Climate Change Awareness and Capacity Building for Fisheries Sector in Cambodia: Needs Assessment

Fisheries Administration

and

WorldFish Center

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Abbreviations

ADB	Asian Development Bank
CC	Climate Change
CCA	Climate Change Alliance
CCCA	Cambodia Climate Change Alliance
CSO	Civil Society Organizations
EU	European Union
FAO	Food and Agriculture Organization
FGD	Focus Group Discussions
FiA	Fisheries Administration
GEF	Global Environment Facility
GIS	Geographic Information System
HARVEST	Helping Address Rural Vulnerabilities and Ecosystem Stability
IFReDI	Inland Fisheries Research and Development Institution
INC	Initial National Communication
IPCC	Intergovernmental Panel on Climate Change
KII	Key Informant Interview
MAFF	Ministry of Agriculture, Forestry and Fisheries
MOE	Ministry of Environment
NAPA	National Adaptation Programmes of Action
NCCC	National Climate Change Committee
NCDD	National Committee for Deconcentration and Decentralization
NP-SNDD	National Programme for Sub-National Democratic Development
NSDP	National Strategic Development Plan
PPCR	Pilot Program for Climate Resilience
REDD	Reducing Emissions from Deforestation and Forest Degradation
RGC	Royal Government of Cambodia
SIDA	Swedish International Development Cooperation Agency
SNC	Second National Communication
SPF	Strategic Planning Framework
SPSS	Statistical Package for the Social Sciences
UNEP	United Nation Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Aid
WB	World Bank
WorldFish	WorldFish Center

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Executive Summary

The Fisheries Administration in cooperation with WorldFish Center is implementing the project "*Building Capacity for Integrating Climate Change Adaptation in Fisheries Sector in Cambodia"*. The project aims to prepare fisheries stakeholders to respond to the potential impacts of Climate Change by increasing their awareness and capacity towards Climate Change. The project conducted training needs assessment with the following three-fold objectives:(1) understand the key fisheries stakeholders' perception and attitude towards Climate Change impacts on fishery sub-sectors; (2) assess the current knowledge and skills of key fisheries stakeholders to response to current and future Climate Change impacts; and, (3) determine appropriate capacity building tools to respond to Climate Change in the fishery sector. Quantitative and qualitative data and information were collected employing review of secondary data and collection of primary data using the instruments Key Informant Interviews (KII) and Focus Group Discussion (FGD). A total of one hundred thirty six (136) fisheries stakeholders had been interviewed in Phnom Penh and in the four regions of Cambodia.

Climate Change has been incorporated into national and sectoral strategies like the Rectangular Strategy II (2008) that identifies CC as major threat to the economic and growth prospects of the country. Both NSDP (2009 – 2013) and NP-SNDD (2010-2019) call for the mainstreaming of Climate Change. The Ministry of Environment in 2006 developed the National Adaptation Programs of Action (NAPA) of Cambodia to priorities projects on Climate adaptation in the country. The Fisheries Administration developed its SPF 2010 – 2019 with the adoption of Climate Change in its framework under the cross-sectoral section, which is being lead by a specific sub-group of the TWG of Fisheries.

TNA Findings

The analysis of stakeholders has been divided into two categories the authorities and the community. The analysis of awareness on Climate Change of the various stakeholders in these categories has been determined using the six selected parameters: *i.e.* perception and knowledge about climate change; observation of different parameters related to CC in the last 10 years; observed impacts of climate change in fishery sector; experienced changes in the resource and activities in the fishery sector; access to information and training about CC in the fishery sector; and preparedness on the impact of Climate Change.

Fisheries Administration Staff and Commune Councils

Seventy five (75) respondents from FiA and Commune Councils were interviewed in the survey. These respondents were categorized according to mandates, geographical locations and female from FiA staffs. Result shows that the respondents are aware of the current effects and impacts of climate change to the environment and to living things including human beings. However, a deeper understanding of climate change such as what causes and what are the future impacts and effects of CC and what types of mitigations and adaptations are needed are still lacking in the responses of the FiA and Commune Councils. Thus, the stakeholders with low level of knowledge on CC are at 66% and 34% with those at the medium level.

Result of the observation on different CC parameters in the last 10 years has been quite satisfactory at a rate of 63% for the high and medium level. However, level of awareness in the different categories varies *i.e.,* for the coastal region the low level is rated at 59%, Plain region at 58% and for the FiA females at 55%. These categories were also seen to have low level of knowledge on climate change in the first parameter measured. Awareness on the impact of climate change in the fishery sector is quite high at a rate of 73% for the high and medium levels. In the category result shows a satisfactory awareness among the respondents except for the commune councils that acquired 50% low level of awareness. As for the issues of changes in fishery sector, result for the eight parameters has shown a medium level of awareness of the respondents at a rate of 61%. The medium awareness of these stakeholders can be attributed in the types of occupation they practice compared with the communities or fishermen who are directly using the resource in a daily basis. Access to information and training about CC has been weak among stakeholders showing a rate of 64% of those with low level of awareness. Result shows that TV and radio were the main sources of information among the stakeholders and only 36% of the total respondents attended any of the awareness raising activities on CC. Awareness on preparedness or what skills the stakeholders needed is quite high at a rate of around 86% of the combined high and medium level of awareness. This means that the stakeholders are aware of what are the requirements for a successful awareness raised on CC and adaptation on the effects and impacts of this phenomenon. The most important support they mentioned is the need for funds for the CC adaptation in the sector, followed by receiving timely information and raising local awareness.

Overall, gaps of awareness of the total FiA and commune council stakeholders are low in almost all the parameters, but with emphasis on access to information, knowledge on climate change and observed impacts in the field. This could be supplemented by proper communications approach in increasing their knowledge about CC and an exposure in the field and the context of each region.

Community Respondents

Community respondents' awareness has been measured using the following parameters collected from the survey, *i.e.* knowledge about Climate Change, community observation and experience on various factors related to CC, experience of the respondents within the fishery sector, access to information and self preparedness. Results show that although the communities are aware of the changes in their surroundings and daily activities, their awareness of almost all the measured parameters are very low particularly on preparedness and knowledge about climate change. The community respondents are aware of the different effects and impact but on how to take advantage of this impacts are still missing to almost all respondents. The capacity building should start with raising awareness about CC, especially what causes these changes; and end it with self and community preparedness and adaptation with consideration of taking the impacts as opportunities rather than threats.

As noted in the assessment the FiA and Commune Councils are still at low level in terms of their knowledge and awareness about CC and its components. This is valid because this is a new phenomenon or initiative in the sector including the department. This is not different with the community respondents, that although they are aware of the different changes in their environment and to their daily activities, their awareness of the CC is still vague. Based on this, the following five (5) points are recommended: (1) that the department need to build capacity in application of climate

change in the fishery sector; (2) there is a need to facilitate the development of training courses including modules; (3) there is a need to develop a comprehensive and focused training plan particularly in the grassroots level; (4) there is a need for the development of strategy and policy in the sector to support awareness in all levels; (5) all of these needs have to be complemented with study tours in other areas or countries to have more practical understanding and knowledge of the CC in the sector.

The following trainings to capacitate the stakeholders are being proposed based on the needs in the sector.

Target Group	Activities/ Knowledge Gaps	Communication Methods	Capacity Building Approaches
FiA National Level	• Advance knowledge on CC and strategies of adaptation (local context) • Knowledge on local level CC impacts and changes • Knowledge of support needed in the local level • Knowledge on the appropriate communication strategies/ approaches to reach the community/fishermen	• Staff briefings • reports (e.g. Annual report of FiA cantonment office) • emails • intranets • Websites • events (forum, workshops, focus groups, launches and conferences • face to face meetings	• Workshops, review of secondary information to understand various adaptation practices in other countries • Orientation and briefing activities • Training on designing and development of materials and instrument for CC awareness raising • Actual visit in the rural areas particularly the fishery areas.
FiA (sub-national)	• Basic knowledge on CC and adaptation, • Communication, facilitation, and dissemination skills • Knowledge of the 5 capitals (human, social, physical, natural financial) situation in the grassroots level	• Staff briefings • Newsletters • Presentations • events • emails • intranets • websites	• Workshops and training on basic knowledge on CC and adaptation • Training of conducting ToT trainings. • Actual visit of the local situation • Resource mapping through PRA
Commune Council Members	• Strengthening of Disaster management	• community forums	• Rehearsal of Disaster Risk Management

	capacity • Commune Mapping Skills • Service Provision during disaster in the commune • Facilitation skills in conducting PRA	• events • leaflets & posters • Newsletters • face to face meetings	• Training on preparedness and project provision skills. • Training on facilitation skills and resource mapping through PRA
Community Members/ Fishermen/ Aquaculture farmers	• Access of information and warning from authorities • Monitoring skills • Alternative livelihood activities • Skills in participating in PRAs • Preparedness and disaster risk management	• Radio and TV • Local comedy theater • events • community forums • leaflets & posters	• Development of information to feed in the Radio and TV in the local context • Participation on the development of information materials for dissemination • Attendance to community forums and events

1. Introduction/ Background

Fisheries play a fundamental role for food security in Cambodian society. Fish is not only important for the daily diet of the population (fish contributes about 75% of annual animal protein requirement), but also in the economy of Cambodia. Cambodia's Fisheries are vulnerable to the impacts from Climate Change yet no clear strategy or plans have yet been formulated to adapt to the changes expected. The impact of Climate Change in Cambodia is severe but there is limited information on how to adapt to Climate Change in the fishery sector.

Therefore, the Fisheries Administration in cooperation with the WorldFish Center is implementing a project "*Building Capacity for Integrating Climate Change Adaptation in Fisheries Sector in Cambodia"*. The purpose of this project is to prepare key fisheries stakeholders to respond to the potential impacts of Climate Change, through increasing their awareness of the climate and building capacity among the key fisheries stakeholders.

2. Objective of the Needs Assessment

The following are the objectives of Climate Change awareness and capacity building needs assessment:

- To understand the key fisheries stakeholders' perception and attitude towards Climate Change impacts on fisheries sub-sectors;
- To assess the current knowledge and skills of key fisheries stakeholders to response to current and future Climate Change impacts;
- To determine appropriate capacity building tools to respond to Climate Change in fishery sector.

3. Definition of terms[1]

Climate

Climate is defined as the "average weather" or more rigorously as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). These relevant quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the *climate system*.

Climate Change

Climate Change refers to a statistically significant variation in either the mean state of the *climate* or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or *external forcings*, or to persistent *anthropogenic* changes in the composition of the *atmosphere* or in *land use*. Note that the *United Nations Framework Convention on Climate Change* (UNFCCC), in its Article 1, defines "climate change" as: "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods." The UNFCCC thus makes a distinction between "climate change" attributable to human activities altering the atmospheric composition, and "climate variability" attributable to natural causes.

[1] Drawn from IPCC Glossary of Terms and the Fisheries Law of Cambodia

Climate Change Adaptation
Adaptation is the adjustment in natural or *human systems* to a new or changing environment. Adaptation to *climate change* refers to adjustment in natural or human systems in response to actual or expected climatic *stimuli* or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation.

Climate Change Impact
Consequences of *climate change* on natural and *human systems*. Depending on the consideration of *adaptation*, one can distinguish between potential impacts and residual impacts. Potential impacts: All impacts that may occur given a projected change in *climate*, without considering adaptation. Residual impacts: The impacts of climate change that would occur after adaptation.

Climate Change Mitigation
Climate change mitigation is an *anthropogenic* intervention to reduce the *sources* or enhance the *sinks* of *greenhouse gases*.

Fisheries Administration
Fishery Administration is a government authority, which manages all fisheries under the direct authority of the Ministry of Agriculture, Forestry and Fisheries of the Kingdom of Cambodia.

Fisheries
Fisheries are activities leading to harvesting and marketing of fisheries resources. It may involve capture and collection of wild fishery resources or raising of fishery resources through aquaculture.

Fisheries Sector
A distinct part of Cambodia's society, which the activities include fisheries, culture based fisheries and aquaculture.

Fisheries Stakeholder
Fisheries stakeholders are all person, group, or organization that has direct or indirect stake/interest in the fishery domains of Cambodia.

Fishery Domains
Fishery domains include Inland Fishery Domains (rivers, tributaries, lakes, streams. effluents, creeks, reservoirs, inundated forest areas, canals, ponds, or deep water holes getting water from rivers, tributaries, lakes or effluents) and Marine Fishery Domains (the fishing areas that extend from the coastline at the higher high tide to the outer limits of the maritime boundaries declared by the Kingdom of Cambodia, and inundated forest areas), which are owned by the State.

Fishery Resources
Fishery resources include freshwater and marine organisms, which comprise living or non-living aquatic animals and plants as well as mollusks, corals, amphibians aquatic insects, aquatic reptiles, aquatic mammals, and water birds, which are born and live in the fishery domains.

Greenhouse Effect
Greenhouse gases effectively absorb *infrared radiation*, emitted by the Earth's surface, by the *atmosphere* itself due to the same gases, and by clouds. Atmospheric radiation is emitted to all sides, including downward to the Earth's surface. Thus, greenhouse gases trap heat within the surface-

troposphere system. This is called the "natural greenhouse effect." Atmospheric radiation is strongly coupled to the temperature of the level at which it is emitted. In the *troposphere,* the temperature generally decreases with height. Effectively, infrared radiation emitted to space originates from an altitude with a temperature of, on average, -19°C, in balance with the net incoming *solar radiation*, whereas the Earth's surface is kept at a much higher temperature of, on average, +14°C. An increase in the concentration of greenhouse gases leads to an increased infrared opacity of the atmosphere, and therefore to an effective radiation into space from a higher altitude at a lower temperature. This causes a *radiative forcing*, an imbalance that can only be compensated for by an increase of the temperature of the surface-troposphere system. This is the "enhanced greenhouse effect."

Greenhouse Gases

Greenhouse gases are those gaseous constituents of the *atmosphere*, both natural and *anthropogenic*, that absorb and emit radiation at specific wavelengths within the spectrum of *infrared radiation* emitted by the Earth's surface, the atmosphere, and clouds. This property causes the *greenhouse effect*. Water vapor (H2O), *carbon dioxide* (CO2), *nitrous oxide* (N2O), *methane* (CH4), and *ozone* (O3) are the primary greenhouse gases in the Earth's atmosphere. Moreover there are a number of entirely human-made greenhouse gases in the atmosphere, such as the *halocarbons* and other chlorine- and bromine-containing substances, dealt with under the *Montreal Protocol*. Besides CO2, N2O, and CH4, the *Kyoto Protocol* deals with the greenhouse gases *sulfur hexafluoride* (SF6), *hydrofluorocarbons* (HFCs), and *perfluorocarbons* (PFCs).

Infrared Radiation

Radiation emitted by the Earth's surface, the *atmosphere*, and clouds. It is also known as terrestrial or long-wave radiation. Infrared radiation has a distinctive range of wavelengths ("spectrum") longer than the wavelength of the red color in the visible part of the spectrum. The spectrum of infrared radiation is practically distinct from that of solar or short-wave radiation because of the difference in temperature between the Sun and the Earth-atmosphere system.

Kyoto Protocol

The Kyoto Protocol to the *United Nations Framework Convention on Climate Change* (UNFCCC) was adopted at the Third Session of the *Conference of the Parties* to the UNFCCC in 1997 in Kyoto, Japan. It contains legally binding commitments, in addition to those included in the UNFCCC. Countries included in *Annex B* of the Protocol (most countries in the Organisation for Economic Cooperation and Development, and countries with *economies in transition*) agreed to reduce their *anthropogenic greenhouse gas emissions* (*carbon dioxide*, *methane*, *nitrous oxide*, *hydrofluorocarbons*, *perfluorocarbons*, *and sulfurhexafluoride*) by at least 5% below 1990 levels in the commitment period 2008 to 2012. The Kyoto Protocol has not yet entered into force (September 2001).

Salinization

Salinization is the accumulation of salts in soils.

Sea-level Rise

Sea-level rise is an increase in the mean level of the ocean. Eustatic sea-level rise is a change in global average sea level brought about by an alteration to the volume of the world ocean. *Relative sea-level* rise occurs where there is a net increase in the level of the ocean relative to local land movements. Climate modelers largely concentrate on estimating eustatic sea-level change. *Impact* researchers focus on relative sea-level change.

Vulnerability

Vulnerability is the degree to which a system is susceptible to, or unable to cope with, adverse effects of *climate change*, including *climate variability* and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its *sensitivity*, and its *adaptive capacity*.

4. Scope of the TNA Methods and Approaches

4.1. Data and information collection

The quantitative and qualitative data and information needed for the assessment were collected using two types of instruments – the Key Informant Interviews (KII) and Focus Group Discussions (FGDs). Prior to the development of instruments, the team reviewed relevant documents on Climate Change development in Cambodia, particularly the fishery sector.

4.2. Identification of Stakeholders

The assessment was conducted among key fisheries stakeholders at different levels, from community level to national level in the four geographical regions of Cambodia. The identified key fisheries stakeholders are: national and sub-national fisheries officers (strategists, policy makers and project implementers), community fisheries, aquaculture farmers, fish processing association, fisheries-dependent households who are most vulnerable to CC impacts (women, children, poor families, floating villagers, seasonal fishers, fish traders), local authorities (district and commune-level councils), and CBOs focus on fisheries

4.3. Identification of target sampling areas

The Climate Change capacity assessment was conducted in Phnom Penh and ten (10) Provinces (Pursat, Battambang, Siem Reap, Kompong Thom, Kratie, Kandal, Takeo, and Sihanouk Ville, and Koh Kong) representing the four geographical Regions (Tonle Sap, Plain, Plateau and Mountain, and the Coastal) of Cambodia.

4.4. Training of Enumerators

The enumerators have been mobilized from the staff of the FiA Phnom Penh. These enumerators have been trained for three days on the familiarization of terms, meaning, and delivery of the various questions of the instruments both KIIs and FGDs. After two days of training, the enumerators conduct a pre-test of the questionnaire with some FiA staff, and finalized the questionnaire based on the responses from the pre-test activity.

4.5. Field primary data collection

The field activities were conducted in the target provinces and accomplished after a month. Using the finalized instrument, 136 respondents from the different stakeholders were interviewed.

Key Informant Interview: A structured questionnaire was designed to interview the identified stakeholders from the three different levels - national, sub-national and local level. The interview aimed to understand the perception on Climate Change and its impact in the fishery sub-sectors and local

livelihood. It also aimed to determine the different level of needs from different stakeholders to improve Climate Change knowledge and adaptation capacities. The actual numbers of interviewed respondents during the field data collection are presented in Table 1.

Table 1. Actual Target Stakeholders Interviewed

Stakeholders	Province										
	Pursat	Battam bang	Siem Reap	Kampong Thom	Kandal	Takeo	Kratie	Sihanouk	Koh Kong	Phnom Penh	Total
	n	n	n	n	n	n	n	n	n	n	n
FiA (national level)	-	-	-	-	-	-	-	-	-	7	7
FiA (sub-national)	8	10	4	8	1	11	5	8	9	-	64
Commune councils	2	-	1	-	-	1	-	-	-	-	4
Fishery community	3	-	-	-	-	-	2	-	-	-	5
Fisherman	4	-	-	-	-	-	1	1	-	-	6
Fish Trader	2	-	-	-	-	2	-	1	-	-	5
Fish farmer	1	-	6	-	-	4	-	-	-	-	11
Fish processer	-	-	-	4	-	-	7	10	-	-	21
Farmer	3	-	-	-	-	5	5	-	-	-	13
Total	23	10	11	12	1	23	20	20	9	7	136

Focus group discussions (FGD) were conducted in selected areas; the main purpose is to encourage all stakeholders to deeply share their knowledge and personal experiences regarding Climate Change with each other. This allows the researchers/facilitators to observe the interaction between the participants with different backgrounds and perspective on Climate Change. The group discussions were conducted mainly at provincial and local level.

4.6. Data entry/analysis

The completed questionnaires for the survey interview were checked for correctness of administration and for logic of responses at the field. This checking process was done by the WorldFish and Fisheries Administration (FiA) Project Team Leader.

At the end of the field survey, all completed and checked questionnaires were double checked and brought to WorldFish office in Phnom Penh for final checking and cleaning. Thereafter, all questionnaires were encoded by the staff of FiA under the supervision of the FiA Project team leader and WorldFish consultant.

Quantitative data from the survey interview were encoded, processed and analyzed using the Statistical Package for the Social Sciences (SPSS) Software version 19. Descriptive statistics, measures of central tendency and dispersion, frequencies, tables and charts were used in the analysis and presented the data and information needed to address the objectives of the study. Reference files (database and tables and graphs for reports and Power Point presentations) were prepared using MS Excel/ Power Point software.

Qualitative data formatted in SPSS and MS Excel (*i.e.* responses to open-ended questions that gathered from Survey, and FGD) were translated to English, compiled, coded accordingly, and the same process described above were applied. Copies of the compiled raw qualitative data translated to English would be submitted to WorldFish and FiA as part of the reports.

4.7. Study Challenges and limitation of the study

Availability of the target respondents particularly the authorities in the sub-national offices are sometimes out of office for a meeting thus target time of completion of the survey has been affected.

The number of respondents is limited to more comprehensive and statistical analysis, especially the representative of each stakeholder and region.

5. Contextual Analysis

5.1. Climate Change/Global Warming[2]

Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be a change in average weather conditions, or in the distribution of weather around the average conditions. Climate change is caused by factors that include oceanic processes (such as oceanic circulation), variations in solar radiation received by Earth, plate tectonics and volcanic eruptions, and human-induced alterations of the natural world; these latter effects are currently causing global warming, and "climate change" is often used to describe human-specific impacts.

Global warming is the continuous increase of the average temperature of the Earth's atmosphere and oceans since the late 19th century. Based on NASA's Goddard Institute for Space studies, the Earth's mean surface temperature has increased by about 0.8 °C (1.4 °F) over the past 100 years, with about 0.6 °C (1.0 °F) of this warming occurring over just the past three decades. The global warming has been attributed by many scientists in the increasing concentrations of greenhouse gases produced by the anthropogenic (human induced) such as burning of fossil fuels and deforestation. As early 1898, scientist Svante Arrhenius publishes the first calculation of global warming from human emissions of CO2. He concludes that industrial-age coal burning will enhance the natural greenhouse effect. The greenhouse effect is when the heat from the Earth is radiated outward and absorbed by "greenhouse gases" (Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), and other gases such as chlorofluorocarbons) in the atmosphere. This process prevents heat from disappearing into space and keeps the Earth warmer. The computer modeling by the Intergovernmental Panel on Climate Change (IPCC), which was established in 1988 to collate and assess evidence on climate change, indicates that during the 21st century the global surface temperature is likely to increase a further 1.1 to 2.9 ^{0}C (2 to 5.2 ^{0}F) on lowest emissions scenario and 2.4 to 6.4 ^{0}C (4.3 to 11.5 ^{0}F) on highest emissions scenario.

Some of the identified effects of an increasing global temperature include a rise in sea levels and a change in the amount and pattern of precipitation, as well a probable expansion of subtropical deserts. The Arctic would be associated with the continuing retreat of glaciers, permafrost and sea ice, the melting of ice sheets could result sea level rise. More frequent occurrence of extreme-weather events including strong hurricanes, heat waves, wildfires, droughts and heavy rainfall, ocean acidification and species extinctions due to shifting temperature regimes are expected. The rise in temperature and increased atmospheric CO_2levels are expected to affect most ecosystems, including tundra, mangroves, and coral reefs. It is expected that these will result in the extinction of many species and reduced diversity of the said ecosystems. The increase of dissolved CO_2may cause ocean acidity, which may result to mass mortality of the marine species.

The vulnerability of human societies to the global warming lies in the effects of extreme-weather events rather than gradual climate change. Climate change is likely to adversely affect millions of people

[2] Drawn from Wikipedia, the free encyclopaedia. http://en.wikipedia.org/wiki/Global_warming; http://en.wikipedia.org/wiki/Climate_change (Accessed date: 10 September 2012)

through increased coastal flooding, reductions in water supplies, increased malnutrition and increased health impacts. Effects significant to humans include the threat to food security from decreasing crop yields and the loss of habitat from inundation.

Policy responses to global warming include mitigation by emissions reduction, adaptation to its effects, and possible future reengineering. Reducing the amount of future climate change is called mitigation of climate change. The IPCC defines mitigation as activities that reduce greenhouse gas (GHG) emissions, or enhance the capacity of carbon sinks to absorb GHGs from the atmosphere. Many countries, both developing and developed, are aiming to use cleaner, less polluting, technologies. Use of these technologies aids mitigation and could result in substantial reductions in CO_2 emissions. Policies include targets for emissions reductions, increased use of renewable energy, and increased energy efficiency. Adaptation to climate change may be planned, either in reaction to or anticipation of climate change, or spontaneous, i.e., without government intervention. The ability to adapt is closely linked to social and economic development. Planned adaptation is already occurring on a limited basis. The barriers, limits, and costs of future adaptation are not fully understood.

Most countries are parties to the United Nations Framework Convention on Climate Change (UNFCCC), whose ultimate objective is to prevent dangerous anthropogenic climate change. Parties to the UNFCCC have adopted a range of policies designed to reduce greenhouse gas emissions and to assist in adaptation to global warming. Parties to the UNFCCC have agreed that deep cuts in emissions are required, and that future global warming should be limited to below 2.0 °C (3.6 °F) relative to the pre-industrial level.

5.2. National Strategy[3]

Cambodia acceded to the UNFCCC in December 1995 and ratified the Convention in December 1996. This included assessments of Climate Change impact on key sectors. Since ratification of the UNFCCC, Cambodia has adopted many policies to address issues of Climate Change. In 2006, the first National Adaptation Program of Action to Climate Change (NAPA) was approved, identifying priority projects in agriculture, water resources, coastal zone, and health. As part of Cambodia's reporting commitments to UNFCCC, two scientific assessments have been undertaken – the Initial National Communication (INC), in 2002, and the Second National Communication (SNC), prepared in 2010 and 2011 by the Ministry of Environment (MoE).

The first national forum on Climate Change was held in October 2009, chaired by the Prime Minister.

The National Climate Change Committee (NCCC) was established in April 2006 as a high-level inter-ministerial body to provide policy coordination and guidance on Climate Change. Since 2009, the Prime Minister is the Honorary Chair of the NCCC. Within the MoE, a Climate Change Office had been promoted to department level in 2009.

In 2010 MoE and the Ministry of Agriculture, Forestry and Fisheries (MAFF) worked together to complete the 'road map' required as part of the preparations for REDD financial support.

Climate Change is being incorporated into national and sectoral strategies. The Rectangular Strategy II (2008) identifies Climate Change as a major threat to the country's economic and growth prospects. In addition, both the National Strategic Development Plan Update (NSDP) 2009-2013 and the

[3]MoE and UNDP Cambodia. 2011. Cambodia Human Development Report 2011. Building Resilience: The Future of Rural Livelihoods in the Face of Climate Change.

Implementation Plan for Decentralization and Deconcentration 2011-2013, under the National Program for Sub- National Democratic Development (NP-SNDD) 2010- 2019, call for the need to mainstream Climate Change (NCDD 2010). The sectoral National Strategy on Disaster Risk Reduction, the National Social Protection Strategy and the draft National Environment and Health Action Plan also recognized the importance of addressing Climate Change.

The RGC has also moved forward on carbon markets, having developed guidelines for CDM projects; seven projects were developed by late 2010, which amounted to 574,804 tonnes of CO_2 reduction per year generating carbon credits (IGES/MoE 2010). At least four projects under voluntary carbon markets have been operating or being proposed in the country, mainly by civil society organisations (CSOs).

Climate Change Projects currently being implemented in Cambodia include:

- NAPA follow-up project on Climate-Resilient Water Management and Agricultural Practices in Rural Cambodia is funded by GEF, UNDP and Government with US$3.09 million.
- PPCR (Pilot Project for Climate Resilience) is funded by WB and ABD with a total budget US$105 of which US$50 million grants and US$55 million soft loan.
- CCCA (Cambodia Climate Change Alliance) is being implemented by MoE and funded by EU, UNDP, SIDA, and Danida for approximately US$9 million.
- National REDD Road Map is being funded by WB, UNDP, FAO and UNEP with over US$6 million committed and it is expected to reach more than US$10 million.
- Vulnerability Assessment and Adaptation Program for Climate Change within the Coastal Zone of Cambodia Considering Livelihood Improvement and Ecosystems is being funded by UNEP for US$1.6 million.
- Helping Address Rural Vulnerabilities and Ecosystem Stability (HARVEST), funded by the USAID, will support natural resources management, forestry and Climate Change from 2011-2015.

5.3. Fisheries Administration Strategy

The Fisheries Administration Strategic Planning Framework (SPF) for fisheries 2010–2019 has recognized the importance of understanding the effects of climate change including measures on how to adapt and mitigate to these effects and impacts. This issue, categorized under Cross-Sectoral Influences of SPF for the fisheries, which a specific Sub- Group of the Technical Working Group (Fisheries), are now focused and working on the climate change and the opportunities and threats posed by the proposal to build hydro-electric dams in the Mekong. (For detailed information please see SPF for Fisheries: 2010 – 2019)

The FiA was awarded support from Cambodia Climate Change Alliance (CCCA) to implement and conduct capacity building of the different stakeholders regarding climate change in the fishery sector entitled "*Building Capacity for Integrating Climate Change Adaptation in Fisheries Sector in Cambodia"*. This assessment is part of this initiative of FiA to accomplish its framework.

6. Findings

6.1. Process of acquiring score of the stakeholder respondents on the parameters

Based on the design of the training needs assessment, **six parameters** have been used and measured to be able to determine the awareness of the different stakeholders regarding Climate Change in the fishery sector. The score of each respondent in each parameter has been acquired as follows:

1. **Perception and knowledge about Climate Change** to determine and measure the perception and knowledge of the stakeholders, each respondent was asked to provide definition about Climate Change, adaptation, and mitigation based on their own knowledge and perceptions. The answers of the respondents were categorized according to the nearest standard definition of the IPCC and UNFCCC. Each answer has been treated as the score of each respondent to determine her/his awareness about CC. The more answers she/he has provided that are related to the standard definition of CC, the higher the score she/he can get; and likewise for those who cannot provide an answer or answers not related to Climate Change.

2. **Observation of different parameters related to Climate Change in the last 10 years.** The survey has provided different parameters in the table that could be rated as higher, lower, and same as before. The score of each respondent is based on each parameter's context in each region; the score is high if the answer is according to the context of the parameters which is supported by the agreed notion of the majority.

3. **Observed impacts of Climate Change in the fishery sector.** The respondents were asked to provide observed impacts of CC in the fishery sector. The respondents' answers were categorized based on the relationship of her/his answers to the impact of CC in the fishery sector. The score of each respondent is based on the number of her/his answer that is related to CC in the fishery sector. The more answers she/he has provided that are related to CC and fishery sector, the higher the score she/he may get.

4. **Experienced/Observed Changes in the resources and activities in the fishery sector.** The survey listed number of issues and activities in the fishery sector such as fish catch, size and type of fish, fishing gear practices/gear used, livelihood opportunity, fish processing and aquaculture production to determine from the respondents the changes based on their own experience and observation in the last ten years. The change has been measured as more, less, and same as before. The score of each respondent is based on the findings of various studies on the status of each issue or activity. The more the respondent's answers are related to the existing facts, the higher the score she/he can obtain.

The respondents also provided the most interesting changes in fishing activities based on their experience and observation. The respondents gain points from the number of their answer; and the more answers that are related to fishing activities they give, the higher the score they can gain.

5. **Access to information and training regarding CC in the fishery sector.** Respondents provided the source or medium of information where they heard about climate change. The more number of these sources a respondent provided, the higher the score she/he can gain. Attendance to consultation; workshop or training courses on climate change had been included in the access to

information. The respondent obtained her/his score if she/he had attended any of the activities on raising awareness or information about climate change.

6. Self preparedness on the impact of Climate Change. The respondents' levels of understanding on the importance of various support and assistance for climate change adaptation have been measured. Support and assistance have been rated in three categories such as, important, medium of importance, and not important. Important answer has the highest score that a respondent can get. The respondents also have given the chance to enumerate what they need particularly on their knowledge and skills development regarding climate change. The number of answers determines the score of each respondent.

6.2. Current Awareness of Stakeholders

6.2.1. Fisheries Administration Staff and Commune Councils Level of Awareness

The Fisheries Administration and Commune Councils respondents are composed of 75 (55%) of the total (136) respondents interviewed around the country. The analysis of these stakeholders has been categorized according to their mandates, geographical locations (regions), and the females of the FiA staffs. Based on the process to measure the level of awareness of stakeholders as discussed in section 5.1., the following results of the survey have been attained;

6.2.1.1. Perception and knowledge of FiA and Commune Councils about Climate Change. Most of the respondents defined climate change as the change in temperature of the environment; causes the serious natural disaster; the occurrence of unpredictable; and the change of weather from year to year; affecting human and animal health like spread of diseases. It can be noted in the definition that the respondents' main thought about CC is the change of temperature which usually increases from its normal condition. The respondents also understand that the change has resulted to different consequences such as irregular rain, drought, flood, serous disasters, natural resources degradation, and also causes diseases to both humans and animals. However, no one from the respondents defined what the causes of Climate Change are and what are its immediate and long term impacts or effects to the environment.

The respondents defined Climate Adaptation as the natural coping mechanism of the people with the change brought about by CC; they also described it as the way to seek alternative approaches and strategies to address climate change impacts; some respondents also defined climate adaptation as the way to find suitable shelter during time of disasters; and others mentioned that CC adaptation is seeking alternative means in fishing activities to cope with the changes brought about by CC. It can be noted in the definition that the understanding of the stakeholders about adaptation is just to prepare them in the possible impact of the CC but not to take this as a whole package of program such as planning, implementation and management of activities towards reducing the impact of CC, and monitoring and evaluation of the different changes and take these changes as benefits and opportunities in their daily lives and activities.

Climate Change mitigation has been defined by the respondents as the way of participating in activities such as planting of trees or increasing the protection and conservation of forest including the flooded

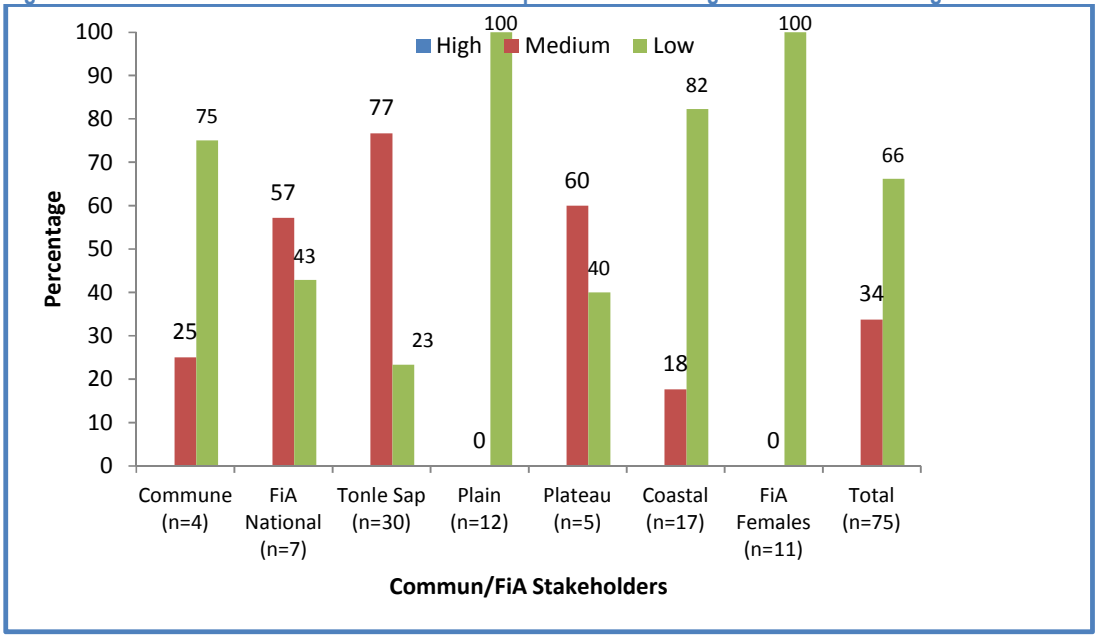
forests; some respondents describe it also as the way to balance climate and minimize or lessen the level of change; others mentioned the reduction of use of chemical polluting products gas and the reduction of huge and polluting industrial activities and wastes. Based on these definitions of the stakeholders it can be noted that they only knew about the local interventions on how to mitigate climate change. The respondents particularly the FiA staff did not mention anything about the different initiatives of the United Nations and other international organizations and committees supporting various agreements, policies and laws regarding mitigating measures that are being implemented in various countries especially in the developing countries seen as a critical pool for the sequestration of carbon sinks, (*e.g*. REDD+, CDM etc..)

Taking all these considerations, the awareness of each respondent has been measured. Each answer of the respondent has been given corresponding score and measured according to its relationship to the subject. The result in Figure 1 shows that the level of the two stakeholders varies among categories and geographical locations. Using the average of each category, nobody got the highest level of knowledge about climate change. The respondents in Tonle Sap Region (medium=77%) have the highest level of perception and knowledge based on the collected and analyzed data. This level of awareness of the respondents in this region could be attributed to the intervention of numbers of donors and INGOs and NGOs in the area because the region has been considered as the poorest region of Cambodia. The FiA in the national level (57%) and Plateau and Mountain Region (60%) have a considerable level of awareness on CC based on the result of the survey.

The Plain Region and the FiA female staff have the highest number of those who have low level of knowledge regarding Climate Change. This could be attributed in the number of those who have attended consultation, workshop, or training regarding climate change. Based on the data collected in the plain region, only 3 out of 12 respondents have attended any of these activities in climate change. The same way for the FiA female respondents, data show that only 4 out of 11 respondents have attended any of these climate change activities. Coastal region has also a considerable low level of knowledge about climate change at 82% of the total respondents of the region.

Overall, the level of knowledge for both the commune council, FiA national and sub-national was low at 66% of the total respondents of these stakeholders. This could be attributed to the number of those who attended training in CC, that is only 36% of the total (75) stakeholders have attended training, consultation or workshop about CC. This means that there is still a need for a comprehensive training for the FiA staff, both national and sub-national, in consideration of gender and the local authorities.

Figure 1. FiA and Commune Councils Level of Perception and Knowledge about Climate Change



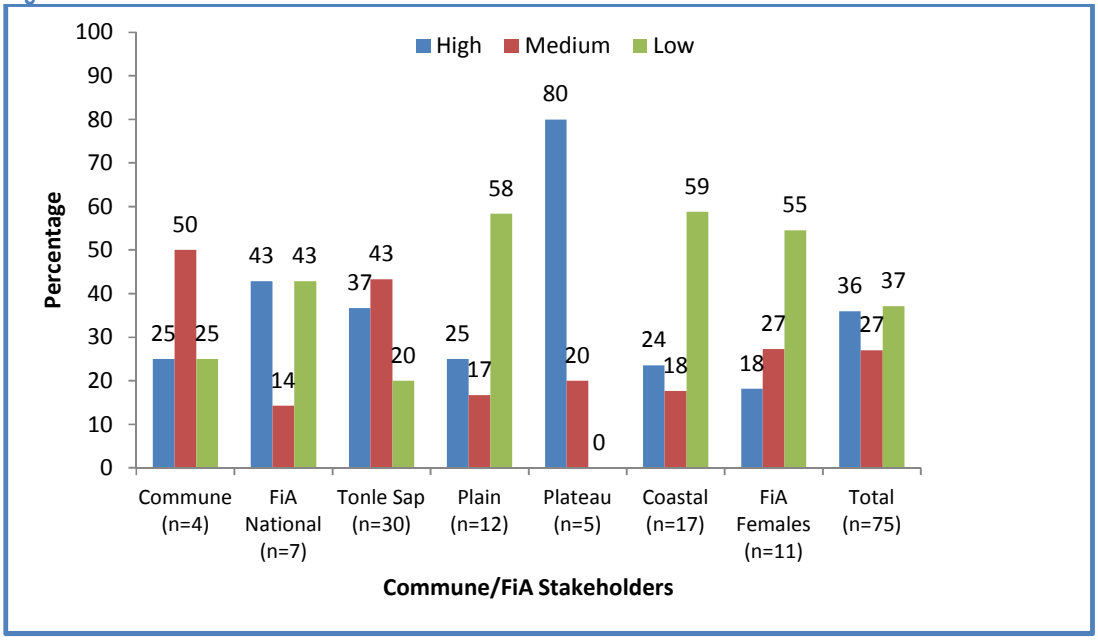
6.2.1.2. Observation of the different parameters related to Climate Change in the last 10 years. Climate Change parameters such as temperature, extreme events, rainfall in dry and wet, freshwater temperature, runoff and erosion, water level dry and wet, and sea level have been determined for levels of change in the last 10 years by the respondents. Respondents' levels of awareness on these parameters have been measured based on the facts from different research particularly in the context of Cambodia. The more related the answers of the respondent from these facts, the higher the score she/he gets.

The result that is based on collated and analyzed data from the two stakeholders in the different locations (Figure 2), shows that those respondents from Plateau and Mountain Region have the highest percentage (80%) when it comes to the high level of awareness on the changes of the different parameters in their area. This could be attributed to the higher awareness of the five total respondents on the changes in their environment. However, this is still contestable because of the less number of respondents representing this region, which only has one province and five respondents.

The respondents from the coastal and plain regions and the FiA female staff have the highest percentage with the low level of score on their awareness on the different parameters of climate change. This could also be attributed to their perception and knowledge about climate change, which is also low.

Overall, the average of awareness of the total respondents about the different climate change parameters is still higher in the low level of 37%. Although, this was balanced by those respondents with high and medium level of awareness, still the respondents with high level of awareness are only at 36%. All of these parameters are usually practical knowledge that can be acquired from a more comprehensive knowledge training of the respondents.

Figure 2. FiA and Commune Councils Level of Awareness about the Different CC Parameters

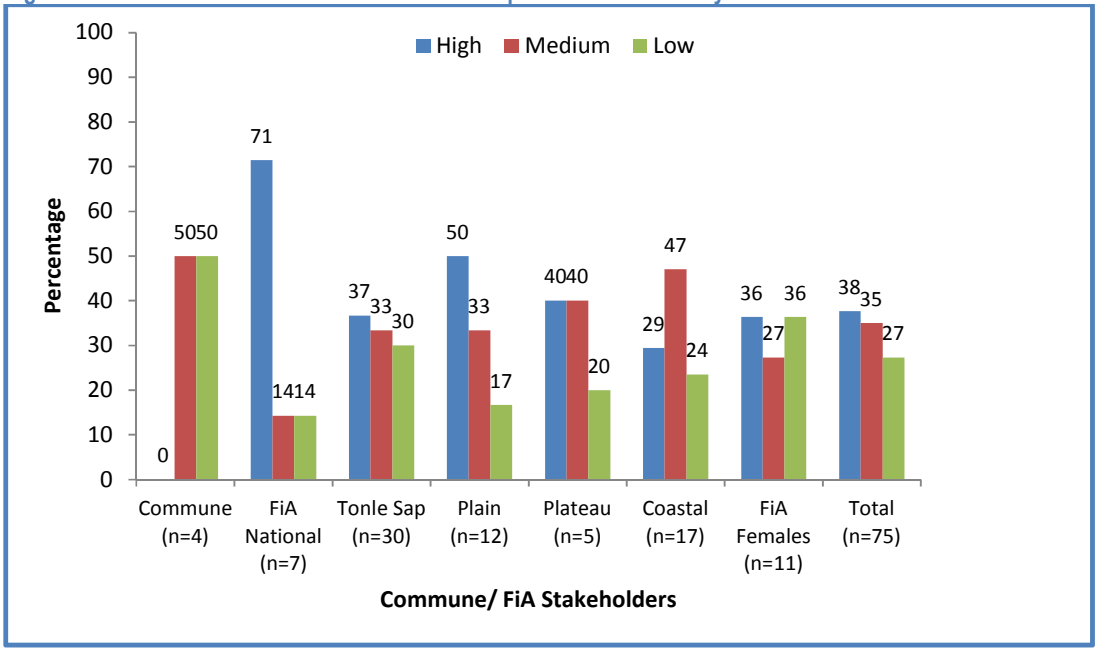


6.2.1.3. Observed impacts of Climate Change in the fishery sector. The fishery administration staff particularly those in the national level (71%) show more awareness on the different impacts of climate change in the fishery sector. This could be attributed to the continuous monitoring of the respondents on the different activities and changes in the fishery sector. The most mentioned impact of the respondents are: the increase temperature of the water particularly during the dry season, which causes mortality of fishery resources including the destruction of fishery habitats; they also observed the difficulties of fish farmers for both season, that is during the dry season as temperature increases diseases also increasing which hinders the normal growth of the fish; during the wet season flood is the main constraint of fish farmers because fish stocks are escaping from the pond; amounts of fish catch both in size and species are decreasing based on the data being collected from the fishery areas; and the irregular season also is affecting the water hydrology which also affects the breeding and spawning in the river and lake. These are only some of the main impact mentioned by the respondents with still dozens of impact that have been shared in during the survey. This only shows that the respondents are familiar of the various impacts that climate change are bringing in the fishery sector. However, to put these impacts into the context or in the way that these could be used as educational material/tool for the communities to understand and used as guide to reduce or eliminate risk and impact are highly necessary.

It is interesting to note in the result of the survey that there is no one from the four commune councils who was able to answer higher level than in the medium level. This could be attributed to the type of their occupation compared with the authorities from the FiA.

Overall, the observations of the FiA and Commune Council stakeholders of the various impacts of climate change in the fishery sector are satisfactory. However, there are still number of respondents who are in the low level of their awareness on these different parameters, which need to be supported and trained.

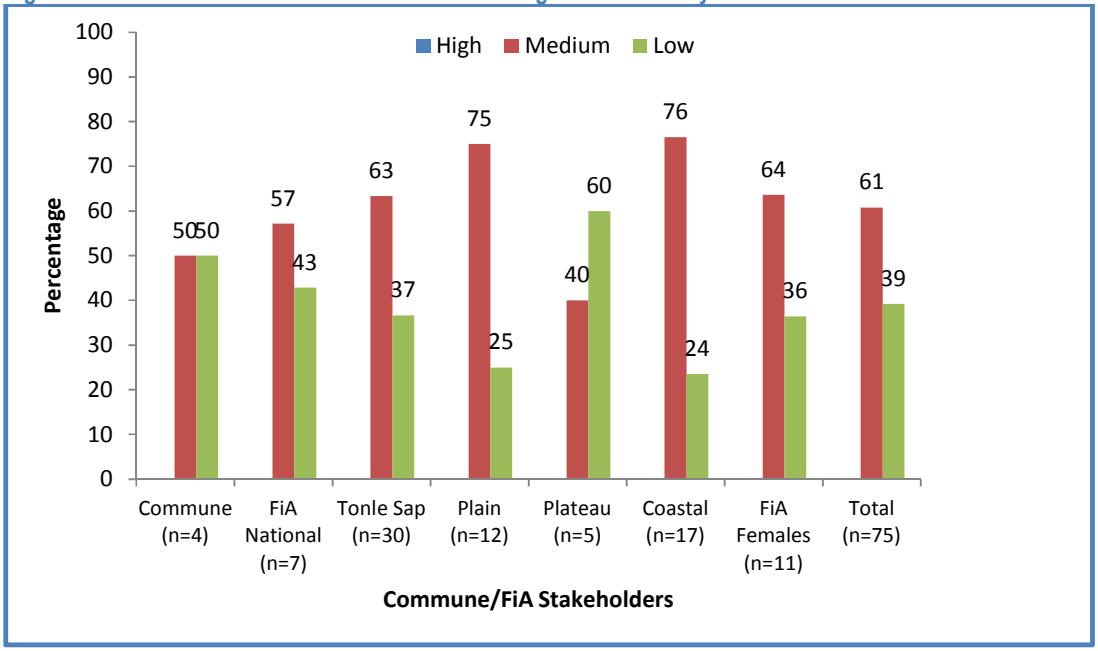
Figure 3. FiA and Commune Councils Observed Impacts of CC in Fishery Sector



6.2.1.4. Experienced/Observed Changes in the fishery resource and activities in the sector. The FiA and Commune Council level of awareness of the different changes of the fishery resource and activities are in the medium level of their awareness. The measured factors in the sector are; fish catch, fish size and type, fishing practices or gear used, livelihood opportunities, fish processing and aquaculture production. It could be noticed in the result that none of the stakeholders in any location reached the high level of awareness on these different factors measured. This result could be attributed to the less experience of the respondents on the actual fishing activity compared with the communities or the fishermen. Usually the knowledge of the FiA staff is more acquired or taken from the report or observed changes in the fishery resource and activities, thus, they could not provide direct answers on the factors being asked. In this sense, the knowledge of the direct users of the fishery resources is useful in the development of the module for any training that is necessary in increasing the awareness of the various stakeholders in this sector.

The Plain (75%) and Coastal (76%) regions have the highest percentage with the medium level of awareness compared from the other geographical regions and category. The Plateau and Mountain Region have the highest percentage of those with the low level of awareness on the changes of the different factors in the fishery sector. Overall, although no one from the stakeholders' category reached the high level of awareness, the medium level of knowledge has satisfactory gained higher percentage of 61% of the total stakeholders' respondents.

Figure 4. FiA and Commune Councils Observed Changes in the Fishery and Activities in the Sector



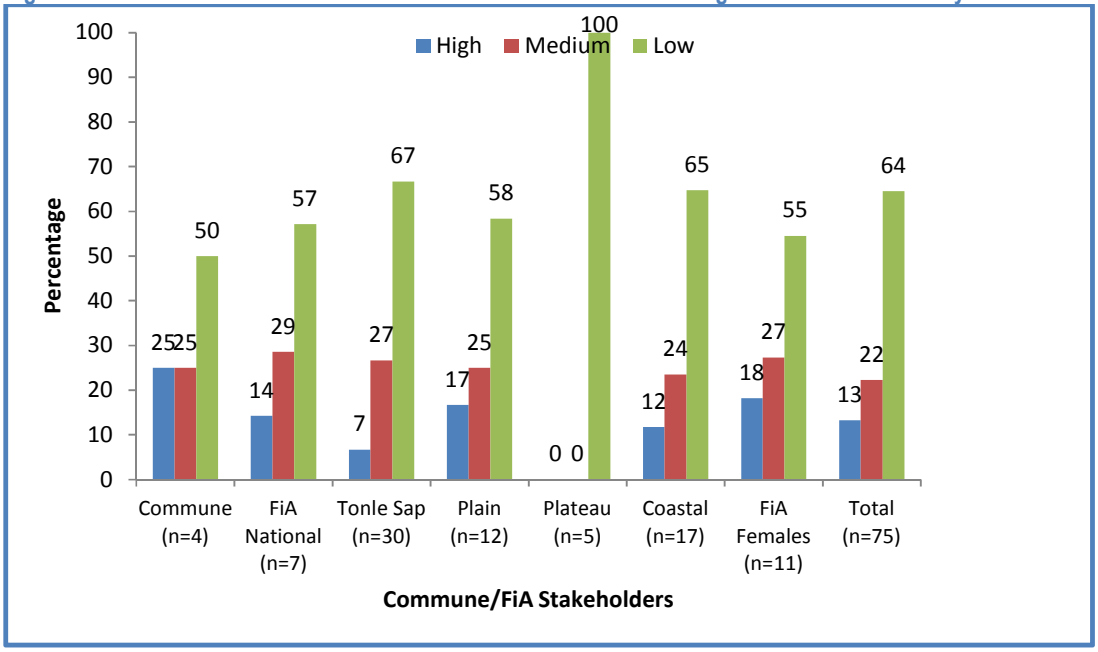
6.2.1.5. Access to information and training about CC in the fishery sector. The awareness of the FiA and the commune councils regarding their access to information and training has been measured based on the source/medium of information they have received and the training, consultation and workshop attendance. Result in Figure 5 shows a very low level of access to information of the stakeholders in the entire geographical locations and categories. Most of the respondents answer for the source of information is either from TV or radio. Few (30%) respondents say that they learn about Climate Change from talking to people and attending local meeting workshops.

Only 36% of the total respondents have attended any of the different activities (consultation, trainings, and workshops) towards raising CC awareness in the fishery sector.

It can be noticed in the result (Figure 5) that although the respondents have access to information, it is still low at a rate of only 13% of the total respondents who scored high level of access. The rate of respondents with a low level of accessibility to information and knowledge about CC is at around 64% of the total respondents. All the respondents in the Plateau and Mountain Region have the highest percentage of respondents without access to information and knowledge. This is followed by those from Tonle Sap (67%) and Coastal (65%) Regions.

Result shows that both the FiA and Commune Councils are missing critical knowledge and awareness because of their lack of information and accessibility to this information. These findings are critical considerations then in the development of strategy in increasing the awareness of these stakeholders who will act as the service providers of the other stakeholders particularly those in the grassroots level.

Figure 5. FiA and Commune Councils Access to Information and Training about CC in the Fishery Sector



6.2.1.6. Self preparedness on the impact of Climate Change. Self-preparedness of the FiA and Commune Councils is related to their needs both knowledge and skills in raising awareness, planning and implementation of CC activities with the fisheries stakeholders particularly those in the grassroots level. As mentioned, the measurement of awareness and readiness of the stakeholders is based on their understanding of the importance of various parameters on preparedness in the fishery sector. Based on the response of the total stakeholders (Figure 6), securing of funds for adaptation in the fishery sector is very important to consider in the strategy of Climate Change adaptation and mitigation. Receiving timely information, raising local awareness and the development of policy are seen to be important components of the CC strategy in the fishery sector according to the respondents. Improving fishery infrastructures and technology development for fishery sector are seen to have least importance among the FiA and Commune Council Respondents.

Aside from rating the importance of the different parameters on preparedness, the stakeholders also asked to identify their needs based on their own necessity. The majority of the respondents mentioned that there is a need to educate and disseminate knowledge and awareness about CC to all stakeholders including themselves and their institutions as a whole; they point it out that knowledge and skills on CC and environmental management should be developed among stakeholders especially those in the grassroots level; the respondents asked for the development of technical knowledge and skills in their livelihood activities to include fish farming. However, it is important to note here that 14% of the total respondents do not know what they need to develop among themselves to be adapted on the impact of CC on their lives and livelihood activities.

As presented in Figure 7, the awareness on the needs of the stakeholders to address the effect/ impact of climate change in the sector is very clear and rated at high level in almost all the stakeholders at different locations and categories. Plateau and Mountain Region have the highest level of awareness on what they need to implement and accomplish based on their objectives set to address climate change effect/ impact.

Overall, the level of awareness of the stakeholders is higher in both high and medium level. However, there is a need to provide more support to the stakeholders in the coastal region and the FiA female staff since they have the higher rate of those with low level of awareness on the preparedness and needs.

Figure 6. FiA and Commune Councils Knowledge of the Importance of the Parameters on Preparedness

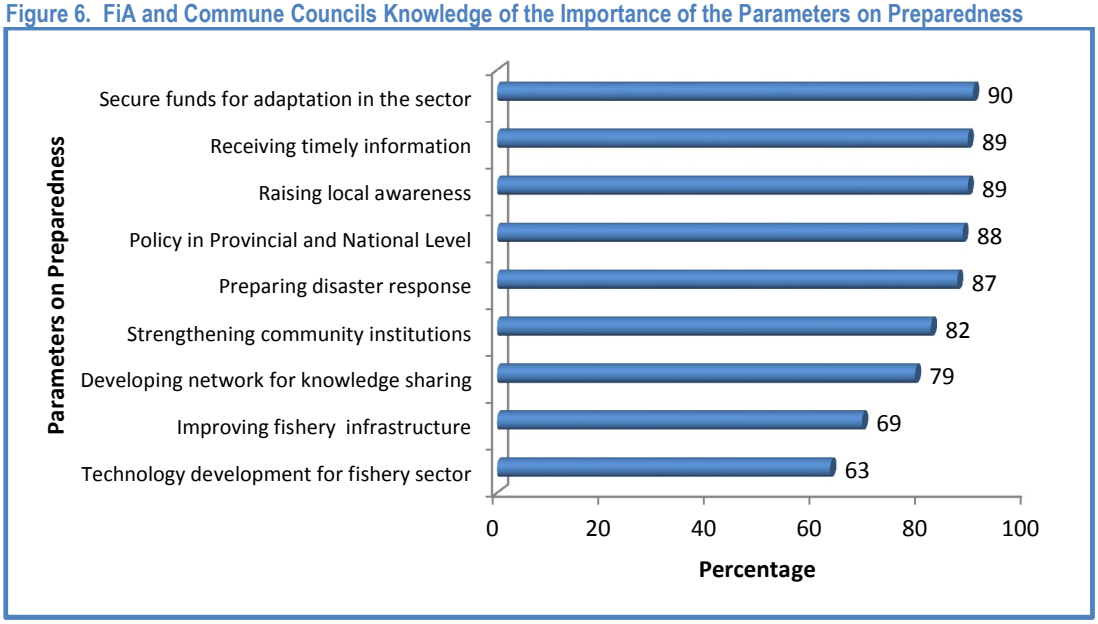
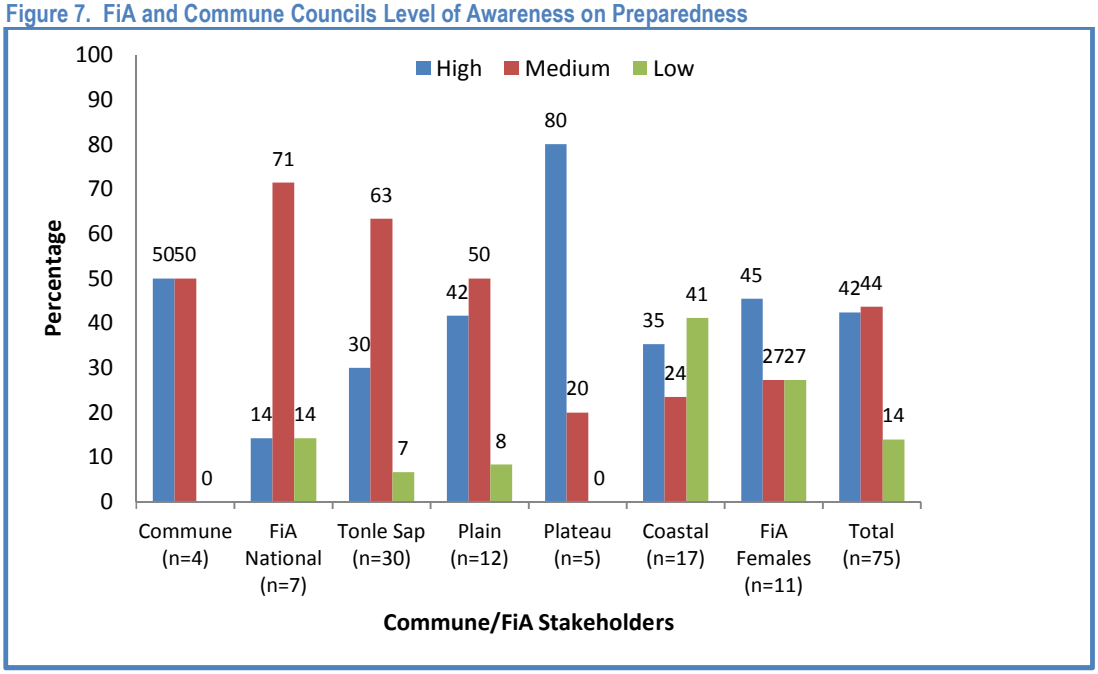


Figure 7. FiA and Commune Councils Level of Awareness on Preparedness



Gaps for each parameter have been determined among the total respondents. The highest score from the total number of respondents has been divided into two and used as the median to determine the low and high level of awareness among respondents. The total number of those with high level was then divided with the total respondents resulting to the percentage of respondents with high awareness in the different parameters as presented in Figure 8.

Result shows that access to information has the lowest percentage of respondents with high level of awareness at 17% of the respondents. The result of the survey shows that 72% of the respondents received information regarding climate change only from TV and radio and only 30% of the respondents were able to attend training or workshop in the past. To increase the knowledge, awareness and preparedness of the various stakeholders, the program needs to develop participatory modules where all the stakeholders will participate and contribute from conceptualization to the monitoring and evaluation of the progress, successes and challenges of the different activities/program towards climate change in the fishery sector.

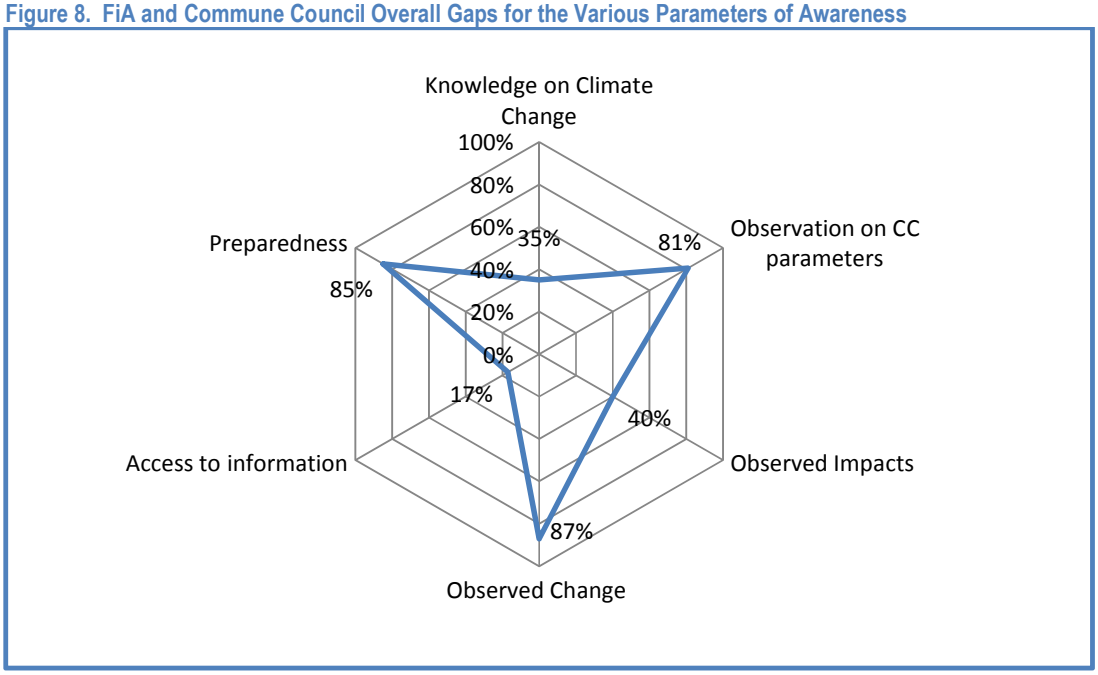
Knowledge on Climate Change is a basic activity that needs to be trained among the stakeholders particularly in understanding the main causes of the changes of the existing climate. What are the ways to mitigate these causes? What are some local activities that are contributing to the changes we are experiencing right now? What are some local activities that can help lessen these contributors? How can we adapt in the changes using the local context and local knowledge and skills? These are only some of the questions where we can start developing modules to enhance and increase the knowledge of the different stakeholders to include the authorities about climate change in the fishery sector.

Respondents are seen to have low level of awareness on observation of impacts parameter. This means that the FiA and the Commune Councils stakeholders need to be strengthened on these aspects especially on the understanding of the different parameters in the grassroots level. Exposure trips to the different regions would be a useful activity to enhance and increase the knowledge of these stakeholders especially on the changes that is occurring in the fishery sector.

As mentioned preparedness of the stakeholder does not mean that she/he can already adapt to the changes brought about by climate change. Because of many factors that are contributing to successful adaptation of the stakeholders, they need to be more aware and used to these factors. This is to make sure that they understand and know how to avail of and develop these factors to be utilized in achieving their goals, objectives and interventions on climate change in the fishery sector.

Once the stakeholders develop their design, plan, implementation strategies, and action of interventions, monitoring and evaluation need to be put in place. Using the different findings in this survey will be a useful benchmark for the level of knowledge and awareness of the stakeholders. Progress needs to be monitored as the activities of interventions are in progress to gather challenges, good practice and lessons learned and at the later part to measure the outcome and impact of interventions.

Figure 8. FiA and Commune Council Overall Gaps for the Various Parameters of Awareness



6.2.2. Community Stakeholders' Level of Awareness on Climate Change in the Fishery Sector

Factors that affect the level of awareness of the community. Based on the design of the assessment the following parameters to measure the awareness of the community in the fishery sector have been explored among the community respondents:

6.2.2.1. Knowledge about Climate Change has been determined among respondents by asking them to provide definition on how they understand Climate Change, adaptation and mitigation are. Most respondents defined **Climate Change** as the changing of temperature, serious disaster, irregular /unpredictable rain and changing in weather form year to year. However, the question on what are the causes of Climate Change has never been mentioned in any of the definition of the community respondents. It was noted that the provided definitions are mainly focused on the observed and experienced effect, outcome or impact and changes of Climate Change in their specific area or regions.

Climate Change adaptation has been defined as the natural coping mechanism on Climate Change, seeking for alternative approaches and strategies and finding suitable shelter during time of disaster. It was observed that in the definition, most of the responses are related to anticipatory and reactive adaption but no one mentioned about an autonomous and planned adaption or private and public adaption. It should be noted also that most of the definition is related to coping mechanisms but nobody mentioned about taking these changes as benefits or advantages that can be enhanced, developed, and implemented as in the UNDP and UKCIP definitions.

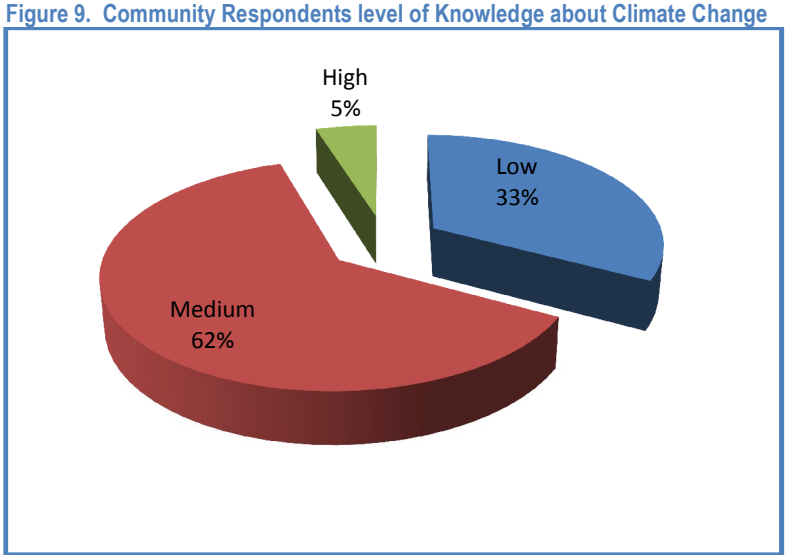
Climate Change Mitigation has been defined as participating in planting or replanting of more trees, planting flooded forest, forest conservation, protecting natural resources and the environment; and the way of reducing the use of chemical products and polluted gasses, reducing polluted industrial activities, and reducing polluted and factory wastes. Again the definition of CC mitigation is more on the

practical intervention to reduce the sources or enhance the sinks of green house gases (GHG). However, none of the respondents mentioned about governance and development of policies towards anthropogenic intervention to reduce the sources or enhance the sinks of GHG as defined by IPCC.

Knowledge and awareness of the respondents particularly the communities are further analyzed by counting the number of valid responses from the definition provided. All related definitions have been collated and coded according to its importance and counted its frequencies per respondent. The counted frequencies determine the score of each respondent, assuming that the more answer he/she has, the higher his/her knowledge and awareness are. The counted codes were further analyzed by grouping these to low, medium and high depending on the level and extent of frequencies of each number/code.

Result of the survey in Figure 6 shows that only 5% of the community respondents have a high knowledge and awareness of what Climate Change is. However, it is important to note here that around 62% of the total community respondents understand what Climate Change is. This means that Climate Change is not a new idea or topic to the people in the community since they are experiencing and observing its effects or impacts to their surroundings and in their daily lives.

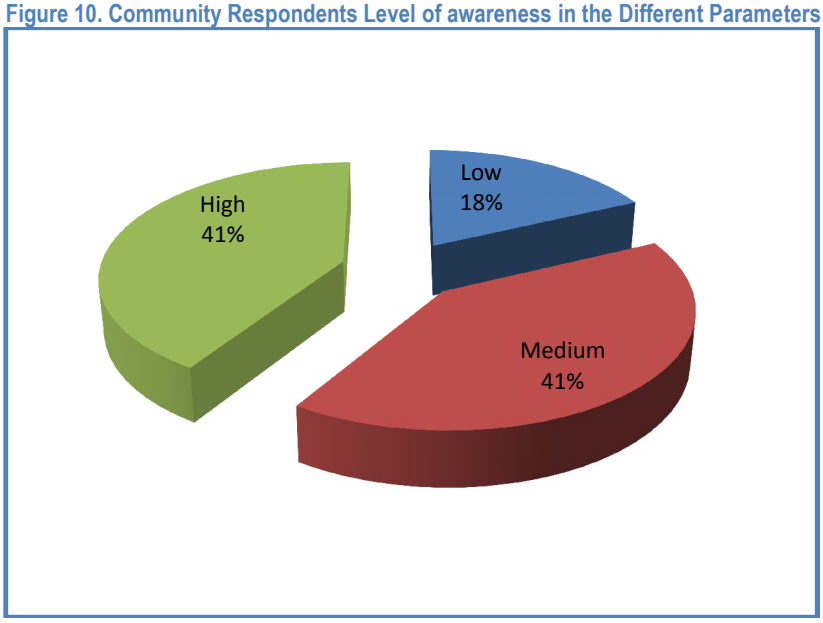
Figure 9. Community Respondents level of Knowledge about Climate Change



6.2.2.2. Determine community observation and experience on the different parameters related to CC. To further determine the awareness of the community on their area and environment the following parameters, such as temperature, extreme events, storm, rainfall in dry and wet season, freshwater temperature, runoff and erosion, water level in dry and wet season, and sea level have been rated either high or low.

Result in Figure 7 shows that 41% of the community respondents have a higher awareness on the changes of these different parameters particularly in the region where they reside. For example, 93% of the community respondents say that the temperature has increased in the last 10 years. It can be noted in the result that only 18% of the community respondents have low awareness in terms of the changes brought about by CC to the different parameters. This only shows that the communities are aware of the different changes and effects of climate change to their surroundings and daily lives.

Figure 10. Community Respondents Level of awareness in the Different Parameters of CC

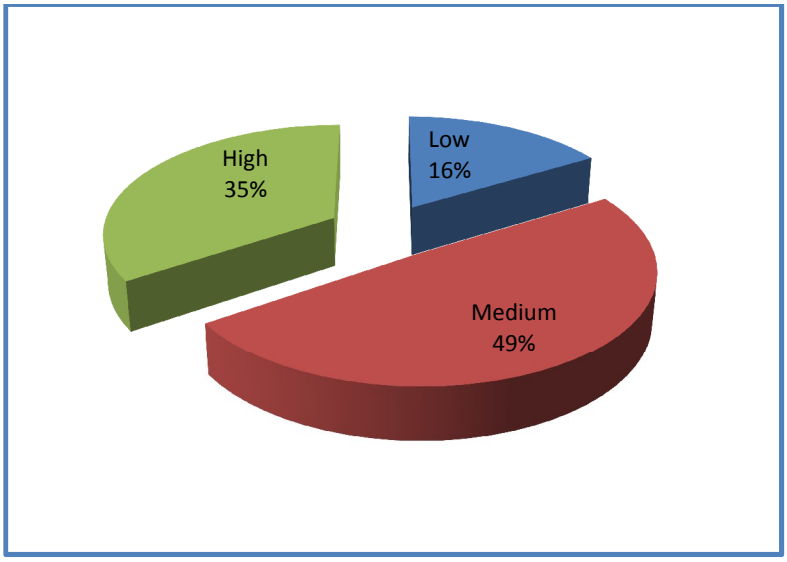


6.2.2.3. Observed impact of Climate Change to Fishery Sector. It's important to determine the observation and experience of the direct stakeholders in the fishery sector, to be able to relate the desired raising of awareness, planning and implementation, which include monitoring and evaluation of the effect and impact of CC to fishery sector. The community respondents have experienced and observed various impacts and changes in the fishery sector, such as increasing temperature of the water that causes fish mortality and losing of habitats; lesser and smaller fish catch, and cultured fish may usually get infected with diseases.

6.2.2.4. Determine changes in fishery resources and activities in the fishery sector. Fish catch, size and type of fish, fishing practices, gear used, livelihood opportunity, fish processing, aquaculture production and fishing season have been validated based on respondents' experience and observation. Result in Figure 8 shows that awareness of the community respondents on the changes on fishery resources and activities has a significant rate of 35% high level of awareness. Some examples of this awareness of the changes are; around 70% of the total respondents say that there is lesser fish catch in the fishing ground compared in the last ten years. Around 60% of the respondents say that the size of fish has reduced significantly in the last ten years. Competition in the fishing ground has also increased according to 79% of the total respondents.

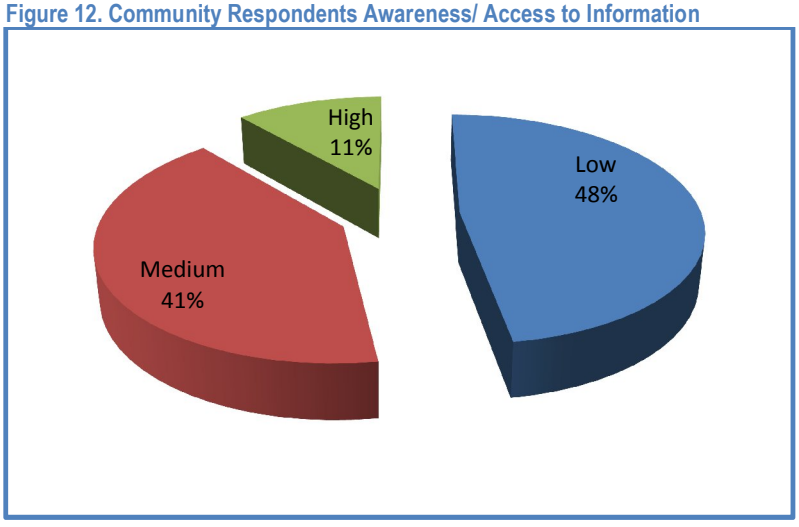
The respondents also mentioned that there is a very low harvest or much lesser fish catch during very hot weather due to Climate Change. They also mentioned that more advanced, modified and destructive fishing gears are introduced in the fishing ground.

Figure 11. Community Respondents Level of Awareness on the Observed Impact and Changes in the Fishery Sector



6.2.2.5. Accessibility to CC Information and training of the respondents has been determined in the survey. Result of the survey shows that community accessibility to CC information is low. Based on the collected and analyzed data, around 48% of the total respondents have access only to TV or Radio as source of information about Climate Change (Figure 9).There are around 36% of the community respondents who mentioned that they have attended consultation and workshop regarding Climate Change in the fishery sectors. The Fisheries Administration has been the main institution identified that organized the consultation activities. It is important to note in the result of the survey that although the communities are aware of the changes, still understanding of the causes and adaptation is an important part of the training, which they do not have access at the moment.

Figure 12. Community Respondents Awareness/ Access to Information



6.2.2.6. Community self preparedness on the impact of Climate Change. Figure 10 shows that around 80% of the community respondents considered "receiving timely information from authorities" is the most important activity in Climate Change Adaptation. Others are community institutionalization, preparing disaster response and raising local awareness. Awareness on the different support from

authorities and other providers are still low as presented in result (Figure 11) where 28% of the respondents have low knowledge of the importance of these support to them and their family. Policy development is still at the low level, because many communities are not yet aware of the importance of governance when it comes to the access of these different supports in the local level. These are therefore some of the activities that needed some intervention during the awareness raising campaign, planning and implementation of the different activities of CC in the fishery sector.

Figure 13. Community Respondents Level of Importance of the Activities in CC in the Fishery Sector

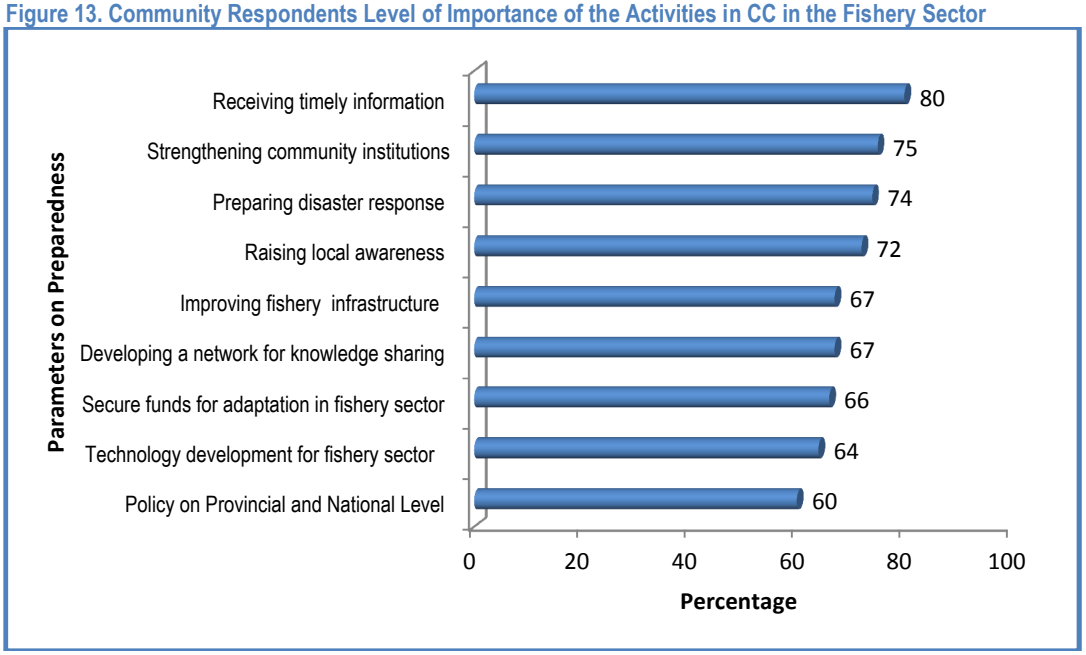
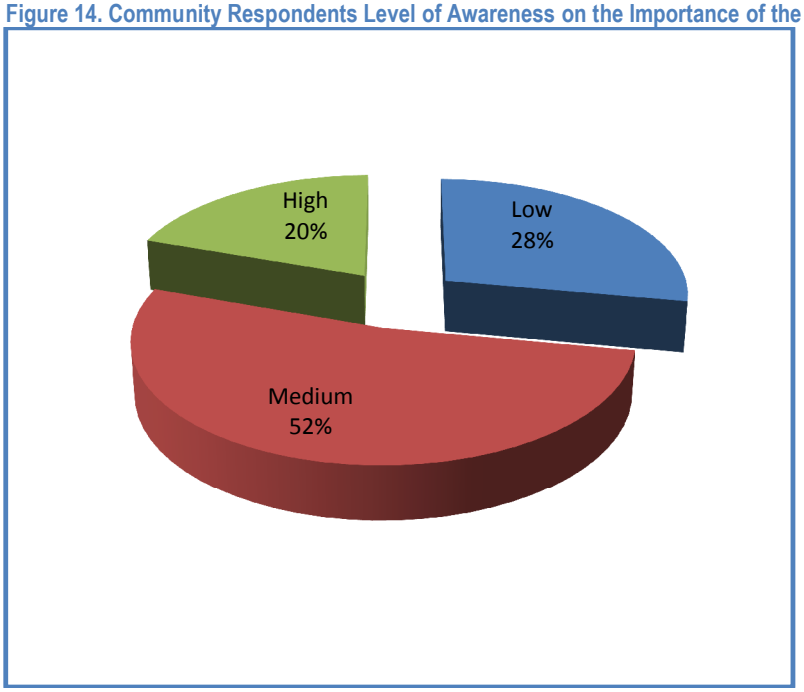


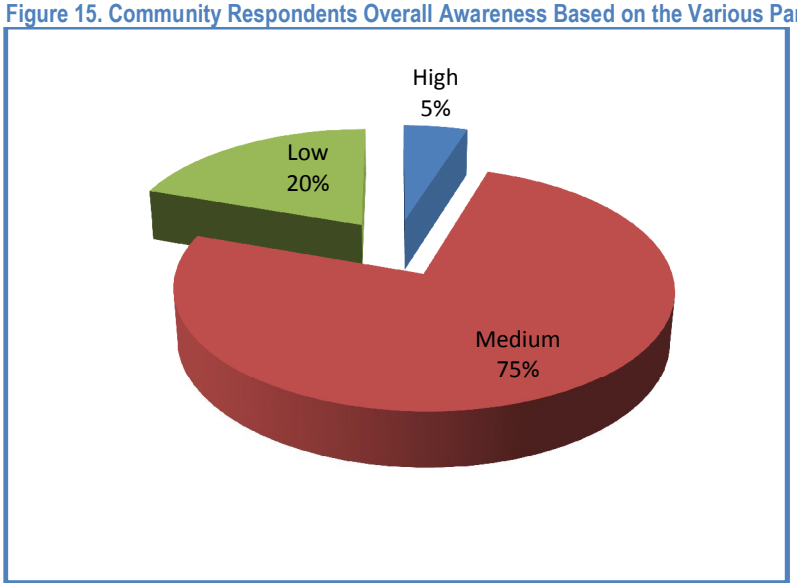
Figure 14. Community Respondents Level of Awareness on the Importance of the Different Support



Overall, the result of the survey shows that based on the different experiences and observation of the different communities in the fishery sector, their awareness on Climate Change has been enhanced or slightly improved. Nevertheless, they are still in the middle level of their knowledge and awareness and they need a more deeper understanding about Climate Change, adaptation, mitigation, planning and implementation of the different activities to hinder or avoid risk and negative impact of Climate Change in their lives, to their families, in the community, in the fishery sector and in the country as a whole.

Based on the overall score of the different factors determined in the survey, result in Figure 12 shows that only 5% of the community respondents have high level of awareness. Most of the community respondents' knowledge and awareness are still based on what they have experienced and observed on their daily activities and lives. The result also indicates that CC in the fishery sector is very new to the community respondents, in the sense that their access to the different source of information are still limited to radio and televisions.

Figure 15. Community Respondents Overall Awareness Based on the Various Parameters



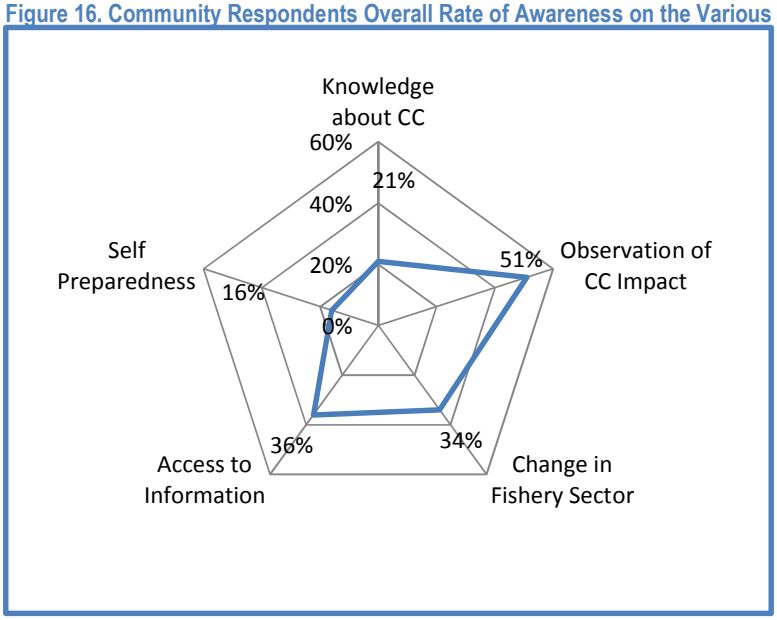
Finally, it can be summarized that the community respondents in the fishery sector are aware of Climate Change and its effect and impact based on their experience and observation in their surroundings and daily lives. The result in Figure 13 shows the computed rate of awareness based on the actual score obtained by each of the total community respondents. As mentioned in the NAPA Cambodia assessment, awareness of the community regarding the different changes in the weather or climate does not mean they are adaptive or prepared. This was validated from the survey that the communities are aware of what climate change is but the preparedness and adaptation from the effect and impact of Climate Change is still very low (16%) as indicated in the result of the study.

Access to information is one of the concerns of the community; the response to the access and best way to inform them are mostly through radio and television. The community did not yet experience a comprehensive program to address their vulnerability in their region particularly during the time of disasters. It is also seen as one of the parameters in the awareness of the community respondents that

is considered to be weak. As mentioned previously, radio and television are the only sources of information of many of the communities. This information is just to provide them warning, but on what to do and how to prepare for the adverse effects of the disaster are still lacking or missing. Various disasters have been experienced in the previous years, but preparedness and adaptability to the situation are still vague. This is an important point where the service providers could address during the time of intervention especially in the fishery sector.

Knowledge about CC is another parameter that needs intervention particularly in the fishery sector. The result of the survey shows that the communities understand well the effect and impact of climate change but on what causes this impact has never been discussed with them. Understanding Climate Change as a whole would help the communities to be more proactive in dealing with it, either in adaptation or mitigation. Most of the respondents view climate change as threats but they never view it as opportunities or benefits, although one of the respondents says that "*Changes in the climate particularly during the dry season help me dry my fish faster, because of high temperature*". Another one says that "*flood provides more shelter to the fish and more fish could breed and spawn their eggs during the season"*. These are some of the positive impact of Climate Change that could benefit the communities if they properly understand what Climate Change is, particularly in the fishery sector. These are also some areas where the service providers could look into during the awareness campaign activities.

Figure 16. Community Respondents Overall Rate of Awareness on the Various Parameters



7. Conclusion and Recommendations

Climate Change in the fishery sector is a new initiative for the different stakeholders of this sector especially for the Fisheries Administration. Therefore, understanding of the level of knowledge and awareness of these various stakeholders is vital for the next step of the fishery sector strategy on climate change intervention.

The result of the assessment shows the low level of knowledge and awareness of all the stakeholders interviewed in almost all the parameters that have been measured. It was noted in the result of the assessment that most stakeholders are aware of the different effects, impacts and changes in the fishery sector brought about by the Climate Change, but these are merely actual experiences, observations and perceptions. It was noted in the assessment that most of the respondents did not or never attend any activities about Climate Change. The result shows that the stakeholders do not know what causes climate change in the local, national or even in the regional context. Deeper understanding of climate change does not exist among the respondents, which hinders them to develop plans, strategies and approaches that could be used to prepare and adapt them on the effect and impact of climate change either negative, benefits or opportunities in the current situation and in the future.

It was noted in the assessment that knowledge and awareness of different stakeholders differs from one region to another, from every categories, or even among the level of service providers and communities. An important thing to note here is the different perception of the service providers and the direct user on the actual changes and impact of climate change in the fishery resources and to their daily livelihood and activities. This is very important to consider during the development of training modules especially for the use of the end-users which is the communities in the grassroots level. Participation of all stakeholders is being encouraged in the development of modules and plan for the implementation of any CC activity in the sector.

The result noted that since climate change is a new initiative in the development strategy of many developing countries including Cambodia, this has not yet been comprehensively prioritized in all the sectors' strategic plans. It was only recently that this has been given high priority in every sector, especially when the effect and impact of climate change is already being felt and taking lives and properties of the communities particularly of the vulnerable communities in the rural areas. Since this is a new initiative, the result of the survey validated the lack or none access of almost the entire stakeholders' respondents on information, formal trainings and other support from the various service providers. Therefore, this should be taken as the priority of the project in the development of strategy of increasing the knowledge and awareness of all the stakeholders in the fishery sector. This priority activity should be simultaneously implemented with the actual planning, strategizing, and implementation. M&E is highly encouraged to monitor and evaluate the progress and impact of interventions to ensure that good practices and lessons learned will be documented and used not only in this sector but also for the other sectors.

Based on these information gathered from both the FiA and Commune Councils, and community beneficiaries, the following points are being recommended;

- The department should build capacity in application of climate change in the fishery sector;
- The department should facilitate the development of training courses (module development) and communication approaches in climate change focused in the fishery sector;
- Develop a comprehensive and focused communication and training plan to address climate change knowledge and skills gaps particularly in the sub-national and grassroots level.

- Develop an awareness strategy on climate in the fishery sector to increase awareness of climate change at national, sub-national and grassroots level.
- The training should be complemented by study tours to different parts of the country or to other countries with successful implementation of CC in the fishery sector.
- The following recommendations based on the result should be included in the FiA Climate Change Strategic Plan (CSSP) for the fisheries sector for further implementation and study.

Based on the above findings and identified need to improve the level of awareness of the different stakeholders, practical recommendations have been summarized in Table 2 below.

Table 2. Awareness Gaps, Communication Methods and Capacity Building Approaches

Target Group	Activities/ Knowledge Gaps	Communication Methods	Capacity Building Approaches
FiA National Level	• Advance knowledge on CC and strategies of adaptation (local context) • Knowledge on local level CC impacts and changes • Knowledge of support needed in the local level • Knowledge on the appropriate communication strategies/ approaches to reach the community/fishermen	• Staff briefings • reports (e.g. Annual report of FiA cantonment office) • emails • intranets • Websites • events (workshops, focus groups, launches and conferences • face to face meetings	• Workshops, review of secondary information to understand various adaptation practices in other countries • Orientation and briefing activities • Training on designing and development of materials and instrument for CC awareness raising • Actual visit in the rural areas particularly the fishery areas.
FiA Tonle Sap Region	• Basic knowledge on CC and adaptation, • Communication, facilitation, and dissemination skills • Knowledge of the 5 capitals (human, social, physical, natural, and financial) situation in the grassroots level	• Staff briefings • Newsletters • Presentations • events • emails • intranets • websites	• Workshops and training on basic knowledge on CC and adaptation • Training of conducting ToT trainings. • Actual visit of the local situation • Resource mapping through PRA

FiA Plain Region	• Basic knowledge on CC and adaptation, • Communication, facilitation, and dissemination skills • Knowledge of the 5 capitals situation in the grassroots level	• Staff briefings • Newsletters • Presentations • events • emails • intranets • websites	• Workshops and training on basic knowledge on CC and adaptation • Training of conducting ToT trainings. • Actual visit of the local situation • Resource mapping through PRA
FiA Plateau and Mountain Region	• Basic knowledge on CC and adaptation, • Communication, facilitation, and dissemination skills • Knowledge of the 5 capitals situation in the grassroots level	• Staff briefings • Newsletters • Presentations • events • emails • intranets • websites	• Workshops and training on basic knowledge on CC and adaptation • Training of conducting ToT trainings. • Actual visit of the local situation • Resource mapping through PRA
FiA Coastal Region	• Basic knowledge on CC and adaptation, • Communication, facilitation, and dissemination skills • Knowledge of the 5 capitals situation at the grassroots level	• Staff briefings • Newsletters • Presentations • events • emails • intranets • websites	• Workshops and training on basic knowledge on CC and adaptation • Training of conducting ToT trainings. • Actual visit of the local situation • Resource mapping through PRA
FiA Staff (Female)	• Basic knowledge on CC and adaptation, • Communication, facilitation, and dissemination skills • Knowledge of the 5	• Staff briefings • Newsletters • Presentations • events	• Workshops and training on basic knowledge on CC and adaptation • Training on conducting ToT trainings.

	capitals situation in the grassroots level	• emails • intranets • websites	• Actual visit of the local situation • Resource mapping through PRA
Commune Council Members	• Strengthening of Disaster management capacity • Commune Mapping Skills • Service Provision during disaster in the commune • Facilitation skills in conducting PRA	• community forums • events • leaflets & posters • Newsletters • face to face meetings	• Rehearsal of Disaster Risk Management • Training on preparedness and project provision skills. • Training on facilitation skills and resource mapping through PRA
Community Members	• Access of information and warning from authorities • Monitoring skills • Alternative livelihood activities • Skills in participating in PRAs • Preparedness and disaster risk management	• Radio and TV • Local comedy theater • events • community forums • leaflets & posters	• Development of information to feed in the Radio and TV in the local context • Participation on the development of information materials for dissemination • Attendance to community forums and events
Fishermen	• Access to information and forecasting skills • Knowledge about PRA • preparedness and disaster risk management	• Radio and TV • Local comedy theater • events • community forums • leaflets & posters	• Development of information to feed in the Radio and TV in the local context • Participation on the development of information materials for dissemination • Attendance to community forums and events

Aquaculture Farmers	• Technical skills and knowledge in fish farming	• face to face meetings • networking • leaflets & posters	• Formal training on new technology and adaptation on the fishery sector • Development of network to assist on the technical capacity

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