



CLIMATE CHANGE ADAPTATION AMONG SMALL SCALE FISHERIES IN COASTAL VILLAGES

Presented By:



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Executive Summary

According to India Network for Climate Change Assessment (INCCA, 2010) report by Ministry of Environment and Forest, Government of India which emphasizes a sectoral and regional analysis for 2030s portrays Odisha's as one of the states among 13 coastal states in India which is more susceptible to sea level rise and cyclone in the country. The report also highlights that a large chunk of population along the coastline is dependent on climate-sensitive sectors such as marine fisheries and agriculture. (INCCA, 2010). The broad objective of the study is to understand fishing community perspective on key climate variables and how those variables affect the fishing as an occupation. The study also seeks to understand how key climate variables affect the livelihood of the marine fishing communities.

The objectives of the study are as follows:

- To understand the perceptions of risk and vulnerability of fishing communities in the context of climate change on their livelihoods.
- To understand how the fishing communities adapt to the changing climate dynamics.
- Suggest measures to protect lives and livelihood of small-scale fishing communities.

The methodology to undertake the study is a described and qualitative based approach where semi- structured questionnaire was prepared and administered to the respondents regarding basic household details, their health condition, education and skill level, livelihood capitals and the climate risks they are facing and the adaptation strategies. Team VIEWS conducted focus group discussions and key informant interview in all the 15 vulnerable seaside villages in Ganjam District of Odisha. In the process, the team met with key functionaries of the village and community leaders, took a note of their current problems, and tried to link it with the dynamics of climate change.

The framework and the guiding principle of analysis was Sustainable Livelihood Approach. The SLA approach helped to decode the vulnerability in terms of shocks, trends and seasonality that inherently plagued the fishing sector. The analysis then tried to figure out the livelihood capital base which includes Natural, Physical, Social and Financial asset base of small-scale fishing communities. The broad objective here was to understand how these

livelihood capitals interact among themselves to make the portfolio strong or weak in terms of achieving the desired livelihood outcomes.

The broad findings of the study are as follows:

1. The climate induced extreme weather events have affected the fishery sector at large. The negative impacts of climate change are borne by the resource poor marine and small-scale fishermen and women. The impacts are reduced catch, reduced number of fishing days, more investment in fuel and food for longer trips to catch fish, fisheries related assets being destroyed due to cyclonic events, storm surge and currents. Moreover, the fishermen also face considerable risks to their life and health.
2. Most of the fishermen have directly attributed climatic factors such as temperature, rainfall cyclonic disturbances and low pressure leading to depression as the prominent factors in reduction of catch and effect on their livelihood portfolio.
3. Around 77.29% of the marine fishermen are illiterate which means they have never attended any formal school nor received any education in any other informal set up. Only 15.35% went to primary school for their basic education and 5.75% went to upper primary school for their basic education and a mere 1.61% went to higher secondary school. This indicates an extremely low level of education and mostly high illiteracy level among fishing communities which restricts them to adapt to changing external environment with respect to opportunities and threats.
4. Fishing at sea is a very hard-working job and it requires lot of effort. Some of the fishermen have narrated horrifying stories related to death of the colleagues' as well as injuries during the voyage. The marine fisher folk communities also shared their views on deteriorating health once they cross the age of 50. They suffer from joint pain, nerve related disorders and other chronic illness as they feel their occupation is very demanding, stress oriented and calls for lot of hardship as there is no proper time for adequate sleep, rest or taking food in time. The old fishermen were of the view that once they grow old their income generation capability drastically reduces as their body does not permit to take trips to the sea and the breakdown of joint family structures put lot of pressure and often push the household into the brink of poverty and financial insecurity.

5. 72% of the household in fishing communities have membership in community-based organizations but from the key informant interview and FGDs indicate that those memberships are mostly in defunct stage and hardly any member of the groups are enterprising nor the are willing to take bold initiatives. Though the households and the respondents agree that there is fellow feeling in the community and relatives and community members help during the crisis period.
6. The women from the fisherfolk community keep toiling hard from 3 AM to 10 PM; where they are involved in buying fish, selling fish in the villages and nearby markets. The women head loaders are also involved in processing of dry fish and its marketing. Thus, from the field observation, key informant interview and focus group discussions it can be concluded that the old group fisher folk population comprising of both women and men are one of the vulnerable sections of the marine fisher folk community.
7. The wage or share earning fish workers engaged in production, fish processing and other activities ails from the effects of a poor asset base coupled with declining production (fish catch) and subsequently fluctuating income. This restricts their capacity to adapt.
8. The lack of boat, net and other fishery related assets among the small-scale fishermen restricts their access to physical capital base. They mostly work as crew members in other boats to support their income. Thus, the crew member and often the old fishermen also work as crew member are the “most vulnerable group” due to their age group and challenges and difficulties that the profession demands.
9. The boat owner is always indebted to money lenders as before the start of the season they do not have the necessary working capital to start the fishing operations. The money lenders generally charge a high rate of interest which often hovers around 36% to 40% per annum. It directly hurts the fishermen income. Moreover, the small-scale fishing communities also get entangled into the “**Vicious Cycle of Credit Trap**” which eventually get into “**Vicious Cycle of Poverty**” due to high interest rate repayment which never ends.
10. Fishing activities are affected by seasonal lows. The number of boats lying idle on the beach is a clear indicator of Seasonal Unemployment. This is reflected in terms of lack of consumption of nutritional food and health related outcomes.

11. The high risk of vulnerability to disasters and lack of fishery asset-based insurance among the small-scale fishing communities make the group more vulnerable and less adaptive.
12. The extreme weather event such as cyclones, flooding, frequent depression, and cyclonic weather conditions in the Bay of Bengal has cut short the number of fishing days coupled the fishing ban by the state government due to nesting sites of “Olive Ridley turtle”. In this context the fishing trips have been reduced and subsequent degradation in the aquatic environment due to pollution and climate variability the fish catch has also been reduced. The fishing gear such as nets, boats and other accessories does get affected and sometimes damaged fully due to changing weather conditions and cyclonic disturbances.

Recommendations:

1. In the context of the field level findings, the need of the hour is to recognize the fact changing climate dynamics does contribute towards reduction in fishery stocks. Though climate change is one of the prominent factors, but other anthropogenic pressures do contribute towards depletion and resource migration into deeper waters. The financially strong trawlers do overexploit the fishery resources by using exploitative fishing gears and catching the juveniles. So, in the above context, there is a need to bring stringent enforcement mechanism which restricts overexploitation of fishery resources by big and powerful players in the fishery industry. This step would help in reducing the anthropogenic pressures on already stressed fishing.
2. Both the men and women fisher folk are illiterate and lack basic skill set. This result in lack of understanding of many basic paperwork relating to registration, licensing, availing of benefits and other entitlements. Moreover, the lack willingness to diversify into other enterprise forms of livelihood is due to a “sense of fear of being illiterate” and they strongly perceive that it is a big impediment.
3. There has been considerable depletion of natural capital in the seaside villages; which is evident from decline in sand dune vegetation. The sand dune vegetation serves as ecological and medicinal value for the small-scale fishing communities. The decline in casuarina tress due to various anthropogenic pressure has affected the coastal ecosystem and livelihood of women fisher folk communities. Thus, steps need to be

taken for plantation, regeneration of coastal forests which include replanting of casuarina and strengthening the sand dune vegetation.

4. The fishery assets such as boats, nets and other fishing gears are often get exposed to cyclonic storms and other extreme weather events. But there is no awareness regarding neither any knowledge in the market related to penetration of fishery-based insurance. So, there is a dire need for developing an understanding of fishery related insurance, awareness, and knowledge.
5. One of the key findings is that the fishery-based cooperatives though are operational in paper but working wise they are not active and neither they are undertaking any entrepreneurial ventures. The members are not owning the cooperative. Thus, there is an inherent requirement to revive the cooperatives and instill a sense of entrepreneurship among its members.
6. Majority of fisher folk in small scale fishing communities are highly indebted to moneylenders for basic working capital requirements. The moneylenders charge exorbitant rate of interest. In this regard, there is a need to inculcate banking habits among the fishing communities and streamline the procedural hurdles for them.
7. The lack of knowledge on coastal laws, policies and rights have affected the overall livelihood portfolio. So, in this aspect training and awareness workshops need to be conducted at village level to make them aware.
8. Migration is huge scale phenomenon among small scale fishing communities. From the focus group discussions, we can say that approximately 75% of the fishing households from different fishing villages migrate to different states either in search of work in the fishing sector or in the construction industry. Though according to the returned migrant view migration to these states are unsuccessful as they face lot of problems related to food, health, lack of proper medical attention, language barriers, education of kids and other associated problems. Thus, we can conclude that for migration to be successful; it must skilled based, informed and safe migration.

The Odisha traditional fish workers union has come out with its set of demands which they feel can change the face of the sector. The set of demands forms the part of our recommendations to strengthen the sector further-

- Odisha is affected by global climate change and pollution which demands for legitimate remedial actions otherwise in near future fishermen village and

new cities will immerse in the depth of the sea. It will also affect the lives and livelihood of fishermen.

- Reconsideration of bills brought by central government in the year 2019 such as National Marine Regulation Act 2017.
- The total coastal area of 482 Kilometres; 165 kilometres is declared as the prohibited area for turtle protection and there is also a plan for construction of more ports in addition to the already existing three large functional ports. Factories, hotels, workshops, and prawn geris because of the Government of India Initiative “Bharatmala” project will gradually occupy the state 482 kilometres sea beach area. As a result, all marine fishermen of Odisha will lose their ancestral profession.
- Requesting the withdrawal of National Marine Management Bill 2019.
- The decision of replacing the CRZ, 2011 with CRZ 2019 will leave the traditional fishermen with no rights.
- In general, after the fishermen came back from fishing, women sell fish and dry fish made from them in market. To help these women we demand platforms, concrete auction halls and storage facilities along with rest room and public toilet facilities of advanced quality.
- The fishermen should be provided with Matya card same as the Kisan Card which is provided to the farmers so that it will help in implementing education, health, loan and other fishing related activities.
- Thousands of fishermen from Ganjam district are migrating to other districts as bonded labour. As a result, their children are devoid of education and social securities. To stop this, mini fishing harbours must be constructed near the fish landing centres along with rest toom, ice mill and cold storages.
- Arrangement should be made to provide diesel and kerosine to the fishermen on discount. Also, all the fishermen should be provided with life jackets.
- The fishermen are included in the unorganised sector like construction labour. So, the fishermen should get some facilities as craftsmen and workers. Some arrangements should be made to provide financial help in full to the fishermen children for their higher education.

- Arrangements must be made to pay INR 3000.00 old age pension to the elderly fishermen and women
- The contribution towards Savings cum Relief Scheme should be increased to INR 10,000 from the existing INR 4,000

CHAPTER-1

INTRODUCTION

1.1 Background and Context

Odisha is one of the eight largest states in India. The state of Odisha has 4.7 percent of India's total land mass and 3.37 percent of the population. But the poverty levels still remain on the higher side when compared to all India average. The poverty level fell from 57 percent in 2004-05 to around 33 percent in 2011-12 (Government of Odisha, 2014). The proportion of poor in Odisha remains well above the national average of around 22 percent. In the context of the above facts, a high poverty level, dependency of livelihood on natural resources makes the state vulnerable to climate change (Odisha Action Plan on Climate Change, 2018-23)

According to India Network for Climate Change Assessment (INCCA, 2010) report by Ministry of Environment and Forest, Government of India which emphasizes a sectoral and regional analysis for 2030s portrays Odisha's as one of the states among 13 coastal states in India which is more susceptible to sea level rise and cyclone in the country. The report also highlights that a large chunk of population along the coastline is dependent on climate-sensitive sectors such as marine fisheries and agriculture. (INCCA, 2010). The coastline of Odisha is generally affected by cyclonic effects. (Patwardhan et al., 2003; GoO 2004; Chittibabu et al., 2004; Kumar et al., 2006; Mohanty et al., 2008; Sharma et al., 2008; Bahinipati et al., 2012; Kumar et al., 2010). In between 2011 and 2015, the state of Odisha in India witnessed two severe cyclones—one in October 2013 (Cyclone: Phailin) and the other again in October 2014 (Cyclone: Hudhud), and the aftermath effects were extensive damages to crops and infrastructure especially in coastal districts. (Annual Reports on Natural Calamities 2001-2013, Special Relief Commissioner, Revenue and Disaster Management Department, Government of Odisha, Bhubaneswar) These cyclonic events have resulted in saltwater intrusion, water logging, which has a direct bearing on livelihood. (Bahinipati et al., 2014). The problems get accentuated by flooding due to cyclones and extreme and sometimes erratic rainfall. The rains in the upper catchment area, as well as unusual rainfall in different districts, cause the flood in all major river systems of the state. (Annual report on natural calamities-2001-2008, SRC, Bhubaneswar, Odisha.) Despite this high level of vulnerability concerning climate change, Odisha has been successful in

managing natural disasters as demonstrated during cyclone Phailin, a very severe tropical storm where the number of casualties was minimal. Moreover, the increase in population density and economic activities in the coastal districts contribute to increased vulnerability.

1.1. Rationale of the Study

Climate change will affect fisheries and aquaculture through a host of variables such as changes in sea surface temperatures, circulation patterns, acidification the frequency and severity of extreme events, and sea-level rise and associated ecological changes (FAO Circular, 2014). Fish migration, feeding and breeding behavior will be directly affected, and changes in their physical environments will indirectly affect growth, mortality, and reproduction (Brander,2010).



Besides, the species and ecosystems that fish rely on will be affected with uncertain impacts on fishery catch potential. In the context socio-economic development of the state of the Odisha, the marine fisheries sector occupies an incredibly significant place. It not only provides income and employment but also helps in the growth of some ancillary activities. Apart from that fish, is a source of nutritious food and export of fish and fish products helps the state to earn foreign exchange. It is the source of livelihood for a large section of the economically backward population of the state and country. The development of fisheries can ensure food security as well as tackle unemployment in this region.

1.2. Objectives of Study

The broad objective of the study is to understand fishing community perspective on key climate variables and how those variables affect the fishing as an occupation. The study also seeks to understand how key climate variables affect the livelihood of the marine fishing communities.

The objectives of the study are as follows:

- To understand the perceptions of risk and vulnerability of fishing communities in the context of climate change on their livelihoods.
- To understand how the fishing communities adapt to the changing climate dynamics.
- Suggest measures to protect lives and livelihood of small-scale fishing communities.

1.3. Structure of study

The structure of the study is divided into four sections:

Initially to start with the Chapter I provide us with a context and the background; where it broadly highlights the context of the state of Odisha and explains the rationale for undertaking the study. In the chapter II- a broad literature review has been undertaken to understand how marine fisheries sector with focus on small scale fisheries get affected, what are the climate variables that affect the marine fisheries sector at large and how do marine fisheries sector relate to it. The chapter III highlights the climate risk and vulnerability; where the sustainable livelihood framework has been used to understand the vulnerability context- which includes understanding on shocks, trend and seasonality. The framework also highlights the livelihood capital; such as Physical, Human, Financial and Social capitals. These livelihood capitals interact among each other and they help to determine the livelihood outcomes. The chapter IV emphasizes the social and livelihood analysis of the marine fisheries sector. The final chapter V comes out with the summarization of final findings and recommendation in the context of undertaking the study.

1.4. About the Organization

About the funding organization:

Global Green grants Fund catalyze the grassroots level solutions by putting resources directly in the hands of the best stewards of the environment that is people. The action areas for Global Green Grant Fund are Climate Justice, Healthy Ecosystems and Communities and Local Livelihoods. GGGF help the activists take on the world's most pressing environmental and social justice challenges. GGGF believes solutions to environmental harm and social injustice come from people whose lives are most impacted.

About the Implementing Organization:

IEWS (Voluntary Integration for Education and Welfare of Society) is a growing grass-roots organization working towards Sustainable Livelihoods, Quality Education, Health, Climate Change and Disaster Management among Tribal, Dalits, PWD and Coastal Fishing Communities in Odisha. IEWS hold the Special Consultative Status with UN's Economic and Social Council (ECOSOC) and are a member of the Masterpieces Global Peace Movement since 2019.



CHAPTER-2

Literature Review

2.1 Vulnerability, Risk, Adaptation, Resilience

The Intergovernmental Panel on Climate Change (IPCC) identifies three components of climate change vulnerability: exposure, sensitivity, and adaptive capacity. The vulnerability to climate variability and change can be defined as the degree to which a fishery-based livelihood system is susceptible to, and unable to cope with, adverse effect of climate change, including climate variability and extremes (adapted from IPCC 2007, page 883). Vulnerability is a function of the character, magnitude and rate of climate change and variability to which a fishery-based livelihood system is exposed, its sensitivity and its adaptive capacity (adapted from IPCC 2007, page 883 and Islam et al. 2014). The fisher folk perceptions on climate change were studied in 15 coastal villages in Ganjam district of Odisha. The fisher folk population was interviewed to know the perceptions, adaptations and responses on how different climate variables affect their life and livelihoods over a period of last 30 years. All fishermen contacted believed that climate had changed in the last two decades. Wind was ranked as the parameter that had changed the most in the last two decades. Sea status was ranked as the most problematic to fishermen. Avenue for safe exit from villages and coastal protection structures in case of natural calamities were the highest scoring adaptation measures. Wind was found the most critical parameter affecting marine fishery and overfishing was identified as the biggest problem facing fisheries.

The impact of climate change on marine fish catches and aspects connected with it has been widely studied and researched. Specifically, there is a wide array of literature which indicates how climate change have affected the fish catch, variability, change in composition of species, decline in species, migration of species to higher latitudes and deep sea and other aspects (Brander, 2010). The temporal and spatial distribution, migration patterns of species, diversity, and quantity of catch and reproduction of economically important species (Finney et. al., 2000; Jacobson and Maccall, 1993; Murawski, 1993). The Inter-governmental Panel on Climate Change (IPCC) has projected that the global annual seawater temperature and sea level would rise by 0.8 to 2.5°C and 8 to 25 cm, respectively by 2050 (IPCC, 2007).

The increase in incidence of extreme weather events such as cyclones, flood and deep depression resulting in bad weather conditions affect the safety of the marine fishermen and also reduce the number of fishing days. The marine fisher folk population reside in the coastal

areas and are vulnerable to the impacts of climate change as they face the wrath of shift in current patterns, wind direction that impact their access to fish grounds and ultimately affect fish catch. Coastal habitats are likely to be impacted through sea level rise and increased coastal erosion which in turn impacts the safety of fishermen. Frequent and intense extreme weather events such as cyclones, floods, hailstorms also impact fishermen directly. Thus fishermen as a group are one of the most vulnerable to the effects of increased climatic variability.



In India, the following responses to climate change by different marine species are discernible: (i) changes in phytoplankton species composition; (ii) extension of distributional boundary and depth of occurrence of small pelagics and (iii) phenological changes (Vivekanandan, 2011). The surface waters of the Indian seas are warming by 0.04°C per decade and this has enabled the Indian oilsardine and Indian mackerel to extend their distributional ranges to northern latitudes (Vivekanandan *et al.*, 2009a). The Indian mackerel, *Rastrelliger kanagurta*, are found to descend to deeper waters in the last two decades (CMFRI, 2008). There is a shift in the spawning season from warmer (April-September) to relatively cooler months (October-March) for threadfin breams (Vivekanandan and Rajagopalan, 2009).

Climate Change and Risk Perception in Odisha: The climate change has special relevance



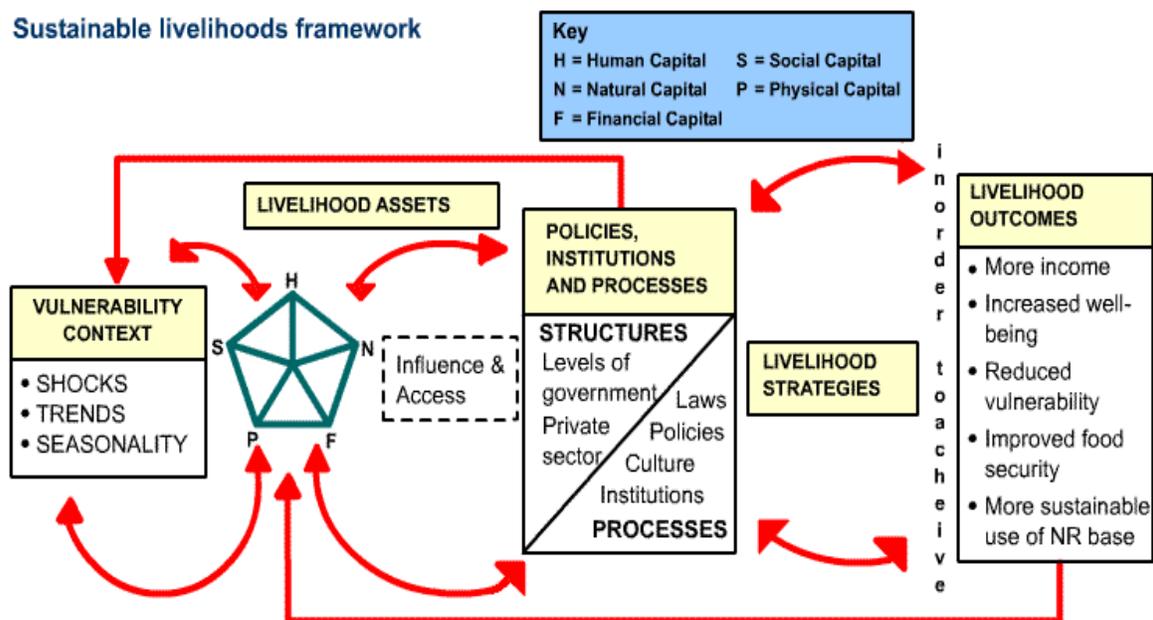
for Odisha because of its location and geophysical conditions. Climate change has the potential to derail the current growth strategies and deepen poverty. The direct impacts of the extreme weather events include loss of life, livelihood, assets and infrastructure. Odisha is frequently affected by climate change and extreme weather events. Out of last 105 years, 95 years Odisha has been affected by different vagaries of climate change (OSDMA, 2005). The 1999 super cyclone that broke the economic backbone of the State, and floods, droughts and heat waves being the constant visitors to State, the State has been relatively more vulnerable to climate change over the years. These issues have the potential to derail the growth strategy and deepen poverty in the State. Climate change has the potential to exacerbate inequality and prevent economic growth.

The sustainable livelihood approach (DFID 1999 and Scoones 1998) provides an in-depth understanding of vulnerability profile of a livelihood portfolio by indicating the shocks, trends and seasonality, the livelihood capitals (asset base) and its interaction with policies, process, and institutions to determine the livelihood outcomes. Fishing is a high-risk livelihood activity due to fugitive nature of resource, the hostile environment of the seas, and

perishability of the product (MRAG 2011). Cyclones and floods damage boats, nets, fishing gears and fish landing centres, as well as educational, health, housing, and other community infrastructure. (Jallow et al.1999; Adger et al 2005;westlund et al.2007).The peer reviewed literature outlines how climate change will negatively impact the fishery-based livelihoods. Lot of studies have investigated the impact of climate change vulnerability, adaptation, and resilience of fisheries sector at the national and regional scales (Allison et al. 2009). Thus, there is a gap that exists in terms of understanding climate vulnerability and adaptation with reference to small scale fishing households particularly at the district and village level in Odisha, India. Little research has examined the impacts of climate vulnerability and change on livelihood of small-scale fishing communities and households in developing countries, particularly in India.

Chapter 3 Research Methodology

3.1 Framework for Analysis: Sustainable Livelihood Approach (SLA)



The ‘Sustainable Livelihood Approach (SLA) provides the detailed understanding of livelihood vulnerability in the context of climate change. SLA framework comprises three components: ‘livelihood assets (natural, financial, social, human and physical capital), ‘vulnerability context (vulnerability analysis)’ and ‘structure and process (institutional analysis)’. The SLA approach emphasize the linkages among the three components, to come up with the adaptive strategies called livelihood strategy along with the possible livelihood outcomes. The detailed methodology for the study is as follows:

Based on the methodology developed, field visits of about 10 days each were undertaken to the 15 villages in Ganjam district of Odisha, and the field interactions were conducted with small scale fishing communities and fish workers unions. The field work in the selected locations involved informal interviews with groups as well as with individuals, with special attention paid to capture the perspectives of women and other vulnerable groups. Besides the fishing communities, other relevant institutional stakeholders in fisheries (government, community, and fish workers union) were also contacted to obtain their perspectives on climate change and understand the adaptive strategies.

3.2. Area and Scope of the Study:

The area of the study is Ganjam district of Odisha. The field work was undertaken in the selected 15 villages of the Ganjam district of Odisha, India. The area chosen for the study was based upon specific criteria related to socioeconomic and bio-physical vulnerability to climate change. The criteria considered are cyclone prone areas and the levels of literacy and level of skill required for diversified livelihood. The structured questionnaire was prepared and administered to 10 respondents belonging to different livelihood groups in the fishing sector. The different category of livelihood groups are fisherwomen, traditional fishermen, young fishermen, old fishermen trader, Crew Member, Boat Owner, fishermen including migrants.

3.3 Tools and Techniques for Data Collection:



Structured Household Questionnaire Survey: A semi-structured household questionnaire was prepared and piloted in the field to know the gaps in questions, response received with respect to different sections of questionnaire. The different section of the questionnaire comprises of basic household data, asset and other livelihood capital data. In the questionnaire, the questions were focused on knowing the various adaptive measures undertaken by the community. A total 150 questionnaire was administered to the different livelihood groups in the fishing communities. The different livelihood groups are Fishermen (Boat Owner), Crew Member, Women Head loader, Migrant (women and men).

Focus Group Discussions (FGDs): A series of 10 focus group discussions were conducted on the selected villages. In the discussions, proper representation of different livelihood groups of the small-scale fishing communities. The groups use to constitute members from different livelihood groups.

The different livelihood groups are women head loaders, young fishermen, old fishermen, community leaders and village heads.



Case Study based approach: The case study approach focuses on understanding the dynamics present within the case(s) (Eisenhardt, 1989). This approach, designed by Yin (1981; 1984) and further advanced by others (e.g., Eisenhardt, 1989), is widely used in social research. In the current research, the case study approach has enabled a detailed and in-depth investigation and analysis of the research objectives. It has offered more accurate and detailed information compared with larger scale studies and provided the opportunity to study social processes and relationships in greater depth and also to understand both how and why things happened (Yin, 1984; Eisenhardt, 1989).

Key Informant Interview (KIIs): The Key Informant Interview was conducted with selected village functionaries who generally represent the village at different governance levels. The KIIs helped to provide detailed understanding of some of the critical issues affecting the sector and how climate change has exacerbated with other pertinent problems of the sector.

CHAPTER-4

Socio-Economic Status

Criteria/Characteristics and a Brief Description	Category	Percentage
Summary of Demographic Features		
Age(%)	18-35 years	35%
	35-40 Years	45%
	>50 Years	20%
Average Household Member		4.1
Human Capital		
Education	Illiterate	77.29%
	Primary	15.35%
	Secondary	5.75%
	Higher Secondary	1.61%
Access to Health Facilities		92%
Natural Capital		
Access to safe drinking water		82%
Ownership of Homestead land		100%
Physical capital		
Own house		100%
Type of House	Kutchra	0%
	Semi-Pucca	0%
	Pucca	100%
Access to toilet facilities		100%
Access to Electricity		100%
Social Capital		
	Membership in CBOs	72%
	Receive support from relative during crisis	100%
	Receive assistance from government	100%
Financial Capital		
Mean Monthly Income(INR)		
Poverty Status(Team Assessment)	Very poor	
	Poor	
	Middle Income	
	High Income	

Source: Survey and FGDs in the Fishing Villages in Ganjam District

4.1 DISCUSSION & ANALYSIS

In the context of key socio-economic status of the fishing communities, it is inferred that the fishing occupation is undertaken by mostly young and middle-aged fishers as they possess the required strength and they do have the capacity to stay in the sea for long hours. Gradually, old people strength

declines once he reaches the age of 50 as fishing is considered as most challenging and difficult occupation in the world. The average household size is 4.1. In the context of human capital, it is observed from the household survey and FGDs data that most of the small scales fishing communities are illiterate. Around 77.29% of the marine fishermen are illiterate which means they have never attended any formal school nor received any education in any other informal set up. Only 15.35% went to primary school for their basic education and 5.75% went to upper primary school for their basic education and a mere 1.61% went to higher secondary school. This indicates a very low level of education and mostly high illiteracy level among fishing communities which restricts them to adapt to changing external environment with respect to opportunities and threats. Though overtime with different interventions of the government the health infrastructure scenario has vastly improved. Thus, the marine fishing communities can receive the access to basic health services. Around 82% of the respondents' feel that regarding health services things are manageable though there is scope for improvement in terms of better and time bound service delivery.



Odisha has been severely affected by many climate induced extreme weather events since the past 100 years. This has resulted in development of cyclone resistant infrastructure in terms of concrete houses especially for coastal villages in all the coastal districts of Odisha. In Ganjam district, all the resident of seaside villages has concrete houses, and they possess their own homestead land also. 100% respondents were of the view that they have their own concrete house and their own homestead land. In this context some of the old fishermen during FGDs shared with us how they suffered the previous cyclones when their houses were completely damaged as they use to reside mostly on kutcha houses. But, then he said things have changed from that time and now everybody has a pucca houses under different schemes of the government. The fishing villages are all well connected with concrete roads and with 100% electricity coverage in all the villages surveyed. Most of the households have also constructed toilets in their village. As far as Social Capital is concerned; around 72% of the

household in fishing communities have membership in community-based organizations but from the key informant interview and FGDs indicate that those memberships are mostly in defunct stage and hardly any member of the groups are enterprising nor the are willing to take bold initiatives. Though the households and the respondents agree that there is fellow feeling in the community and relatives and community members help during the crisis period.



CHAPTER 5
RISK PERCEPTIONS & CLIMATE VULNERABILITY

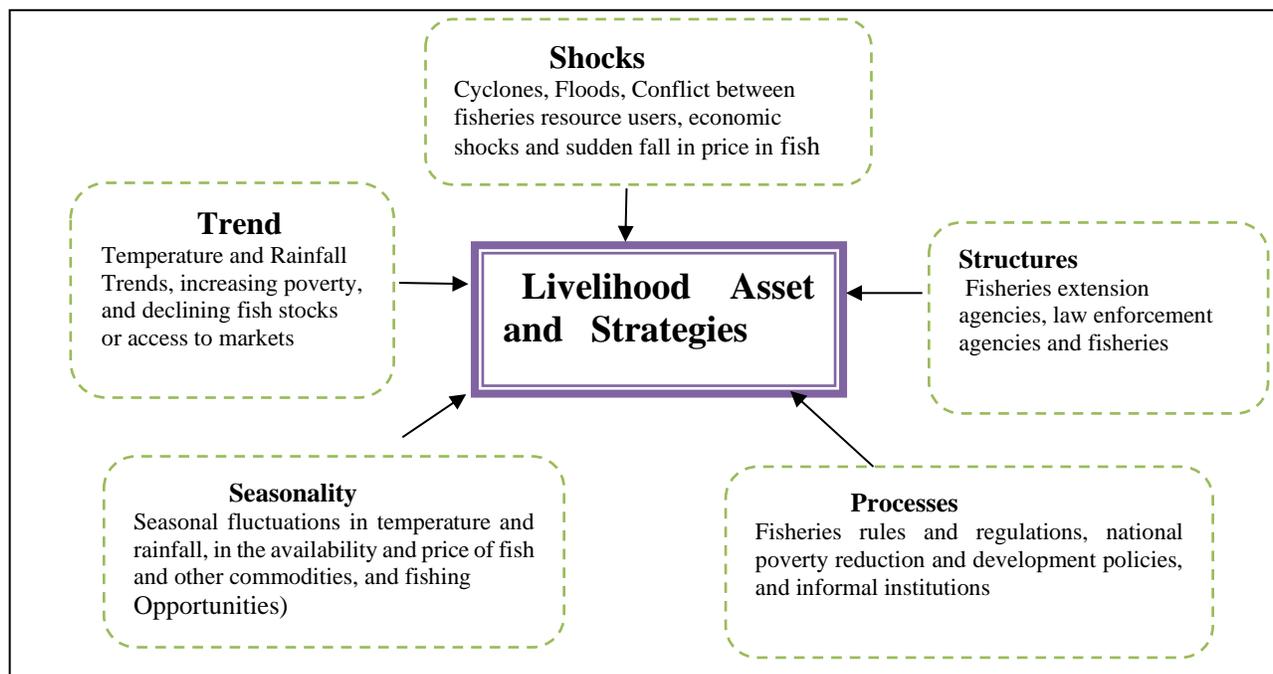


Figure 2: Factors affecting Livelihood Asset and Strategies of a fishing community(Adapted from DFID,1999;Allison and Ellis 2001;Satia 2004 and

5.1 FISHERS’ PERCEPTIONS ABOUT CLIMATE CHANGE AND FISHERIES

Climate Variables	Trends	1960	1970	1980	1990	2000	2010-20
Cyclones				—————→			
Change in Temperature			—————→				
Wind Pattern				—————→			
Rainfall Pattern			—————→				
Volume of Rainfall			—————→				

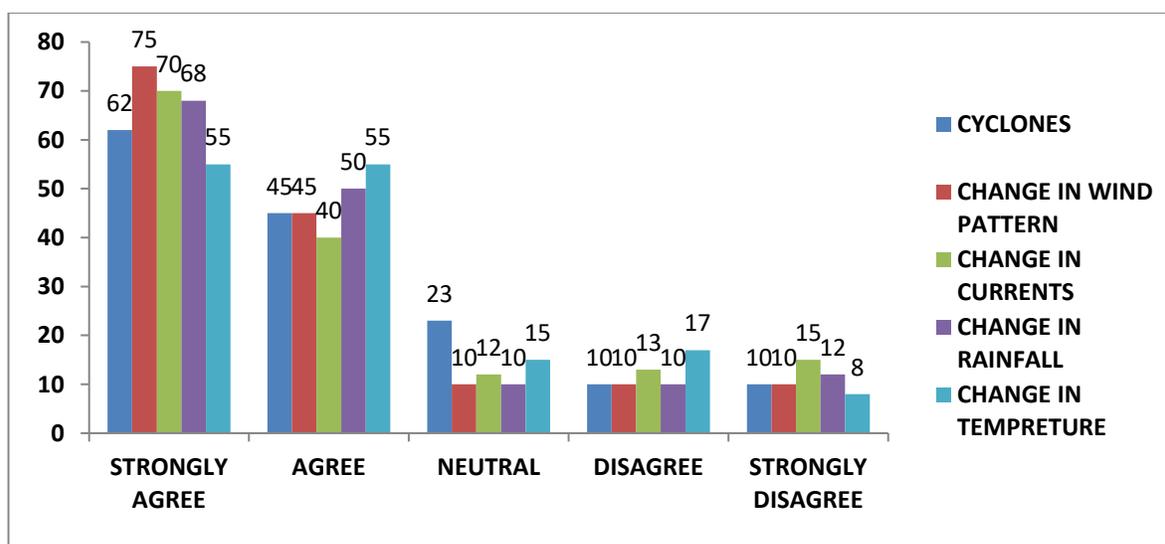
Shocks

Sl.No.	Type of Disaster	Frequency	Intensity
1	Flood	Regular Feature	High
2	Cyclone	2–3-year interval	High
3	Tsunami	Rare	High
4	Drought	3-5year	Moderate
5	Heatwave	Regular	High
6	Earthquake	Low	Moderate

The fishers’ perceptions about climate change and discussions with other relevant stakeholders. Based on the literature review and the FGDs and Key Informant Interview a set of issues relating to climate change and climate variability was identified as having significant impacts (real and potential) upon Indian fisheries.

5.2 SEA-LEVEL RISE

Sea-level rise is an important manifestation of global warming. The sea level rise was best understood by fisher folk community when a group of middle-aged fishermen talked about how the sea waves invaded their village in Podempeta. One of the residents of the village was of the view that “Sea is eating away our land, settlements and we realized soon that we have to live our ancestral place and move to some other place”. The case was evident as the Podempeta village was resettled to a new location named as “New Podempeta” with all the basic amenities for fisher folk community by the state government of Odisha as many houses was washed away by waves and there was severe erosion of the beach in Podempeta village in Ganjam district of Odisha.



5.3 Increase in temperature

The fishermen understanding of temperature indicates temperature in general and particularly sea-surface temperature. They (marine fishermen) feels is an important factor in determining factor as far as fish catch and changing composition of species in the catch is concerned. The increased sea surface temperature coupled with pollution from industries have affected the sea ecosystem altogether. The fisher folk are of the view that most of the pelagic species have descended to the lower layers.

5.4 Change in pattern of wind

The seasonal wind patterns have changed; winds that should arrive at periods of the year do not appear on time, which leads to an overall disturbance in fishing conditions. The decrease in wind velocities is reported to have impacted upon the currents, upwelling processes, fish movements, navigation, and fishing effort.

5.6 Change in seasonality patterns

The fishers are as dependent on the monsoons as the farming communities, and the consequences of a poor or delayed monsoon are just as hard for them. The timely arrival of monsoons, especially the southwest monsoon, remains the most critical requirement for productive fisheries. Increasingly, the monsoons have become quite irregular; even when they arrive on time; they seem less consistent in their behavior. With changing seasonal patterns, fish availability has been affected, and some important seasonal fish species have reportedly declined in catches.



5.7 Erratic rainfall and decrease in volume of rainfall-

There have been some critical trends in rainfall patterns from year to year and within each year. Heavy downpours in certain years are followed by near-drought conditions in the following years, both being equally disastrous for fishing and other activities. Even within a year, rainfall is not spread evenly through a season; the entire annual rainfall occurs within a short period, creating problems, both immediate (swamping) and long-term (reduced upwelling). Thus, while the total annual rainfall may remain constant, its distribution being not uniform through the season means a severe upset of fishing and other activities. This seasonal downpour helped to churn the coastal waters and ensured upwelling, while also facilitating flows of freshwater into the system, which enabled fish breeding.

5.8 Cyclonic Disturbances

Ocean warming plays a major role in sea-level rise, intensified cyclone activity and heightened storm surges. The 1999 super cyclone which hit the Coastal Odisha has virtually devastated everything and it has not spared the fishing community. The super cyclone severely affected the fishing infrastructure, fishing gears and livelihood of the fishing community. Apart from the direct loss of lives and livelihood assets, the super cyclone left a tale of destruction and other long-lasting impacts in form of biological, geographical, social, and economic phenomenon for fishers.

5.9 Currents and Waves

In most places, it was seen that the intensification of waves in one area is complemented by a weakening of the same in the neighborhood. The cyclical pattern that characterized the movement of waves to the coast appears to be broken. The wave action in the coastal waters has become weaker because of weakening nearshore winds and increased siltation around river mouths.

5.10 Tidal action

Changes in tidal action are felt particularly in the estuarine regions, and evidence of both increase and decrease in tidal amplitude has been reported. An important (natural) phenomenon appears to be the fluctuations in tidal cycles based on the lunar phases. This is reflected in changes in fish availability in the creeks, where the operations are largely influenced by the tidal cycle. Increase in tidal influx from the sea is said to be caused due to less freshwater flows from upstream and contributes to increased salinity along the upper reaches. Erosion of beaches has led to increased inundation of fishers' houses during the high-tide period

5.11 Change in Shorelines

Erosion and sedimentation are the most significant factors affecting the coastal areas and fisheries. Erosion, which is reported to affect 23 per cent of the shoreline along the Indian mainland (Vivekanandan, 2011:11), is a major threat faced by many fishing communities in all four States. Most villages—including major fishing Erosion and siltation go hand in hand, which is the reason why in the neighborhood of the same areas being affected by erosion, there are problems of siltation that are equally severe for the local fishers. Siltation of the river mouths (i) obstructs the water flows from upstream.

5.12 Other Factors

The fisheries-related factors exacerbating the impacts of climate change include increasing fishing fleet size, engine powers and capacities; destructive or ecologically unsound fishing practices; and poor engine and fuel efficiencies. Also, even where not directly contributing to climate change, these activities adversely affect the health of the resource base, undermining fishers' ability to cope with the changes. Moreover, pollution is a critical problem.

5.12 Discussion and Analysis

From the analysis of climate variability, it was found that the indicators indicate that there a change in the trend and trend reflects that the climate variables have a negative impact on livelihood and mostly importantly on sustainable livelihood. The Climate variability perception timelines of local communities indicate that the climate variable such as rainfall pattern has been erratic in the last 20 years. The rainfall volume has decreased considerably, if we consider last two decades timeline and it has affected the agricultural sector. The drought and increase in temperature have also increased during the last 20 years. The frequency of the calamity and sea erosion is on the rise.

In the context of perception of local communities on the status of key resources for livelihood in a timeline indicates- The status of high income generating marine fish species has also declined considerably. The fish species such as kanga, bada kantia, telia and firka was available in plenty for the fish folk communities residing in that area, but the current status is that this species are hardly seen now. The fish species such as ilish, pomfret and prawn have declined considerably, thereby reducing the income of the fisher folk.

The current status of the key resources is presented in the following table:

Table 2 - Status of Key Resources as perceived by fishing communities

Name of the some of the species with Scientific and local name (as reported by the fishing community)	30 years	20years	10years	Now
Kanga	was available	was available	Declined Considerably	Hardly Seen
Bada Kantia	was available	was available	Declined Considerably	Hardly Seen
Telia	was available	was available	Declined Considerably	Hardly Seen
Tenualosa ilisha (Ilisha)	was available	was available	Declined Considerably	Hardly Seen
Black Pomfret- Parastromateus (Kala Chandi/Bahala)	was available	was available	Declined Considerably	Hardly Seen
White Pomfret-pampus argenteus(Chandi Macha)	was available	was available	Declined Considerably	Hardly Seen
Firka	was available	was available	Declined Considerably	Hardly Seen
Indian White Prawn(White Chingri)	was available	was available	Declined Considerably	Hardly Seen
Penaeus Monodon(Tiger Prawn)	was available	was available	Declined Considerably	Hardly Seen

Source - FGD and Key Informant Interview in study villages



CHAPTER-6

LIVELIHOOD CAPITAL & OUTCOMES

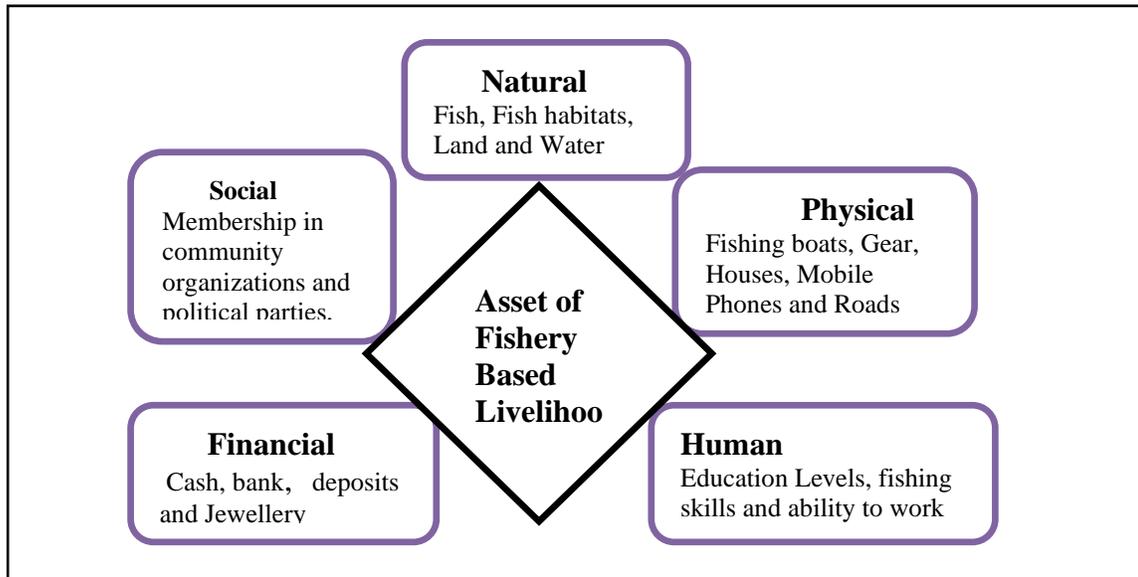


Figure 1 Livelihood capital assets of a fishing community (adapted from DFID 1999; Satia 2004; Townley 2004)

Human Capital

The household survey reflects that most of the fisher folk populations (77.29%) are illiterate and around (15.35%) have received basic primary schooling only. Thus, such high level of illiteracy is likely to create a barrier and limit their capacity for diversification of livelihood opportunities and strengthening their overall resilience. Though the fisher folk communities revealed that they love their occupation and possess the skills to undertake it in the most efficient way but changing climatic conditions and extreme weather events sometimes make fishing in the sea exceedingly difficult and challenging. Moreover, fishing at sea is a very hard-working job and it requires lot of effort. Some of the fishermen have narrated horrifying stories related to death of the colleagues' as well as injuries during the voyage. The marine fisher folk communities also shared their views on deteriorating health once they cross the age of 50. They suffer from joint pain, nerve related disorders and other chronic illness as they feel their occupation is very demanding, stress oriented and calls for lot of hardship as there is no proper time for adequate sleep, rest or taking food in time. The old fishermen were of the view that once they grow old their income generation capability drastically reduces as their body does not permit to take trips to the sea and the breakdown of joint family

structures put lot of pressure and often push the household into the brink of poverty and financial insecurity. Though the women from the fisherfolk community keep toiling hard from morning 3 AM to night 10 PM; where they are involved in buying fish, selling fish in the villages and nearby markets. The women head loaders are also involved in processing of dry fish and its marketing. Thus, from the field observation, key informant interview and focus group discussions it can be concluded that the old group fisher folk population comprising of both women and men are one of the vulnerable sections of the marine fisher folk community.

Life of a Fisherwomen

B. Chandama, a resident of New-Boxipalli village in Ganjam district of Odisha was walking down with a headload of fish to nearby villages. She had an herbal toothpick in her mouth as she did not get time to brush her teeth in the morning. But still she gave us time and narrated her story and in general and the life of a fisherwomen. While interaction with her regarding her understanding on changing climate dynamics and its impacts. We are amazed with her clarity on the above subject and clear mindset about the challenges faced by fisherwomen amidst climate change. She felt that the effects of climate change are expected to affect disproportionately; particularly the marginalised and poorest communities as their adaptive capacity is less than the other segments of the population.

In this context, one of the most vulnerable group is women. The women from marginalized communities are already plaguing with issues relating to socioeconomics, security, rights, and entitlement related aspects. The negative impact of climate change will exacerbate this further. Various studies and reports on climate change and gender dimensions indicate that after the occurrence of any climate induced extreme weather events such as cyclones, drought or floods women tend to suffer more, and they are highly vulnerable. The UN reports on Women, Gender Equality and climate change clearly indicate that women are more vulnerable than male counterparts as their livelihood are predominantly dependent on climate sensitive sectors. Another aspect to this differential vulnerability between men and women exist on account of their roles and responsibilities at the household levels.

In general, women and men experience the impacts of climate change differently because of differences in their roles and responsibilities at the household and community levels. The fisherwomen daily work is exceedingly difficult and challenging. They work in the scorching

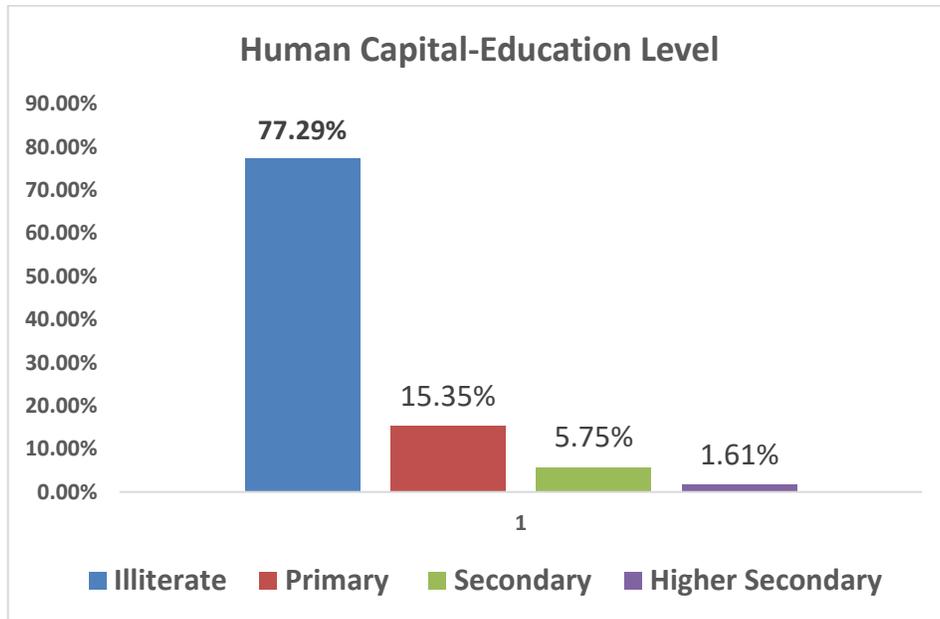
sun for long hours which involves buying, drying, processing, and selling in villages and markets. Apart from the outside work, the fisher folk also undertake all the activities of household chores. Thus, this result in health issues and many fisherwomen suffer from many skin related diseases, sleep related disorders and stomach and kidney related disorders. As the temperature increases the miseries of the fisherwomen increase and they tend to suffer from health and livelihood issues as the fish catch drastically get reduced during the summer.



The fisher folk society is generally driven by men. They tend to control the household finances and waste all the resources earned by women and their own earnings on liquor. This further contributes towards weaking of financial asset base. The fisherfolk households are generally dependent on indigenous moneylenders for their working capital requirements and credit related aspects. Due to this, they often get trapped into a “Vicious Cycle of Credit” and continue to repay the moneylenders back at high rate of interest. The cycle continues to grow during the fishing season every year. Ultimately this “Vicious Cycle of Credit” turns into to “Vicious Cycle of Poverty”.

B. Chandama, aged around 55 years, a fisherwoman from Revu Kuthuru village in Ganjam district of Odisha; very categorically pointed out how their adaptive capacity gets reduced as they need to hire the transportation vehicle and bear its cost of transporting to marketplaces. The fisherwomen are not allowed to board the government bound buses to the nearest market. In this backdrop, it has been observed that changing climate dynamics affect the fisherwomen in many ways. But their adaptive capacity is limited as they are not functionally literate and

possess low skill set to diversify into alternative livelihood portfolios. In this context, the only potent options that remains with the fisherwomen is to migrate sometimes with their husband and sometimes to nearby towns for manual labour work. At the field level it is often reported that in fishing communities there is large scale migration and most importantly it is distress migration. Thus, there is a dire need to understand and reinvent the livelihood portfolio of fisherwomen.



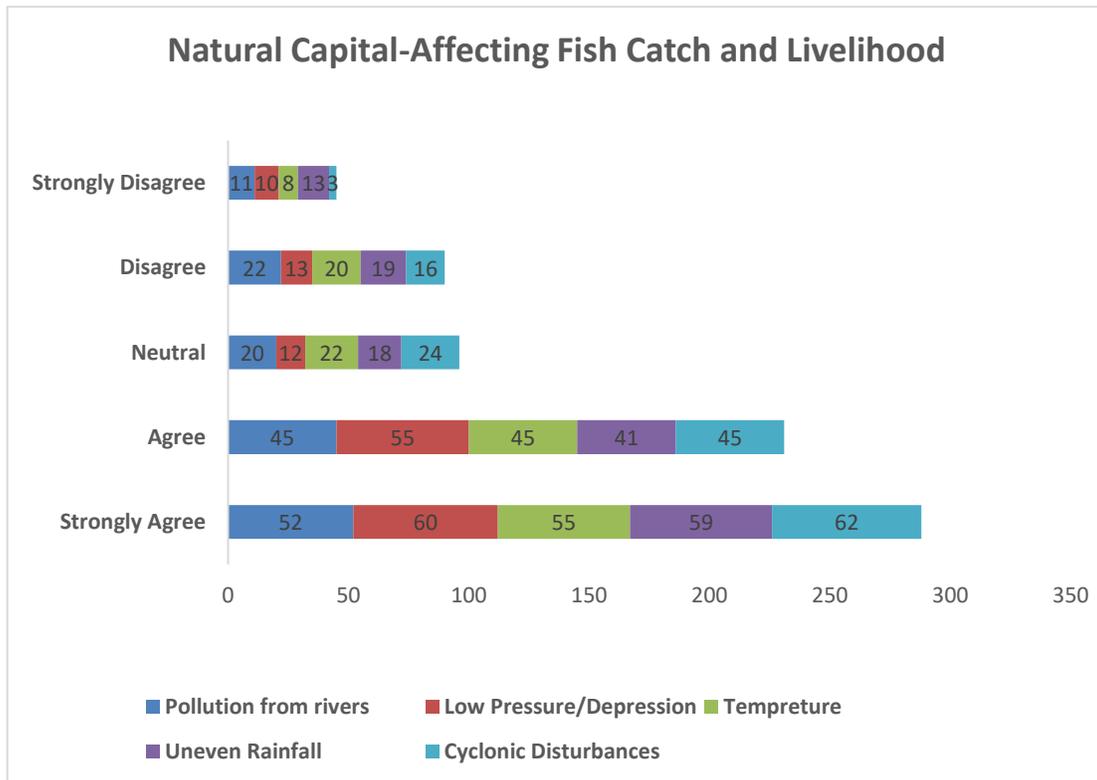
Natural Capital

Natural capital is the most important form of capital as far as marine fishery is concerned. Around 74% of fishermen agreed that due to prolonged riverine pollution and environmental degradation; the fishery sector has been affected to an large extent.

To quote one of the old fishermen from Revu Kathuru village in Ganjam district of Odisha-

During my youth days when I use to go to fish with my fellow mates; we use to get lot of fish but now after toiling hard in the sea for hours and days we hardly get enough catch to feed our family. Sometimes it does not cover our cost of operations. “The FGDs in the study sites revealed several anthropogenic factors, which they attributed to the degradation of fisheries including river pollution, excessive trawler fishing and destructive methods of fishing; that is fishing of juveniles. Climatic Change has led to depletion of fishery stocks. Increased sedimentation into riverbeds, changes to monsoon and rainfall patterns (rain is

necessary for breeding) and changes in coastal morphology can all negatively act the availability of species. A change in water temperature has affected the spatial and temporal distribution of spawning. As a key informant from the Department of Fisheries (DoF) claimed, “Due to sea level rise and salinity intrusion, the fishes tend to migrate longer distances upstream to search for favorable water parameter. Furthermore, changes in rainfall patterns sometimes cause drought, which accelerates the impact of dryness and reduces water flow. Riverbed siltation is one of the most noteworthy causes of the diversion of fish migration routes.



The Case for Sand Dunes Vegetation

The serene geographical location of Coastal Villages of Odisha where the small-scale fishing communities reside seems incredibly unique in terms of physical landscapes, its attributes and distinctiveness. But the threat to this beautiful ecosystem looms large in form of declining coastal sand dunes and other vegetation associated with it. Sand dunes are formed at the interface between the sea and land. They are formed from sand which is eroded and ground rock, derived from terrestrial and oceanic sources. The form of dune systems includes number of factors such as the shape of the coastline, shape of the beach, currents and swell of the ocean, prevailing wind, frequency of storm events, and particle size of the sand.

The coastal sand dunes are natural structures, which protect the coastal environment by absorbing energy from wind, tide and wave action^{1,2}. The plants present on coastal sand dunes are called psammophytic species. These psammophytic species are playing a vital role in protecting the coast from erosion and flooding². The degradation to this coastal vegetation is a concern in the current context. The coastal belt of Odisha is rich in plant resources, which harbour many economic and medicinal plant species. The surrounding villages near the coast use to depend upon these resources for their livelihood. They used to collect and utilize these plants for food, timber, fuel and medicine. These plant species used to be of tremendous utility; both medicinally and economically. But overtime, due to overexploitation of these plants resources without replenishment or replantation has resulted in decline in such species. To be specific; now they are threatened and endangered species.

Dune vegetation contains many species of specific flora and thus it is an ecological storehouse rich in genetic diversity. They also have high ecological values. They bind sand particles, develop and stabilize sand dunes, check sand movement, produce humus, increase soil water holding capacity, etc. Sand dune vegetation is not commonly used for economic gain but is also identified for medicinal use.

In interaction with villagers of seaside villages in Ganjam district of Odisha; it is observed that coastal sand dunes and its associated vegetation is under severe threat from changing climate dynamics resulting from the effects of global warming and other anthropogenic pressures. Thus, this calls for immediate rejuvenation and restoration measures for sustainable use and benefit of poor small scale fishing communities and larger societal interests.

One of the old fishermen along with his colleagues shared their childhood stories where they were not able to sea from their village. They had to climb a mountain of sand dunes; then they would get to see a glimpse of the sea. Moreover, there was also lot of plant species which use grow in the sand dunes. They said those plant species were of great use to us. But now, we hardly come across those plant species. *To quote one of the old age fishermen from New-Boxipalli Village in Ganjam District of Odisha- "Sand Dunes use to provide us protection from cyclonic disturbances, strong winds, furious waves and storms. But overtime they are eroded and destroyed. In this context, we are sure of one thing without*

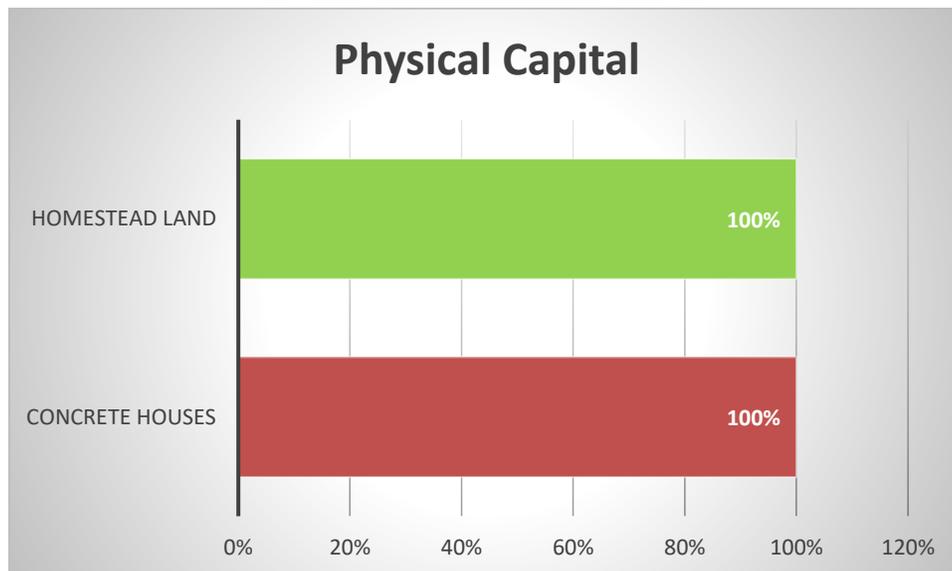
*sand dunes the small-scale fishing communities who are residing in seaside villages are exposed to future hazards”.*¹²

Physical Capital

The fisher folk physical capital includes boats, fishing gears, storage and landing infrastructure, transportation and road networks. Extreme weather events as a manifestation of climate change have a direct impact on physical assets. Fishers must invest a large amount of money for any kind of trip, with significant costs involved in boats, engines, fishing gear and maintenance. Any natural calamity in the sea causes damage or a loss of fishing equipment, especially boats and nets.

To quote one old fisherman from New-Baxipalli village in Ganjam district of Odisha-

“To save us from cyclones and bad weather we return to the shore as soon as we get information from authorities but us generally, we are not able to safeguard our fishing assets as we have to leave it in water tied down with the help of anchor. These results in very less or no catch in fish and ultimately leads to financial loss due to the incomplete fishing trips”.



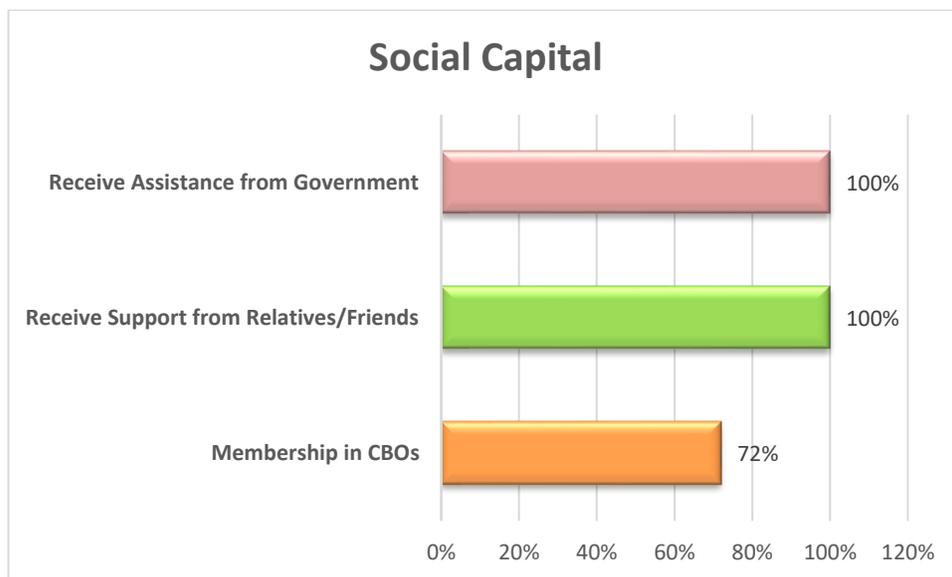
Social Capital

Social capital plays a very critical role when it comes to deal with any crisis per se. In the context, whenever the community faces any extreme weather events; the community members support each other in form of cash, kind and provide the psychological support.

¹Pattanaik et al, Phytomedicinal study of coastal sand dune species of Orissa, 2008

² Desai KN, Dune vegetation: need for a reappraisal, Coastin: A Coastal Policy Rese Newslett, 3, (2000) 6-8.

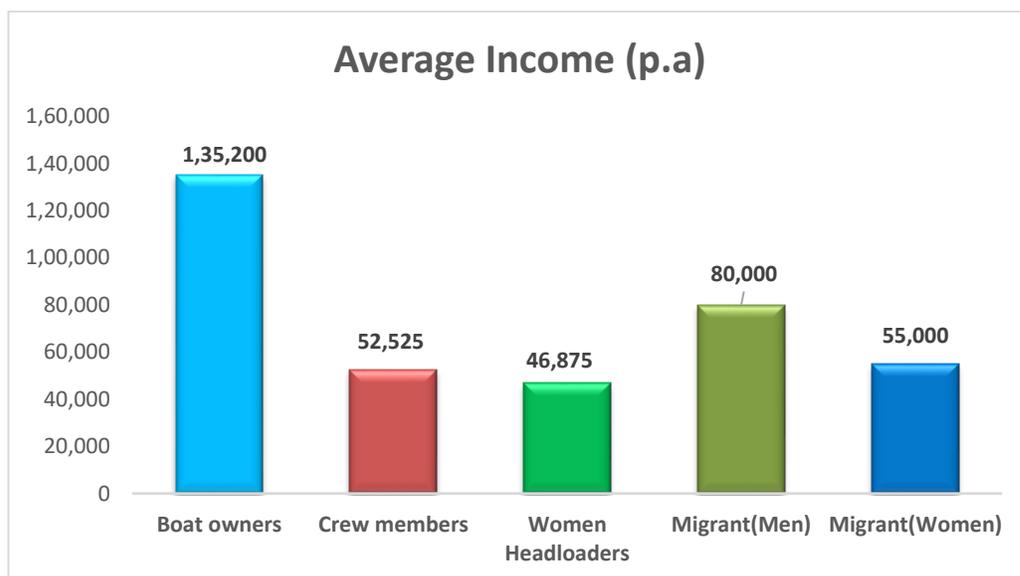
Though marine fishermen are the part of community-based organization; but they are not doing enough to promote their entrepreneurial activities; so as to generate income and strengthen their voice. As, both the fishermen and women feel that in the community there exist strong bonding which often get reflected in time of any kind of emergencies. The discussions reveal that during any extreme weather events, like in cyclones; the community stands together and the overall approach reflects a strong bonding and willingness to help each other. The neighbors' generally come in support as they provide the firsthand help. The relatives and other friends do provide financial support in time of need. However, with rise in climate induced extreme weather events "Social Cohesiveness" alone cannot determine a fully-fledged recovery and a complete restoration of livelihood. However, increasing inequality and poverty among fishing communities lead to conflicts of interest, social envy and opportunism. Rehabilitation and relief programs after any disaster also create disputes between beneficiaries and non-beneficiaries. Consequently, tensions may rise among fishers, loosening social bonding. Information gathered from the FGDs revealed that genuine fishers are sometimes may deprived of relief due to nepotism and bias related to partisan politics.



Financial capital

The extreme weather event such as cyclones, flooding, frequent depression and cyclonic weather conditions in the Bay of Bengal has cut short the number of fishing days coupled the fishing ban by the state government due to nesting sites of "Olive Ridley turtle". In this context the fishing trips have been reduced and subsequent degradation in the aquatic

environment due to pollution and climate variability the fish catch has also been reduced. The fishing gear such as nets, boats and other accessories does get affected and sometimes damaged fully due to changing weather conditions and cyclonic disturbances. Moreover, near shore marine species are not available anymore; we need to take plunge to dive deep into the sea for catch which requires more investment terms of food and fuel and other support. Thus, ultimately the above-mentioned factors have contributed towards decline in production and thus it has been reflected in terms of their socio-economic indicators. The situation of fisher folk communities and specially the vulnerable groups such as the crew members, old age fishers and women head loaders with little or no asset is deplorable. Though, there are opportunities for livelihood diversification but high level of illiteracy and sometimes lack of will for livelihood diversification make them more vulnerable to the changing climatic conditions. Around 69% of fishers said that they do not have any other alternative occupation during the lean season and they survive on credit and borrowing from friends and relatives. During the FGDs, one clear thing that came into picture was that how the marine fishermen get into the credit trap which eventually turns out to be a poverty trap for them. These fishing communities borrow heavily from the indigenous money lenders at an exorbitant rate of interest generally to meet household expenses in the lean season and also to fund the upcoming trips after the start of the season.



Discussion and Analysis

In the light of the sustainable livelihood approach, the natural capital factor indicates that there is a decline in fish catch as well as economically valuable species. The deforestation of coastal forest and declining sand dunes and its associated vegetation is also an indicator of weak natural capital base for the communities. The analysis of financial capital highlights that family regularly depends on credit for investment and consumption purposes during some parts of the year. The inadequate savings and institutionalized sources of credit results in sub-optimal performance with respect to financial capital base. The physical capital analysis throws a grim picture in terms of household lack of ownership of sufficient productive assets to make a living. When owned, the productive assets are traditional, low cost and indigenous, catering to local markets and vulnerable to competition from new technology and market forces. The lack of ownership of homestead land and housing make the matter worse for the communities. The villagers pay encroachment fine to the administration. The family resides in thatched or kutchra house. In the context of the social capital, lack of active community-based organizations. The members of the family undertake seasonal or occupational migration to meet the subsistence needs.

In this section the focus is on livelihood outcomes. The decline in fish catch and economically valuable species, also results in declining income. The reduced income leads to less expenditure on food and other basic needs and often these changes are also accompanied by changes in occupational pattern in study villages. There have been increased instances of out migration in these villages as people move to cities within the states as well as for away cities in other states for employment and often they are exploited in terms of non-payment of wages in their working place. The migration ranges from seasonal to all months of the year. It has also been observed that the community has adapted to climate change. It is reflected in terms of Migration and diversification into agricultural activities is seen in the context of Marine fisher folk community and promotion of kitchen garden in the monsoon season is viewed as a coping mechanism in the context of marine fisheries.

The pattern of rainfall has been very fluctuating since 1960's with below normal rainfall recorded in almost all the district of the state for most of the years. Generally, during the monsoon time the state used to receive normal rain of 120 days but it has now come down to 60 to 70 days. But, the torrential rainfall of over 200-250 millimeters per day during the

monsoon season lead to flooding. The coastline of Odisha is particularly vulnerable to episodic storm events (such as cyclones) and a host of other associated events such as storm surge, coastal flooding, shore erosion and Inundation. (OCCAP,2018-23)Odisha is one of the vulnerable states in the context of climate change. The reasons for its vulnerability are: its natural setting (geographic location) and poverty where people have very little capacity to cope with and adapt to the climate extremes and variability. The climate variability, which has become a regular event, result in loss of production and income, mainly for the marginalized sections of the population. The framework of the paper is based on Sustainable Livelihood Approach (DFID, 1999). The framework identifies vulnerability in the context as the trends, shock and seasonality (DFID, 1999). In response to these changes the households both as individual units and as a community choose different coping and adaptation strategies

CHAPTER-7
ADAPTATION & RESILIENCE AMONG MARINE FISHING COMMUNITIES

Resilience here is best understood as a result of absorptive, adaptive and transformative capacities.

Absorptive and Adaptive Capacities and Responses Captured:

Capacities	Responses
Absorptive Coping Capacities	<ul style="list-style-type: none"> • Multipurpose Cyclone Shelters(MCS) and Community buildings used as temporary shelters in case of severe cyclonic storm where the people in the communities are fed with cooked food and provision of electricity. • Receives assistance from INGOs, NGOs and government for house repair and maintenance. • Reduction in consumption of food during pre- and post-cyclone periods, cut in daily expenses and borrowing from relatives and friends in need and indigenous money lenders. • Generally, the money lenders charge an exorbitant rate of interest. • Migrating for a short-term with or without family post cyclone or any extreme weather events.
Adaptive Capacities-Fishing	<ul style="list-style-type: none"> • Increase the fishing effort and changing gears accordingly • Whereas if a migrant chooses to work in fishing sector then he generally chooses to travel alone and work in the sector leaving behind the entire family in the village.

	<ul style="list-style-type: none"> • Household Head allow women to work outside village • The family generally survive on remittances and pension income.
Adaptive Capacities-Non-fishery related strategy	<ul style="list-style-type: none"> • Migration permanently with the family if one chooses to work in the construction industry. • Diversification (develop/invest in non-fishery activities)
Planned Adaptation (The case of Podempeta in Ganjam district Of Odisha)	In Podempeta, the government of Odisha planned their resettlement to a new location called “New Podempeta” with all the basic amenities and the new location is safe in terms of facing any eventuality, such as cyclones or the coastal erosion.

Table: Field observations of the team.

In the context of the framework on resilience as the result of absorptive, adaptive and transformative capacities the y-axis indicates the intensity of shock/stressor impact (it is classified as mild, moderate and severe) and the x-axis indicates the intensity of responses (in the context of stability, flexibility and change). In that response, the absorptive coping capacity is to reduce the food intake of the family and most women come forward and sacrifice her share of the food. The cutting down of the general expenses of the family and borrowing from the friends, relatives and sometimes from the indigenous moneylenders at exorbitant interest rates. The adaptive capacities, generally in the context of fishing as an occupation is to change fishing gears from time to time, change in targeted species, fishing ground, fishing calendar and fishing calendar. The adaptive capacities in the context of non-fishery related strategy are to migrate (sometimes temporarily or permanently) but generally in the study area, one or two members migrate. The diversification in non-fishing activity is seen as an adaptation to changing climate variables. But transformational capacity or form of adaptation was not entirely evident in the context of the study area.

In the context of Podempeta village in Ganjam district of Odisha, the state government planned their resettlement in a new location named New Podempeta, where the communities were provided with land and financial assistance to build a pucca house and also developed

other amenities. Thus, it is a clear case of planned relocation in the context of adapting to climate change.

Resilience –An Illustrative example to justify the case of the transition phase of Podempeta to New Podempeta in Ganjam district of Odisha

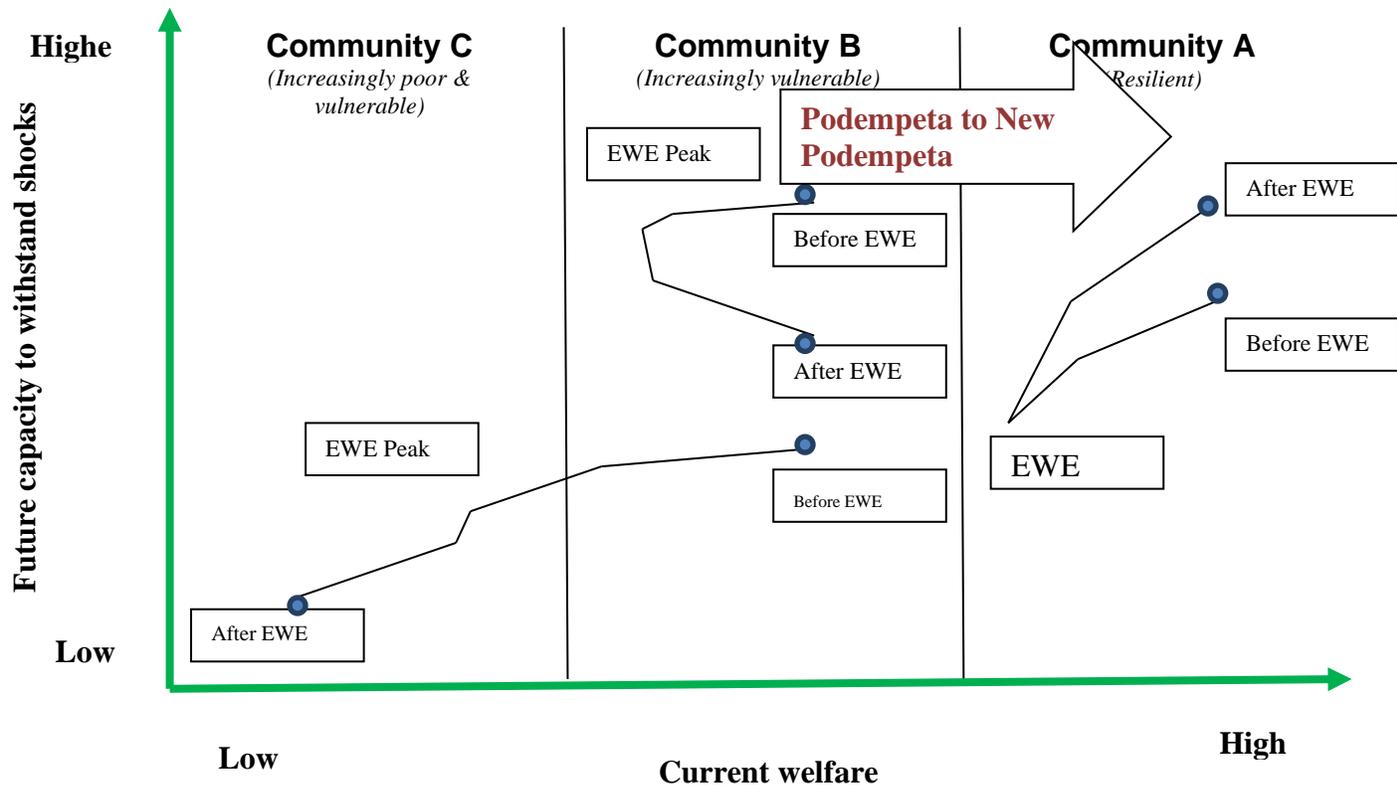


Figure 6: Adapted from Global Hunger Index, 2013: The challenge of Hunger Building Resilience and Food Security. *EWE: Extreme Weather Events*

This is an illustrative example that indicates that how a community is termed as resilient aftermath of an extreme weather event. In the above graph, there are three phases that depict the communities. The community A, which is considered to be resilient because before the occurrence of an extreme weather event the current welfare and future capacity to withstand shocks was lower, but after the extreme weather event, it is observed that the capacity and the welfare increased as depicted in the graph. As it had opted to diversify livelihood choice led by women groups. The community B, after the occurrence of extreme weather event that is its peak the vulnerability increases. The case is more or less the same in the context of

community C. They are also poor and vulnerable as they fell drastically after the occurrence of extreme weather event.

Chapter-8

POLICY ANALYSIS

The Central government policy on fisheries in India is detailed out in two key policy document i.e., the five Year plans developed by the planning commission and the central marine fisheries policy(CMFP) under the purview of Ministry of Agriculture, Government of India. The CMFP developed provide a guiding document to the state government for the conservation, management and sustainable conservation of resources.

The policy document establishes three key objectives:

- Augment marine fish production of India up to the sustainable level in a responsible manner so as to boost export of seafood from the country and also increase per capita fish protein intake of the masses.
- Ensure socio-economic security of the artisanal fishermen whose livelihood solely depends on this vocation.
- Ensure sustainable development of marine fisheries with due concern for ecological integrity and biodiversity.

The CMFP (2004) consists of ten-point agenda which include establishing a stringent fisheries management system, encompassing an improved regulatory and Monitoring, Control, Surveillance (MCS) systems. The guidelines and provisions of the Comprehensive Marine Fisheries Policy (2004) of the Central Government and which advocates protection and conservation of the resources, encouragement of subsistence level fishermen and technology transfer to small-scale sector and infrastructure support to industrial sector, will be adopted. For reducing fishing pressure in the traditional fishing areas, resource specific fishing in the offshore areas will be promoted, by refurbishing the existing trawlers and by designing and introducing new fuel efficient fishing crafts.

Marine fisheries specific policy developments in the context of Odisha: -

- Collection of reliable statistical data and proper assessment of marine fishery resources and other related aspects by applying standardized methodologies. The focus would also be given upon strengthening of database in marine fisheries and proper application of information technology.

- In the context of conserving and protecting the turtle breeding grounds, the fishermen would be compensated for the loss of fishing days by encouraging the fisher folk communities to undertake alternate livelihood and income generating activities through skill up gradation and market tie-ups and the nesting grounds will be demarcated leaving the rest of the coastline.
- The provisions under OMFRA will be strictly enforced and a stringent fishery management system put in place. The restriction of fishing effort in the territorial waters of Odisha will be in the form of restriction in the number of vessels, number of days or hours at sea, engine power, size of the fishing gear and mesh size, prolonged seasonal closure to allow recovery of over-fished species, prevention of fishing juveniles and spawners during breeding/spawning season and reduction in fishing pressure on over-exploited fishery resources, for which appropriate enforcement measures/mechanisms will be introduced.
- A sound Monitoring, Control and Surveillance system (MCS) including the Vessel: Monitoring System (VMS) on the lines of international instruments will be implemented to check violation of the provisions of OMFRA and intrusion of fishing vessels of the neighbouring states/countries into coastal and territorial waters of Odisha. The fishing crafts registered with Odisha Government will be given special identification marks such as colour codes for different fishing crafts, or other signs.
- Co-management and Community involvement in fisheries management a. Co-management is considered the most suitable approach to manage fisheries given that the fishing community has its own management traditions and institutions. It should be seen as a process, whereby through actual practice, a multi-tiered system has to be evolved given the length of the coastline and the different administrative jurisdictions involved. Existing traditional and self-organized structures at grass roots level need to be used as —building blocks for this approach
- Recognizing the role of the Government in establishing conditions for co-management in fisheries, legitimacy and accountability for the local organizations and institutional arrangements will be created. The Government will strive to create the necessary enabling environment to promote the establishment of fisheries management institutions at local government and community levels to ensure the effective participation of stakeholders in the fisheries sector; permit communities to

- engage in fisheries management and development activities; ensure the provision of appropriate support services to fisheries management institutions at village community levels; and train government officials in the principles, practices and benefits of co-management.
- **Reducing and Controlling Fishing Capacity:** The first set of capacity controls need to start with the trawl fleet as it is the most over capitalized part of the sector and having a seriously negative impact on fishing habitat, fish resources, and other fishermen. Trawl fleet reduction could be achieved by formally closing new entry into the trawl fishery and stopping any fleet expansion and/ or moves to increase unit capacity (size, horsepower).
 - **Deep Sea Fishing:** It should be recognized that deep sea resources are not entirely state resources, but also national as well as international resources. Deep sea fishing opportunities certainly exist, but not to the extent that they can be used to address the overcapacity in coastal waters with appropriate technology and scale of operation, ensuring that it is profitable for the operators and the resource available.
 - **Mariculture as an alternative to Fishing:** Alternative or supplementary employment opportunities including Mari culture need to be evaluated carefully and should have a sound management framework before being promoted as a solution to the fisheries management problem in Odisha.
 - **Fish Quality and related infrastructure:** Development of appropriate fish handling, processing, preservation, transportation, distribution and marketing systems will be encouraged both in the inland and marine capture fisheries and aquaculture.
 - **Use of low-cost energy sources in fish processing, particularly nonconventional energy sources will be considered and promoted.** Plant quality control and hygienic conditions in fish processing establishments will be improved and maintained by enforcing the Code for Good Manufacturing Practices.
 - **Development of improved fisheries sector infrastructure and equipment, including fishing boats, fish landing sites, fish stores, fish markets, and systems for the transport of fish that contribute to maintaining the quality of harvested fish will be promoted.** Large capacity ice plants, chilled rooms and standalone cold storages will be established at strategic locations with irradiation facility as a common facility, with uninterrupted power supply.

- Ice storage boxes at reservoir sites and Fish Landing Centers/Jetties along the coast will be promoted where there are no Ice plants. With a view to reducing the number of intermediaries in supply of ice for fish preservation, to maintain its shelf life and marketing of fish cultured in selected viable pisciculture clusters, flake/tubular ice plants of adequate capacity will be promoted for producing quality ice.

To understand the exact nature of demands of fish worker's, the TEAM VIEWS decided to meet and interact with Mr. K. Alleya, Secretary, Odisha Traditional Fish Worker's Union (OTFWU) and discussed with him regarding the demands of the union. The demands of the union are as follows:

Odisha Traditional Fish Worker's Union (OTFWU) are requesting the central government to implement the following demands:

1. There is a possibility of construction of number of ports and factories as a result of "Sagarmala Project", a Government of India initiative. If this happens the coastal environment will erode and the fishermen who reside their will lose their livelihood. Also, it is a deviation from Marine Coastal Regulation zone (CRZ). This will endanger fisheries and coastal forests. Fishermen all over India are opposing this and we are supporting them.
2. Odisha is affected by global climate change and pollution which demands for legitimate remedial actions otherwise in near future fishermen village and new cities will immerse in the depth of the sea. It will also affect the lives and livelihood of fishermen.
3. Please reconsider the bills brought by central government in the year 2019 like National Marine Regulation Act 2017.
4. The misfortune of marine fishermen is beyond description. From total coastal area of 482 Kilometres; 165 kilometres is declared as the prohibited area for turtle protection and there is also a plan for construction of more ports in addition to the already existing three large functional ports. Factories, hotels, workshops and prawn geris as a result of the Government of India Initiative "Bharatmala" project will gradually occupy the state 482 kilometres sea beach area. As a result all marine fishermen of

- Odisha will lose their ancestral profession. If its is not taken care of know then the marine fishermen community will disappear from Odisha.
5. Requesting the withdrawal of National Marine Management Bill 2019
 6. The decision of replacing the CRZ, 2011 with CRZ 2019 will leave the traditional fishermen with no rights
 7. All arrangements are in place to declare Puri sea beach as blue flag sea beach. But till date no discussions were held with 15,000 local fishermen regarding their livelihood.
 8. In general, after the fishermen came back from fishing, women sell fish and dry fish made from them in market. To help these women we demand platforms, concrete auction halls and storage facilities along with rest room and public toilet facilities of advanced quality.
 9. The fishermen should be provided with Matya card same as the Kisan Card which is provided to the farmers so that it will help in implementing education, health, loan and other fishing related activities.
 10. Thousands of fishermen from Ganjam district is migrating to other districts as bonded labour. As a result their children are devoid of education and social securities. To stop this, mini fishing harbours must be constructed near the fish landing centers along with rest toom, ice mill and cold storages.
 11. Arrangement should be made to provide diesel and kerosine to the fishermen on discount. Also all the fishermen should be provided with life jackets
 12. The fishermen are included in the unorganised sector like construction labour. So, the fishermen should get some facilities as craftsmen and workers
 13. Some arrangements should be made to provide financial help in full to the fishermen children for their higher education.
 14. Arrangements must be made to pay INR 3000.00 old age pension to the elderly fishermen and women
 15. The contribution towards Savings cum Relief Scheme should be increased to INR 10,000 from the existing INR 4,000/-.

In the context of policy analysis there are not of initiatives' undertaken by the state in the context of fisheries policy, coastal regulation zone notification and aquaculture authority of India and Odisha marine fishery regulation act. To be specific in the above context, the comprehensive marine fisheries policy, alternative livelihood diversification schemes and post-harvest infrastructure, support and marketing related schemes have helped the fisher folk community. The outcome of policy analysis in the context of fisheries and agriculture sector is that policy implementation needs to be strengthened, problem of open access need to be re-looked into, the policy coherence need to be strengthen in case of marine fisheries. The diversified cropping pattern coupled with latest technology will definitely usher an era of higher production and better returns.

CHAPTER-9

FINDINGS & RECOMMENDATIONS

The broad findings of the study are as follows:

- The climate induced extreme weather events have affected the fishery sector at large. The negative impacts of climate change are borne by the resource poor marine and small-scale fishermen and women. The impacts are reduced catch, reduced number of fishing days, more investment in fuel and food for longer trips to catch fish, fisheries related assets being destroyed due to cyclonic events, storm surge and currents. Moreover, the fishermen also face considerable risks to their life and health.
- Most of the fishermen have directly attributed climatic factors such as temperature, rainfall cyclonic disturbances and low pressure leading to depression as the prominent factors in reduction of catch and effect on their livelihood portfolio.
- Around 77.29% of the marine fishermen are illiterate which means they have never attended any formal school nor received any education in any other informal set up. Only 15.35% went to primary school for their basic education and 5.75% went to upper primary school for their basic education and a mere 1.61% went to higher secondary school. This indicates an extremely low level of education and mostly high illiteracy level among fishing communities which restricts them to adapt to changing external environment with respect to opportunities and threats.
- Fishing at sea is a very hard-working job and it requires lot of effort. Some of the fishermen have narrated horrifying stories related to death of the colleagues' as well as injuries during the voyage. The marine fisher folk communities also shared their views on deteriorating health once they cross the age of 50. They suffer from joint pain, nerve related disorders and other chronic illness as they feel their occupation is very demanding, stress oriented and calls for lot of hardship as there is no proper time for adequate sleep, rest or taking food in time. The old fishermen were of the view that once they grow old their income generation capability drastically reduces as their body does not permit to take trips to the sea and the breakdown of joint family structures put lot of pressure and often push the household into the brink of poverty and financial insecurity.
- 72% of the household in fishing communities have membership in community-based organizations but from the key informant interview and FGDs indicate that those

memberships are mostly in defunct stage and hardly any member of the groups are enterprising nor the are willing to take bold initiatives. Though the households and the respondents agree that there is fellow feeling in the community and relatives and community members help during the crisis period.

- The women from the fisherfolk community keep toiling hard from 3 AM to 10 PM; where they are involved in buying fish, selling fish in the villages and nearby markets. The women head loaders are also involved in processing of dry fish and its marketing. Thus, from the field observation, key informant interview and focus group discussions it can be concluded that the old group fisher folk population comprising of both women and men are one of the vulnerable sections of the marine fisher folk community.
- The wage or share earning fish workers engaged in production, fish processing and other activities ails from the effects of a poor asset base coupled with declining production (fish catch) and subsequently fluctuating income. This restricts their capacity to adapt.
- The lack of boat, net and other fishery related assets among the small-scale fishermen restricts their access to physical capital base. They mostly work as crew members in other boats to support their income. Thus, the crew member and often the old fishermen also work as crew member are the “most vulnerable group” due to their age group and challenges and difficulties that the profession demands.
- The boat owner is always indebted to money lenders as before the start of the season they do not have the necessary working capital to start the fishing operations. The money lenders generally charge a high rate of interest which often hovers around 36% to 40% per annum. It directly hurts the fishermen income. Moreover, the small-scale fishing communities also get entangled into the “**Vicious Cycle of Credit Trap**” which eventually get into “**Vicious Cycle of Poverty**” due to high interest rate repayment which never ends.
- Fishing activities are affected by seasonal lows. The number of boats lying idle on the beach is a clear indicator of Seasonal Unemployment. This is reflected in terms of lack of consumption of nutritional food and health related outcomes.

- The high risk of vulnerability to disasters and lack of fishery asset-based insurance among the small-scale fishing communities make the group more vulnerable and less adaptive.
- The extreme weather event such as cyclones, flooding, frequent depression and cyclonic weather conditions in the Bay of Bengal has cut short the number of fishing days coupled the fishing ban by the state government due to nesting sites of “Olive Ridley turtle”. In this context the fishing trips have been reduced and subsequent degradation in the aquatic environment due to pollution and climate variability the fish catch has also been reduced. The fishing gear such as nets, boats and other accessories does get affected and sometimes damaged fully due to changing weather conditions and cyclonic disturbances.

Recommendations:

- In the context of the field level findings, the need of the hour is to recognize the fact changing climate dynamics does contribute towards reduction in fishery stocks. Though climate change is one of the prominent factors but other anthropogenic pressures do contribute towards depletion and resource migration into deeper waters. The financially strong trawlers do overexploit the fishery resources by using exploitative fishing gears and catching the juveniles. So, in the above context, there is a need to bring stringent enforcement mechanism which restricts overexploitation of fishery resources by big and powerful players in the fishery industry. This step would help in reducing the anthropogenic pressures on already stressed fishing.
- Both the men and women fisher folk are illiterate and lack basic skill set. This result in lack of understanding of many basic paperwork relating to registration, licensing, availing of benefits and other entitlements. Moreover, the lack willingness to diversify into other enterprise forms of livelihood is due to a “sense of fear of being illiterate” and they strongly perceive that it is a big impediment.
- There has been considerable depletion of natural capital in the sea side villages; which is evident from decline in sand dune vegetation. The sand dune vegetation serves as ecological and medicinal value for the small-scale fishing communities. The decline in casuarina tress due to various anthropogenic pressure has affected the coastal ecosystem and livelihood of women fisher folk communities. Thus,

steps need to be taken for plantation, regeneration of coastal forests which include replanting of casuarina and strengthening the sand dune vegetation.

- The fishery assets such as boats, nets and other fishing gears are often get exposed to cyclonic storms and other extreme weather events. But there is no awareness regarding neither any knowledge in the market related to penetration of fishery-based insurance. So, there is a dire need for developing an understanding of fishery related insurance, awareness and knowledge.
- One of the key finding is that the fishery-based cooperatives though are operational in paper but working wise they are not active and neither they are undertaking any entrepreneurial ventures. The members are not owning the cooperative. Thus, there is an inherent requirement to revive the cooperatives and instill a sense of entrepreneurship among its members.
- Majority of fisher folk in small scale fishing communities are highly indebted to moneylenders for basic working capital requirements. The moneylenders charge exorbitant rate of interest. In this regard, there is an need to inculcate banking habits among the fishing communities and streamline the procedural hurdles for them.
- The lack of knowledge on coastal laws, policies and rights have affected the overall livelihood portfolio. So, in this aspect training and awareness workshops need to be conducted at village level to make them aware.
- Migration is huge scale phenomenon among small scale fishing communities. From the focus group discussions, we can say that approximately 75% of the fishing households from different fishing villages migrate to different states either in search of work in the fishing sector or in the construction industry. Though according to the returned migrant view migration to these states are unsuccessful as they face lot of problems related to food, health, lack of proper medical attention, language barriers, education of kids and other associated problems. Thus, we can conclude that for migration to be successful; it has to skilled based, informed and safe migration.

The Odisha traditional fish workers union has come out with its set of demands which they feel can change the face of the sector. The set of demands forms the part of our recommendations to strengthen the sector further-

- Odisha is affected by global climate change and pollution which demands for legitimate remedial actions otherwise in near future fishermen village and new cities will immerse in the depth of the sea. It will also affect the lives and livelihood of fishermen.
 - To reconsider the bills brought by central government in the year 2019 like National Marine Regulation Act 2017.
 - The misfortune of marine fishermen is beyond description. From total coastal area of 482 Kilometres; 165 kilometres is declared as the prohibited area for turtle protection and there is also a plan for construction of more ports in addition to the already existing three large functional ports. Factories, hotels, workshops, and prawn geris as a result of the Government of India Initiative “Bharatmala” project will gradually occupy the state 482 kilometres sea beach area. As a result, all marine fishermen of Odisha will lose their ancestral profession.
 - Requesting the withdrawal of National Marine Management Bill 2019
 - The decision of replacing the CRZ, 2011 with CRZ 2019 will leave the traditional fishermen with no rights
 - In general, after the fishermen came back from fishing, women sell fish and dry fish made from them in market. To help these women we demand platforms, concrete auction halls and storage facilities along with rest room and public toilet facilities of advanced quality.
 - The fishermen should be provided with Matya card same as the Kisan Card which is provided to the farmers so that it will help in implementing education, health, loan and other fishing related activities.
 - Thousands of fishermen from Ganjam district are migrating to other districts as bonded labour. As a result, their children are devoid of education and social securities. To stop this, mini fishing harbours must be constructed near the fish landing centres along with rest toom, ice mill and cold storages.

- Arrangement should be made to provide diesel and kerosine to the fishermen on discount. Also, all the fishermen should be provided with life jackets.
- The fishermen are included in the unorganised sector like construction labour. So, the fishermen should get some facilities as craftsmen and workers. Some arrangements should be made to provide financial help in full to the fishermen children for their higher education.
- Arrangements must be made to pay INR 3000.00 old age pension to the elderly fishermen and women
- The contribution towards Savings cum Relief Scheme should be increased to INR 10,000 from the existing INR 4,000

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