 households.					
Dry season (November to April) and rainy season (November to October)					

e. Kampong Tralach CFI

In Kampong Tralach CFI, there are 95 fishery households. Based on the questionnaire survey results, each household is able to obtain the total average amount of **25.7USD** per time of fishing. Moreover, the mean annual income of each household is approximately **7,401.6USD**. In the entire CFI, the valuation of total fishery production is approximately **703,152USD** (Table 3.5).

Table 3.5: The fishery production (18 samples of fishery households)

Type of Fisheries	Fishery Production (kg/day)			Per Time	
	Dry season	Rainy season	Average Production	\$/kg	Total (USD)
ត្រីអាំងកើយ	3	2	2.5	6	15
ត្រីតុកែ	2	1	1.5	6	9
ត្រីក្បូក	1	1	1	1	1
ត្រីកាម៉ាយ	3	3	3	1	3
ផ្សេងៗ (ត្រីមើច, ត្រីកាជី, ត្រីគ្រាប់ខ្នុរ, ត្រីពន្លួស, កូនត្រីដាក់ក្បាប់)	10	11	10.5	3.7	38.85
ត្រីចម្រុះប្រភេទ	31	43	37	2.5	92.5
មីកបំពង់	11		5.5	4.5	24.75
បង្ការស	8	5	6.5	3	19.5
បង្កាខ្លាបឹង	4	6	5	2.5	12.5
បង្កាខ្លីង	1	1	1	2.5	2.5
ក្តាមស្តុរ	70	50	60	4	240
សប្បីជាតិ (ខ្យង គ្រំ គ្រែង)	2	2	2	2	4
Total					462.6
Total income/fishery household/per time					25.7
Mean annual income per household*					7,401.6
Total fishery valuation per year in entire CFI**					703,152
Remarks:					
*Based on the interview, each fishery household conducts fishing activities with an average of 24 times per month.					
**The total number of fishery households in Kampong Tralach CFI is 95 households.					
Dry season (November to April) and rainy season (November to October)					

f. Phum Thmey CFI

In Phum Thmey CFI, there are 127 fishery households. Based on the questionnaire survey results, each household is able to obtain the total average amount of **122.69USD** per time of fishing. Moreover, the mean annual income of each household is approximately **30,919.9USD**. In the entire CFI, the valuation of total fishery production is approximately **3,926,828USD** (Table 3.6).

Table 3.6: The fishery production (23 samples of fishery households)

Type of Fisheries	Fishery Production (kg/day)			Per Time	
	Dry season	Rainy season	Average Production	\$/kg	Total (USD)
ត្រីឆ្លាម	5	5	5	3.75	18.75

សេក	19	12.5	15.75	1.87	29.4525
ត្រីតុកែ	5	3	4	10.62	42.48
ត្រីកាម៉ុង ឬត្រីប្លាតូ		20	10	2.5	25
ត្រីក្បក	10	10	10	3.5	35
ត្រីបែល	1	1	1	3.75	3.75
ត្រីកាម៉ាយ	25	13	19	1	19
ផ្សេងៗ (ត្រីគីង្កក់, ត្រីគ្រាប់ខ្មៅ, ត្រីគោ, ត្រីគោ, ត្រីដូអង្ករ, ត្រីថ្មី, ត្រីកេស, ត្រីក្រហម)	27.5	39.5	33.5	1.9	63.65
ផ្សេងៗ (ត្រីគ្រាប់ធូរ, ត្រីព្រលុះ, ត្រីខ្សាច់, ត្រីពន្លួស, ត្រីកូ)	17.5	28.5	23	2.6	59.8
ត្រីចម្រុះប្រភេទ	7.5	29.5	18.5	1.75	32.375
មីកបំពង់	10.5	11	10.75	8.25	88.6875
មីកស្លឹក	14.5	8.5	11.5	5	57.5
មីកពឹងពាង	65	36	50.5	5.41	273.205
បង្ការស	1.5	3.5	2.5	5.17	12.925
បង្កង	0.5	3.5	2	8.75	17.5
បង្ការប៉ារ៉ា	5.5	1.5	3.5	9.37	32.795
បង្កាខ្លីង	0.3	1	0.65	10	6.5
ក្តាមខ្លា	60	100	80	3	240
ក្តាមសេះ	365	348	356.5	5.09	1763.68
Total					2,822.06
Total income/fishery household/per time					122.69
Mean annual income per household*					30,919.9
Total fishery valuation per year in entire CFI**					3,926,828
Remarks:					
*Based on the interview, each fishery household conducts fishing activities with an average of 21 times per month.					
**The total number of fishery households in Phum Thmey CFI is 127 households.					
Dry season (November to April) and rainy season (November to October)					

g. Ou Krasar CFI

In Ou Krasar CFI, there are 109 fishery households. Based on the questionnaire survey results, each household is able to obtain the total average amount of **99.16USD** per time of fishing. Moreover, the mean annual income of each household is approximately **15,469.35USD**. In the entire CFI, the valuation of total fishery production is approximately **1,686,159USD** (Table 3.7).

Table 3.7: The fishery production (20 samples of fishery households)

Type of Fisheries	Fishery Production (kg/day)			Per Time	
	Dry season	Rainy season	Average Production	\$/kg	Total (USD)
ក្តាមសេះ	235	236	471	7	3297
ត្រីចម្រុះប្រភេទ	50	50	50	2.8	140

ត្រីបំបែល	40	57	48.5	3.5	169.75
សប្បីជាតិ (ខ្យង គ្រី គ្រែង)	10	10	10	2.5	25
Total					1,983.25
Total income/fishery household/per time					99.16
Mean annual income per household*					15,469.35
Total fishery valuation per year in entire CFI**					1,686,159
Remarks:					
*Based on the interview, each fishery household conducts fishing activities with an average of 13 times per month.					
**the total number of fishery household in Ou Krasar CFI is 109 households.					
Dry season (November to April) and rainy season (November to October)					

Figure 3.1 shows the total annual valuation of fishery production in all CFIs located in the study site. The total valuation is **25,248,063USD/year**, while the maximum valuation is found in the Trapeang Ropov CFI, which has the maximum number of fishery households. Moreover, the mean annual income is found to be high in the CFIs located in Keb Province, particularly for Phum Thmey and Ou Krasar CFIs. This might be explained by the high fishery production for Crab (ក្អមស៊ែ), which is very popular in Keb Province.

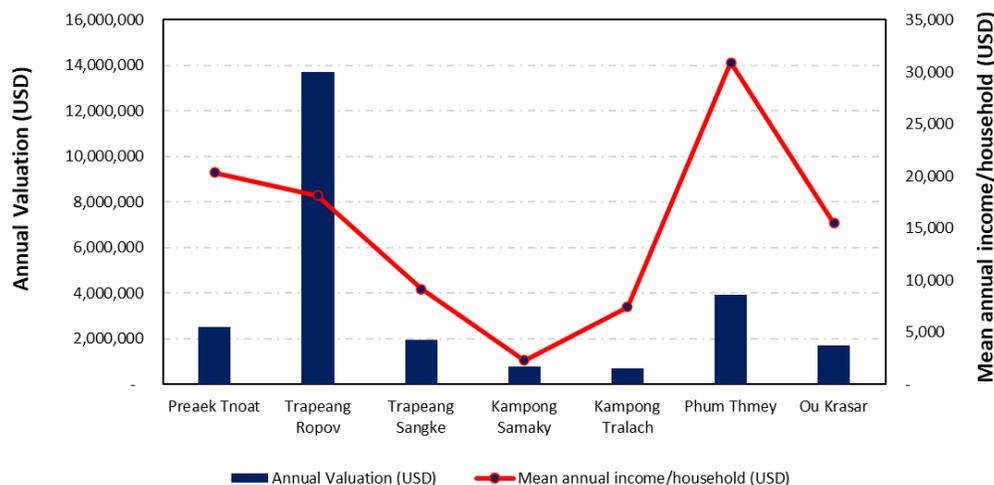


Figure 3.1: Annual valuation and mean annual income per household for each CFI

3.1.2. Indirect Valuation of Marine Resources

Based on the Figure, inside the project site, there is only seagrass resources, which has completely overlapped areas with both investment projects (CHING KOR Project and OMNI Project) with an overlapping area of **967 hectares**. There are no other marine resources such as coral and mangrove forests.

The seagrass ecosystem has many indirect services (regulating, supporting and cultural services), including carbon sequestration, biodiversity, climate regulation, water filtration, disease control, ocean acidification buffer, coastal protection, and tourism etc. (UNEP, 2010). However, to value those services are very difficult with a very limited dataset. Therefore, in this study, only the Carbon sequestration service is valued by using previous researches in Cambodia and neighboring countries, particularly in Southeast Asia. Table 3.8 shows the results from previous studies regarding the estimation of the valuation of key marine resources in Cambodia and Southeast Asia.

Table 3.8: The valuation of marine resources (Seagrass, Coral, and Mangrove)

No.	Marine Resources	Unit (Ton/ha)	Unit Price (USD/ton)	Valuation (USD/ha/Year)	Country	References
1 Seagrass						
1.1	On-site fisheries				Cambodia	Based on Questionnaire survey
1.2	Carbon sequestration	96.32	3 - 6*	433.44	Cambodia	Thorhaug et al., 2020; UNEP, 2008
2 Coral						
2.1	Coastal protection			171.00	SEA	WWF, 2013; USAID, 2015
2.2	Tourism			207.00	SEA	WWF, 2013; USAID, 2015
3 Mangrove						
3.1	Local use of aquatic product			282.00	SEA	WWF, 2013; USAID, 2015
3.2	Coastal protection			2,243.00	SEA	WWF, 2013; USAID, 2015
3.3	Tourism and recreation			3,000.00	SEA	WWF, 2013; USAID, 2015
3.4	Carbon sequestration	176.32	3 - 6*	793.44	Cambodia	Thorhaug et al., 2020; UNEP, 2008
3.5	Support to offshore fisheries			45.00	SEA	WWF, 2013; USAID, 2015

Remarks:

* The estimate of the selling price of carbon credit price is very difficult. This range of price is based on the selling price for carbon sequestration of forest (such as Prey Lang Wildlife Sanctuary, Keo Seima Wildlife Sanctuary, Southern Cardamom National Park and Tatal Wildlife Sanctuary), Said Secretary of State, Ministry of Environment, published on 9 October 2020 by Khmer Times (<https://www.khmertimeskh.com/50771699/carbon-credit-sales-enhance-cambodias-image-on-international-stage/>, retrieved on 6 February 2021)

For example, using the information from the table 3.8 above, the indirect valuation of seagrass as carbon sequestration is estimated to be **419,192.83USD/year** inside the overlapped areas, which is 967hectares. This is estimated by assuming the average unit price of carbon credit of 4.5 USD/ton C.

3.2. Valuation of Marine Resources in the study site

Table 3.9 shows the summary of all valuation of marine resources inside and surrounding the investment projects. Inside the investment project, the total valuation is approximately **25,667,255USD/year**, while the surrounding (5km radius) has a total valuation of approximately **17,390,009USD/year**. The surrounding marine resources are determined using the 5km buffer from the boundaries of each investment project. This 5km buffer has been applied for the full environmental and social impact assessment and is always recommended by the Department of Environmental Impact Assessment, Ministry of Environment. In this study, the services provided by the coral ecosystem are on-site fisheries, coastal protection, and tourism, while the services provided by mangrove forest are local use of the aquatic product, coastal protection, tourism and recreation, carbon sequestration and support to offshore fisheries (UNEP, 2013; and USAID, 2015). The valuation of marine resources inside the investment project is relatively high since the investment projects overlap the majority of the community fisheries (7

out of 11 CFis) in the region. Moreover, considering the potential inverse impacts to surrounding areas, the investment project will result in a huge loss of environmental valuation of approximately **43,057,265USD/year**.

Table 3.9: The summary of all valuation of marine resources inside and surrounding the investment projects

No.	Marine Resources	Valuation (USD/ha/Year)	Total Area (ha)	Total Valuation (USD/Year)
1	Overlapping Resources			25,667,255.61
1.1	Seagrass			
A	On-site fisheries			25,248,063
B	Carbon sequestration	433.44	967	419,192.83
2	Surrounding resources (5 km buffer from the investment projects)			17,390,009.59
2.1	Seagrass			9,355,019.19
A	On-site fisheries (Changhoan CFI)*			8,361,384.00
B	Carbon sequestration	433.44	2,292	993,635.19
2.2	Coral Reef			17,056.00
A	On-site fisheries	155.00	32	4,960.00
B	Coastal protection	171.00	32	5,472.00
C	Tourism	207.00	32	6,624.00
2.3	Mangrove			8,017,934.40
A	Local use of aquatic product	282.00	1,260	355,320.00
B	Coastal protection	2,243.00	1,260	2,826,180.00
C	Tourism and recreation	3,000.00	1,260	3,780,000.00
D	Carbon sequestration	793.44	1,260	999,734.40
E	Support to offshore fisheries	45.00	1,260	56,700.00

Remarks:

*Changhoan CFI is included for estimating the on-site fisheries since it is located within the 5km buffer. However, the estimation is based on the income per fishery household from Preaek Tnoat CFI, which is the nearest CFI.

3.3. Relocation of CFis

The relocation of Community Fisheries is not considered as an alternative for ESIA study. However, it is likely to happen since the relocation of two of CFis was already approved by the governmental ministry (MAFF) (Letter No. 483 ប្រកាស ក្រសួង ចាត់ ចែង លើ ថ្ងៃ ទី ០៧ ខែ ឧសភា ឆ្នាំ ២០២០, Prakas about the relocation of two community fisheries in Kampot Province). However, the relocation of those CFis (Preaek Tnoat and Trapeang Ropov CFis) will not be beneficial to community fisheries. The reasons are clear that the new locations of those CFis do not overlap with marine resources such as seagrass, resulting in no fishery productions (Figure 3.2). On the other hand, with those huge investment projects, the surrounding environmental resources or marine resources will be severely vulnerable and led to extinction due to project activities, particularly during construction phases.



Figure 3.2: The relocation of Community Fisheries (this modification is approved by MAFF for Preaek Tnoat and Trapeang Ropov CFIs, and under process for others)

Chapter 4: Potential Adverse Impacts

4.1. Environmental Adverse Impact Assessment

The environmental impacts assessment is carried out by considering all kinds of both direct and indirect impacts that can be resulted from the project activities. This assessment is also conducted by determining the magnitude and duration of the impacts. For this project, the environmental impact assessment is carried out during only the project implementation phases. All kinds of project activities can influence both negatively and positively on the existing environmental resources (physical environmental resources and biological environmental resources) and socio-economic situation for local people. The preparation of environmental impact mitigation is conducted by providing the appropriate mitigation options or alternatives, which can be implemented in order to avoid, reduce and compensate all kinds of environmental impacts based on the analysis of current environmental resources, project activities, and concerns and recommendation from local stakeholders and people.

To clearly identify the environmental impacts and also determine the mitigation measures, information leading to identify the relevant issues needs to be identified based on the information as follows:

- a.* Detail information related to the environmental impacts: information from previous sections (project description, description of environmental resources and socio-economic situation).
- b.* Definition of environmental and social impacts
 - **Scope of impacts:** the impacts can occur in both the project site and its surrounding areas.
 - **Duration of impacts:** the impacts can occur in short duration during project implementation and long duration after the project termination.
- c.* Magnitude of the impacts
 - **Major impacts:** the impacts caused by project activities, resulting in significant changes in current environmental resources in both present and future.
 - **Moderate impacts:** the impacts caused by project activities, resulting in moderate changes in current environmental resources in both present and future.
 - **Minor impacts:** the impacts caused by project activities, resulting in less significant changes in current environmental resources in both present and future.
 - **No impacts:** no impacts caused by project activities that may change the current environmental resources in both present and future.

A brief description of potential environmental impacts can be found in table 4.1 below. Moreover, the detailed description of environmental impacts on each environmental resource and mitigation measure can be found in the Table 4.2.

Table 4.1: Identification of Potential Impacts on Environmental Resources and Socio-Economic

Environmental resources and socio-economic situation	Impacts during Project Implementation Phase			Impact Magnitude
	Negative	No	Positive	
1. Construction Phase				
1.1. Physical environmental resources				
Hydrodynamic patterns	✓			Minor
Air quality	✓			Moderate
Noise and vibration disturbance	✓			Minor
Surface water quality)Seawater(✓			Major
1.2. Biological environmental resources				
Marine Resources (Fishery, Seagrass, and Coral)	✓			Major
1.3. Socio-economic situation				
Occupation/employment	✓			Major
Education	✓			Major
Coastal Traffic	✓			Moderate
2. Operational Phase				
2.1. Physical environmental resources				
Seawater quality	✓			Moderate
2.2. Biological environmental resources				
Marine resources (fishery, seagrass and coral)	✓			Moderate
2.3. Socio-economic				
Coastal Traffic	✓			Moderate

4.1.1. Potential Adverse Impacts on Environmental and Socio-Economic resources

The potential significant impacts from the investment projects are summarised below:

- Potential change in hydrodynamic or coastal current patterns;
- Potential impacts to noise and vibration quality;
- Potential impacts to coastal and seawater qualities (sedimentation & siltation, oil, solid waste and wastewater, etc.)
- Potential impacts to marine and coastal resources, particularly for seagrass bed, fishery and coral;
- Significant impacts on local people livelihood, particularly for the fishery household;
- Indirect impacts on the education to local people due to loss of income or employment.

Chapter 5: Conclusion

The findings of this Environmental and Social Impact Study shows that the impacts of investment project (CHING KOR Project and OMNI Project) have significant inverse impacts from moderate to major magnitudes to marine resources/habitat (seagrass, coral and mangrove) for both inside and surrounding the investment projects. Moreover, the project activities might trigger negative impacts on seawater quality due to dredging and reclamation during the construction and due to the solid waste and wastewater generation during both construction and operational phases.

- Socio-economic

The socio-economic study shows that the majority of households depend on fishery production. They commonly conduct fishery activities inside their community fisheries' boundaries. Their income is mainly used for their food, transportation, bank loan, and others. With these development projects, those fishery households will absolutely lose their income, resulting from the loss of marine resources, including fisheries and others in their FCis' boundaries. Without income, there will be strong impacts on their local livelihoods, including expenses for food, education of their children, the ability to pay bank loan, and others. Most of the households with an average of **76.2%** for all CFis do not support the investment projects. However, other **17.6%** support with conditions.

More importantly, the public consultation with all seven community fisheries shows that all the heads and members, who participated in this publication consultation, do not support both investment projects because it could potentially take away the benefit from fishery families whose daily life are based on coastal resources. However, they also provide their own point of view about the concerns and suggestions as follows:

- The investment project should not fill up or reclaim the coastal area, particularly at the community fisheries and develop as in the proposed plan;
- The investor may convey the investment plan to land area, but not coastal areas;
- The investment project should be implemented at the deeper part of the coastal areas, which are outside of communities' boundary defined by MAFF;
- Some community fisheries also suggest having a detailed study on environmental and social impacts, which can be conducted and shown in a public forum or include all key public consultation before the approval on these investment projects.

- Environmental Valuation

The analysis of environmental valuation shows that the investment projects may cause the loss of environmental valuation of approximately **25,667,255USD/year** by considering the complete loss due to the direct removal of environmental resources by dredging and reclamation. However, for the potential impacts with 5km surrounding the investment project, the environmental valuation to be lost is estimated to be approximately **43,057,265USD/year**.

Table 5.1: The summary of finding on potential impacts due to the development projects

Potential Adverse Impacts on Environment and Socio-Economic Conditions	Potential Positive Impact*
<ul style="list-style-type: none"> - 1,763 households whose main occupation depending on fishing will be heavily affected, resulting from development activities on their fishing grounds. - Inside the project site, the development project may cause the loss of seagrass, which has a total valuation of approximately 25,667,255USD/year, by considering the complete loss due to the direct removal of environmental resources by dredging and reclamation. This total valuation comprises of fishery production of at least 25,248,063USD/year and carbon sequestration of 419,192USD/year. The estimate fishery product here does not include of the big commercial fishing private sectors. - Additionally, the development of the project might further cause the loss of nearby environmental resources (considering 5 km surround the project site) of approximately 17,390,009USD/year, which is comprised of the loss of seagrass (9,355,019USD/year), Coral (17,056 USD/year) and Mangrove Forest (8,017,934USD/year). - Therefore, the total loss of environmental valuation caused by the development project might be estimated to be approximately 43,057,265USD/year. 	<ul style="list-style-type: none"> - 3000 Job opportunities for local people within 3 – 10 years when the project finished, which has a salary of 250USD to 2,000USD/month; - Reduce immigration to other regions of the country or abroad; - Increase the national economy by contributing the tax payment such as 5.5 million for salary tax, etc.; - Attract more investment to Cambodia, particularly surrounding the project site. - Establishment of attractive touristic sites such as natural resorts with improved infrastructures; - Environmental and social funds of 10,000 USD/year.
<p><i>*The positive impacts claimed by the project development</i></p>	

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