SOCIO-ECONOMIC AND ECOLOGICAL PRESSURES ON THE FISHERMEN COMMUNITY IN THE COASTAL ZONE VIS-À-VIS CLIMATE CHANGE

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By

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Under the guidance of

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CERTIFICATE

This is to certify that the Ph.D. thesis entitled "SOCIO-ECONOMIC AND ECOLOGICAL PRESSURES ON THE FISHERMEN COMMUNITY IN THE COASTAL ZONE VIS-À-VIS CLIMATE CHANGE" submitted by Mr. Sachin Pavithran AP is a record of bona fide research work carried out by him under my supervision and guidance in the Department of Applied Economics in partial fulfilment of the requirements for the Degree of Doctor of Philosophy of Cochin University of Science and Technology. The thesis has not formed the basis for award of any degree, diploma, associateship, fellowship or other similar title of any other University or Board and is worth submitting for the award of Doctor of Philosophy under the Faculty of Social Sciences of Cochin University of Science and Technology. I also certify that all the relevant corrections and modifications as suggested by the audience during the pre-synopsis seminar and recommended by the Doctoral Committee of the candidate have been incorporated in the thesis.

Cochin Dr. K.C.Sankaranarayanan

June 2019 Dept. Of Applied Economics

DECLARATION

I hereby declare that the dissertation entitled "SOCIO-ECONOMIC AND ECOLOGICAL PRESSURES ON THE FISHERMEN COMMUNITY IN THE COASTAL ZONE VIS-À-VIS CLIMATE CHANGE" is a record of bona fide research work done by me under the guidance of Dr.K.C.Sankaranarayanan Department of Applied Economics, Cochin University of Science and Technology, and that it has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or any other title of recognition.

Cochin, *Sachin Pavithran A.P.*

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ABBREVIATIONS

CBET	-	Community Based Ecotourism
DTPC	-	District Tourism Promotion Councils
EIA	-	Environmental impact assessment
GDP	-	Gross Domestic Product
GoI	-	Government of India
GoK	-	Government of Kerala
KSPB	-	Kerala State Planning Board
NGO	-	Non-Governmental Organization
PRA	-	Participatory Rural Appraisal
PVA	-	Participatory Vulnerability Analysis
SHG	-	Self-Help Group
SWOT	-	Strength, Weakness, Opportunities and Threats
SAF	-	Society for Assistance to Fisherwomen
PARS	-	Parameter Attribute Resilient Indicator and Score
NAPCC	-	National Action Plan on Climate Change
ICZM	-	Integrated Coastal Zone Management

Dedicated to
My Dad, Late Pavithran A.P.
who blessed me to start this journey and
departed after a month

Chapter 1

INTRODUCTION

1.1. Background of the Study

The present world, with its various sectors having blended together in terms of its manifestations upon the nature and bio diversity, exerts much pressure up on the livelihoods of the mankind. However, the marginalised groups who are rather sidelined from the mainstream society on several bases like social, economic, political or geographical, are the most susceptible to the harmful impacts of any imbalance in the sustainability of the system. Considering this, the marine fisher folk communities faces a lot of crises from various pressures of social, economical, political, biological or geographical aspects. Apart from the livelihood issues like the backward living conditions, vicious circle of poverty and low education or health attainment, they also face competition in fishing, climate change issues, natural calamities and the like. Even though the previous primitive set up of the sector have changed when mechanisation, government protection schemes and innovative political and organisational set ups have paved way for the progress of the sector, the lives of the fisher folk still are buried in the darker sides of fortune.

The infrastructural development, both private and public, exerts a greater influence on the development of the vulnerable fisher folk. Despite the various government protection measures like establishment of EEZs and CRZs, implementation of Coastal Zone Management Plans, welfare programmes for building adaptive capacity of the fisher folk, or provision of health, education and transportation facilities, there are many small and big problems which are acting as obstacles to the coastal development. The illiteracy and resultant inability to make

use of alternate job opportunities coupled with the indebtedness due to poor credit facilities acts as catalysts for trapping of their lives in poverty.

The modern world is facing major problems, which gathers the attention of all the national heads, scientists, social scientists and common people alike. Among these, the threats to the ecological and environmental balance are the most important, as these can extend their reach even into the social and economic aspects of even the lives of the common people. Climate change is the most important issue in this regard, which is caused by a number of factors, which are driven and enhanced by the human activities like industrialisation, pollution and the like. The communities that are susceptible to the harmful impacts of climate change suffer from these, in addition to the imbalance in their economic stability. So, the far reaching consequences of the climate change impacts must also be addressed.

The following points show different types of effect of climate change on fishery.

The ecological impacts of climate change on fishery include: 1. Change in ecosystem processes, change in total yield i.e. fish stocks and production, change in species distribution i.e. fish migration, increased variability of catches, changes in seasonality of production i.e. decrease in fishing season, shifting of mudbanks (Unique feature of Kerala coast)

The direct impacts of climate change on fishery livelihood include: 2. Damage to infrastructure, damage to fishing gears, increased danger at sea, loss/gain of navigation routes, sea erosion, flooding in the living areas of fishing villages

The socio-economic impacts of climate change on fishery include: 3. Economic drain on fishermen, increase in debts, rehabilitation, increase in fuel costs, reduced health due to diseases.

For achieving the required and feasible solutions to the existing problems, attempts in multidimensional direction need to be adopted, that encompasses the problems and suggestions on the part of the fisher folk and other stakeholders amply, and thereby concludes in formulating and implementing necessary action

plans and welfare schemes. For this, the issues that concern the various aspects of the livelihoods of the fisher folk need to be taken into consideration, thereby ensure the active participation by all the participants. The marine fisheries sector are facing lot of issues which are simultaneously deteriorating the ecological balance and sustainability as well as increasing the susceptibility of the fishing community to the harmful impacts of climate change. Upon studying the socio economic conditions of the fisher folk we must consider certain indicators, such as , age, education, size and nature of family type, religion, habitation, public facilities available to access, nature of occupation, technological advancement, welfare programmes, organisations or action groups existing, social participation and the gender perspective in active participation. The backward socio economic condition of the fishing population compared to the general population acts as a catalyst to the further marginalisation of them. However, globalisation and the resultant developments have had mixed effects on their progress into commercial and diversified enterprise from a traditional sector. The main emphasis on mainly technical studies can be linked to the important crisis in the present scenario in which the impacts of climate change affects the fishing sector negatively. The ideas, knowledge, suggestions and propositions are often sidelined. Most of the national level or state level action plans and schemes lack specific emphasis on these issues of the coastal line and the fisheries, thereby increasing the problems already faced by them.

There is a lack of attempts in analysing how far the objectives of fisheries development have been put into effect for the development of the fisher folk in the background of influences of climate change impacts. The present study is an attempt to analyse the socio-economic and ecological pressures on the fishermen community towards climate change.

1.2. Fisheries Sector At A Glance:

With the global fisheries sector gaining momentum against the various obstacles, contributing more to income generation and output produced, it is successful in adding to the food security of a vast population directly as well as, is responsible for providing for the needed nutritional intake for about 3 billion people,

in 2016. Apart from contributing to the foreign exchange earnings, it is successful in providing employment to a huge population, by being an integral segment of the primary sector. Being one of the pristine and earliest formed labour intensive industries of the world, it aids significantly in erasing unemployment, especially for the socially vulnerable sections and provides the livelihood source for the economically backward sections, especially for those belonging to the coastal areas. The industry has been able to thrive well despite the odds, thanks to the rich marine resources worldwide, with a total coastline of 586153 kms and also the access to the deepest and farthest parts of the oceans, with the mechanical aids and modern gears. Mechanisation in the 20th century, paved its way for the growth and development of the sector through mechanisation. Main three elements that were part of the process of progress from 1980, includes the introduction of synthetic fibres in nets, cold storage and freezing facilities at shore, usage of electronic elements for fish detection and navigation. (Jasna P. T., Palai, Sanghamitra, 2016).

Beyond an income source, fishing involves the psychological aspects of adventure and this adds to the reluctance of the fishermen to choose an alternate source of income. Fisheries, being a primary unorganised sector, in India have a total of 2.2 million sq km area of exclusive economic zone, ranking seventh in the global level. According to FAO Report of 2011, if in 2002, out of 38 million total commercial and subsistence fishermen in the world, 74 percent engaged in capture fisheries and 26 percent in aquaculture, it made a total output of 133 million tonnes, i.e., about 3.5 tonnes per person of average productivity. Similarly, in 2006, this rose to 43.5 million and the gross production increased to 143.6 million tonnes, with an average productivity of 3.3 tonnes per person.

Production from marine capture fisheries has been stagnant during the past 10 years because of overfishing, unregulated fishing, habitat destruction and pollution; climate change may exacerbate this situation. Warming of water may impact fish diversity, distribution, abundance and phenology. Acidification of water will affect calciferous animals. Storms, floods and drought will severely impair fisheries. Sea level rise will lower fish production and damage the livelihoods of

communities. Some tropical fish stocks may face regional extinction. Some others may move towards higher latitudes. Coastal habitats and resources are likely to be impacted through sea level rise, warming sea temperatures, extremes of nutrient enrichment (eutrophication) and invasive species. Most fish species have a narrow range of optimum temperatures related to their basic metabolism and availability of food organisms. Even a difference of 1◦C in seawater may affect their distribution and life processes. At shorter time scales of a few years, increasing temperature may result in changes in distribution, recruitment and abundance. Species with short-life span and rapid turnover such as plankton and small pelagic fishes are most likely to experience such changes.

In Indian context, the country is a major player in the global fisheries market; the foreign exchange contribution of the sector is prominently recognised and also contributes to 1.4 percent of the nation's GDP. The sector offers employment to about 6 million fishermen. With the coastline of 8129kms, the country is the seventh largest marine fish producer in the world. The rich marine resources and promising employment opportunities makes it eligible for providing food security and livelihood, for majority of the country's coastal population. Apart from this, the export- import resultant scope of employment as well as a well-connected marketing network with about half of the world's countries is an added importance of the sector. The sector has grown from a primitive one to a mostly mechanised one, by means of improvements and modifications in crafts, gears and farming methods. The introduction of EEZs also helps us to harvest the economic benefits of fishing.

1.3. Kerala As A Leading Producer of Marine Fisheries:

In Kerala context, this south western State with a terrestrial area of 38863 sq km, total coastline of 590 km and coastal density of 2168 persons per sq km, holds fishing communities forming a total of 10 lakh people providing for the source of livelihood, both directly and indirectly, to about 8 lakh marine fishermen. Of this, 2 lakh fishermen inhabit 222 coastal villages, engaging actively in fishing. Kerala has an influential and unique place when it comes to fishing, especially in contributing to the major share of exports in the sector from India, contributing to around 3

percent of the state's gross economical output. However, the backwardness and conditions of poverty prevails in the sector, consisting mainly of traditional fisher folk. And they lead a marginalised life, compared to the general population, owing to the poor and below average living standards.

Mainly the fishermen can be divided into groups according to the nature of their employment, namely as traditional fishermen, motorised fishermen, mechanised fishermen, local fish traders, middlemen traders and fish exporters. Traditional fishermen have relatively poor economic situations leading to the limited investment in gears, especially like catamarans and canoes, thereby limiting them exploring various fishing grounds effectively and instead stay in near shore waters mostly. Motorized fishermen and Mechanized fishermen use outboard engines or motors in canoes due to slightly better economic status and therefore be able to utilize the resources better as the fishing ground exploration percentage is higher than for the traditional fishermen community. Local fish traders form the first line traders between the fishermen and the local markets with very limited investment in trading. Middlemen fish traders have much better investment and proper trading strategies. They buy fish from the local fishermen and sell it at higher prices. Finally, fish exporters are investment-wise better off with higher profits based on the quantity and quality of their exports (Pavithran.A.P, Sachin,.Moors,Eddy., Singh,Tanya, Menon,N.R., 2015).

Despite the numerous inherent as well as external socio- economic and physiological problems faced by the sector, it is making a progress to development, by providing around 3.86 lakh people(Jasna P. T., Palai, Sanghamitra) (2016). The geographical location and ecological situation of the coast, along with tropical climate that provides abundant rainfall and major rain fed rivers makes the coast rich in marine resources. For instance, mud banks, which are formed by clay and organic compounds that is found in the post monsoon calm sea, are present often in Kerala coast. This is a harvest spot for fisher men. Considering the 14 coastal states of India, Kerala holds the 8th position in terms fishing population.

Kerala being a leading producer in fisheries sector, with an impressive growth trend from 0.75 lakh tonnes in 1950-51 to 6.8 lakh tonnes in 2002-03 and continuing, the proportion of the state's share in production has been higher than its share in water resources, despite the fact that the state is bestowed with abundant water resources (CSO, 2013). However, there has been a trend of stagnation, and this over turned by the ever increasing consumption of fisheries products in India and abroad alike; and is now in the fourth largest fish producing state after West Bengal, Andhra Pradesh and Gujarat (Department of Animal Husbandry, Handbook on Fisheries Statistics 2011). The NSSO survey−61st Round (July 2004-June 2005) and 68th round(July 2011−June 2012) shows that the states per-capita fish consumption is about 10 times more than the average national level, and interestingly, the average consumption levels in both urban and rural areas are similar. As per the Marine Fisheries Statistics 2010, the state provided significantly for the fisheries export industry, thereby significantly contributing around 19 percent of the export earnings in 2004-05. However, this had got reduced to 16 percent later by 2009-10. Fish production in Kerala for inland fisheries had a growth rate of 0.35% and for marine sector it was -1.09% during 2004-05, whereas in 2011-12 was 15.53% and of marine fisheries was -1.29%.

Table 1.1: *Fish Production in Kerala (2012-13 to 2016-17)*

Year	Marine (Lakh tonnes)	Inland (Lakh tonnes)	Total (Lakh tonnes)
2012-2013	5.31	1.49	6.8
2013-2014	5.22	1.86	7.08
2014-2015	5.24	2.02	7.26
2015-2016	5.17	2.1	7.27
2016-2017	4.88	1.88	6.76

Source Fisheries Department, Government of Kerala

Table 1.1 shows that the total fish production in Kerala during 2016-17 was 6.76 lakh tonnes, of which marine fish landings accounted for 4.88 lakh tonnes and inland fish production was 1.88 lakh tonnes.

Table 1.2 gives the district-wise details of fisher folk population and coastal length.

Table 1.2: *District wise details of fisher folk population and coastal length*

Districts	Coastal Length (km)	Fishermen population	Active fishermen	Population density
Thiruvananthapuram	78	167754	50899	2096
Kollam	37	92500	18561	2418
Alappuzha	82	127776	25900	1307
Ernakulam	46	72119	13230	1543
Thrissur	54	55657	5803	1314
Malappuram	70	89365	31479	1113
Kozhikode	71	97987	21769	1336
Kannur	82	37627	5786	658
Kasargode	70	43115	9983	606
Total	590	783900	183410	1307

Source: Kerala Fishermen Welfare Fund Board, Directorate of Economic and Statistics (2016)

Trivandrum has the majority of marine fishermen population, followed by Alappuzha, Kollam and Kozhikode (Department of Fisheries, 2005).Upon studying the socio economic conditions of the fisher folk in India and Kerala we must consider certain indicators, such as , age, education, size and nature of family type, religion, habitation, public facilities available to access, nature of occupation, technological advancement, welfare programmes, organisations or action groups existing, social participation and the gender perspective in active participation. However, globalisation and the resultant developments have had mixed effects on their progress into commercial and diversified enterprise from a traditional sector.

1.4. Socio- Economic Issues In Marine Fisheries

Many social and economic issues affect the fisheries sector apart from the physical ones. Being trapped in the vicious cycle of poverty, backwardness is a part

and parcel of the traditional fisher folk, who need high boost up to come to the forefront of development path. Despite the high costs faced by the fishermen, like operating costs of individual crafts gear, etc, the economic loss can be in terms of loss of juvenile fishing of certain species by trawlers, purse seiners, ring seiners, etc. which can amount upto Rs.1847 crore on an average. However, as per the study by Mohan Joseph Modayil on Marine fisheries and its impact on coastal people (2007), the excess fishing pressure in coastal waters and unsustainable exploitation of resources, especially the juveniles of many important species, shrimp trawling, reduction in sea area per active fishermen, conflicts between artisanal or traditional and mechanized fishermen, a poor fisheries management system and badly implemented fisheries policies and unawareness together, persists in the sector, which leads to further issues. According to him, sustainable measures like responsible fishing, regulation in fishing activities, gear used and sea area, along with the implementation of MFRA must be taken. This can be aided by means of promoting deep sea oceanic fishing, artificial fish habitats, usage of discards and by-catch, sea ranching, etc.

Mechanisation was introduced in Kerala from mid 1960s, which led to the further marginalisation and poverty of traditional fishermen, who with their canoes and small vessels were unable to compete effectively with the trawlers, thereby affecting the livelihood of the traditional fisher folk adversely. As a result to escape poverty, they tried to avail loans in banks, many of which were rejected owing to the lack of required collateral security needed for the same. So they borrowed from money lenders and other such unconventional sources like middlemen, with exorbitant interest rates, which often worsened their situations. However, a new class of entrepreneurs, the moneylender-cum-boat-owners emerged, who increasingly took economic control of the villages, which has often acted as catalysts for clashes between the mechanised boat owners and traditional fisher folk (Chekutty, N.P., 2010). Salagrama (2006) had identified that, even if the fisheries sector as including various types of livelihood activities, from production and processing to marketing and ancillary functions, still many of the people engaged in this activity remained unrecognized.

So, to reduce the poverty and vulnerability of the fishing community multidimensional policies and sustainable development strategies are to be implemented. From the mechanisation in the sector in 1960s onwards, the socio economic structural progresses of the sector have been under progress. There has been an impressive 70% growth in the mechanised units and almost 200% progress in the case of technically able motorised units until 2005, despite a negative growth trend of 43 % in the traditional fishing sector. However, the socio economic indicators like literacy, housing, health, etc. have improved throughout. Even though the sector has welcomed mechanisation warmly, the need for capital investment in order to acquire mechanised or motorised fishing units have led to a reduction in the number of owner operators. Despite this, disguised unemployment owing to lesser sea area available per fisherman, rise in fishing pressure, juvenile fishing, poor storage and processing facilities and related loss of stocks, resource depletion, etc. also are present. Paradoxically, when traditional sector provides 33% of the employment,it produces only 75 outputs. On the other hand, mechanised sector produces 70% of the total output, while providing 34 % employment. For instance, if we consider the average annual per capita earnings of fishing labourer, it will be Rs.13,200 in a motorised boat whereas that of a mechanised purse seiner, it could be Rs.127200 (Sathiadhas.R, 2009). So this indicates the disparity in income even among the various types of fishermen. So this is an important aspect of coastal rural poverty and backwardness. Several policies and development programmes are initiated in the country in this regard.

The fish industry occupies an influential and unique place in Kerala economy. The major share of exports in this sector from India is from Kerala. Fisheries contribute about 3 percent of the economy of the state. The current level of annual marine fish production is about 6 lakhs tonnes/ year. About two lakh people depend on ancillary professions like processing of prawn and fish and marketing of fish for a living in Kerala. The general living condition and economic status of the fisher folk in the state is considered not on par with the living standards of the general population of the state fishing in India employs about 14.5 million people. The country's rich marine and inland water resources, fisheries and aquaculture

offer an attractive and promising sector for employment, livelihood and food security.

The fisheries sector is highly male dominated despite women contributing well in post-harvest activities, resource management and decision making, covering both their household and community together. The pitiable situation of the fisher folk, in a grip of subsistence economy, indebtedness, mass poverty (79 percent of fisher households) and isolation, in order to have gender equality through inclusive development on an enduring basis, addressing the poverty and empowering the women to enhance capacity building, public participation, to address the social and economic crises of suppression and also to mark their place in political forefront.

When the traditional fishing communities practice gender based division of labour; pressurised also by the taboos related with women going to the sea, women involve mainly in near shore and shore based activities, thereby limiting their role in actual fishing, especially for subsistence. The absence of viable alternate jobs makes them try forming groups and adhere to their occupation, facing the burdens of extended area covered, extra trading time (nearly 8-10 hours) and indebtedness.

In the dry fish trade of northern Kerala, women produce and sell directly to consumers, or to merchants. Some self-help groups have promoted production and marketing, due to development in processing industry. But many others work for low wages as labour, processors and sorters for huge units and landing centres in both the unorganized sector and the organized sector where they dominate in prawn/shrimp processing and peeling work (Bhatta, 2003). However, development of peeling industry was a curse to them. “In Kerala, peeling work dominates the occupation scene with nearly 45 percentof the total work force, followed by small fish traders (23 percent), processing plant workers (16 percent), fish curers/ dyers constituting 7percent, beach workers (6 percent), and remaining constituting in value addition”(Sathiadhas, 2005).

1.5. Climate Change: An Overview

The most widespread problem and heavily discussed concern of the present world, making all the governments, international organisations, people, groups and even the media equally indulge in active discussions and bargaining talks on every scale is the evil of climate change, which has started to take its toll on almost all the aspects of our lives. Starting from the biological or environmental sphere, to the social and political fields, the harmful effects of climate variability has reached almost all the areas of human livelihood. From bureaucrats to world leaders all are emphasising the urgency to tackle this massive issue, which, is extending its tentacles of harmful impacts that threatens the livelihood of the vast majority of human population, either directly or indirectly. So, the governments and international organisations are actively trying to put up frameworks and policies on controlling it, through reduction of harmful emissions of greenhouse gases, establishing fisheries code of conduct, sustainable measures, extending awareness, etc. Among the various sectors, fisheries sector, especially of less developed countries are deemed to be the most susceptible to the effects of climate change. Despite a lot of studies and research works in this regard, still the issue of vulnerability of fisher folk to climate change is prevailing, and should be addressed effectively, starting with the adaptive measures in the primary level onwards. So, we must adopt a holistic approach, incorporating all the stakeholders in considering the already existing issue of climate change, considering the future prospects of the fisheries sector, through environmentally sustainable and economically feasible measures.

Climate change is an established fact and its impacts on water, air, agriculture, health, bio-diversity, forest and socio-economic sectors are quite visible around the globe. According to IPCC (2007), developing and the least developed countries are expected to suffer more due to climate change as compared to the developed countries. This is true, if we scale down this fact to the community level; in case of any climatic anomaly the poor people face the consequences due to lack of resources and access to information (Ansari, 2002).

Anthropogenic activities are mainly blamed to be responsible for the surging trend of climate related disasters occurring in different parts of the world and people who earn only a marginal income are the major group affected by such disasters. After industrial revolution, emission of Greenhouse Gases (GHGs) to the atmosphere increased drastically from industry and vehicular fossil fuel burning emission. Such gases have large warming potential and long life time to sustain warming process for decades to centuries. However, the anthropogenic activities are not the sole reason for the increasing global warming. For instance, intensified solar radiation as well as volcanic eruptions, during the 1920s–1950s are pointed out as the main cause for the early 20th century Arctic warming (Suo, L. et al. 2013). Another research has reported that the tropical easterly jet stream (TEJ) of the boreal summer monsoon season is weakening as a result of the rapid warming of the equatorial Indian Ocean (Abish, 2013). Harley C.D.G et al. 2006 reported that changes in ocean chemistry may be more important than changes in temperature for the performance and survival of many organisms. Ocean circulation, which drives larval transport, will also change, with important consequences for population dynamics.

The intense heat wave condition that is sweeping across India currently could be another manifestation of an extreme weather event. About 2,000 people have been killed in India by this weather condition. The maximum temperature recorded in Allahabad, in Uttar Pradesh (India) is 47.3◦ C on 30th May 2015 (Times of India, 30th May 2015). Of course, it is well realized that the temperature has been increasing considerably in Indian subcontinent.

Along Kerala's coastal area, coastal erosion and the measures taken to control it have together led to the loss of several beaches. The barrier beaches & backwater islands of Kerala are very sensitive environmentally, socially and economically as a large population depends on the system. The communities in most of such island systems are ecosystem people who depend on the natural island system for their survival. Degradation of resources, uncertain employment and earnings, limited livelihood assets and subsistence almost entirely from fishing

impacts these community's livelihood options. Rao et al., (2005) and, Beck and Nesmith (2001) argue that there is a need to give greater attention to the role of Common Property Resources (CPR) in poor people's livelihoods. Non-motorised boats with low mobility for comparatively poor fishermen also add to the problem of catch fluctuations.The sole dependence of people on marine fishery for their livelihood itself is a major challenge. The stock of resources is reported as depleting and the resulting conflict prevails between the traditional fishermen and the capitalists. The policy connected with deep sea fishing is allegedly making distress to fishermen. Most of the fishermen are severely indebted, addicted to alcohol & drugs, under educated and lacking skills for alternate employment. It helps occasionally in mushrooming of the illegal activities and attracts more and more unemployed youth. Darkened expectation in life, illiteracy, lack of awareness & counselling support, rising influence of alcohol and drugs, rise in communalism and criminal tendencies, etc. are some of the reasons for such social issues. On a whole, backwardness becomes the hallmark of fisherman. This vicious circle of poverty needs to be broken so that a virtuous circle of prosperity is set in motion by 2030. (John Joseph, 2015). Consequently schooling on one hand result in putting them out of their traditional occupation and also the dropout rate is also higher in fisher folk. (John Kurien, 1981).So, the people have limited alternative skills other than the traditional fishing activities.

1.6. Impacts of Climate Change on Fisheries

There is an increasing concern over the consequences of climate change and climate variability for fisheries production and the state of marine ecosystems (Brander 2010; Cheung et al. 2010; Mora et al. 2013). The FAO estimates that, overall, fisheries and aquaculture assure the livelihoods of 10–12 percent of the world's population. This highlights the importance of fisheries for the world population (FAO, 2014). Marine and fresh water ecosystem are profoundly affected by process like ocean acidification, coral bleaching, industrial effluents and altered river flows, etc. with obvious impacts on fisher folk. Fisheries, which make a significant contribution to the food and nutritional security globally, will be very

much affected due to climate changes. Fisheries sector plays an important role in the economic activity of the nation, through its contribution to national income, foreign exchange, food and employment. About 12.49 lakh fisher folk operate using diverse types of craft-gear combinations with regional and seasonal variations all along the Indian coastline. The secondary sector provides employment to more than 15 lakh people and another two lakh people is employed in the tertiary sector. It is estimated that fishery and allied activities provide livelihood security to about 30 million people (Sathiadhas et al, 2007). The density of population is very high all along the coastline as compared to the midlands and the highlands (Asia Development Bank, 2003).

Changes in the ocean currents, which have a substantial influence on the world's climate, may have significant direct effect on the primary productivity of fisheries sector and hence food availability and distribution of disease causing to the algal blooms and predators. The rising ocean acidity makes it more difficult for marine organism such as shrimps, oysters, or corals to form their shells – process known as calcification. Many important animals, such as zooplankton, that forms the base of the marine food chain have calcium shells. Thus, the entire marine food web is being altered - there are 'cracks in the food chain' as a result, the distribution, productivity, and species composition of global fish production is changing. This has an inter-related impact on oceans, estuaries, coral reefs, mangroves and sea grass beds that provide habitats and nursery areas of fish. According to Marie-Caroline Badjeck, et al. (2010), climate change can impact fisheries through multiple path ways. Changes in water temperature, precipitation and oceanographic variables such as wind velocity, wave action and sea level rise can bring about significant ecological and biological changes to marine and fresh water ecosystems and their resident fish population. As per the temperature data maintained by the Ministry of Statistics and Programme Implementation, Government of India (2013), among the warmest period since 1901, the period from 2001-2012 recorded the maximum temperature in India. Of course, during May 2015, the temperature in the northern states of India hadcrossed 45◦ C (Times of India, 30th May 2015).

Climate change will impact the productivity of marine fisheries through alteration of water temperature, currents and upwelling, as well as through the indirect (ecological) and direct (biological) effects of ocean acidification affecting reef fisheries, declines in dissolved oxygen and disruption of fish reproductive patterns and migratory routes (Allison et al. 2005; Cheung et al. 2010; Nurse 2011;Guillotreau 2012). According to Nurse, (2011) there already exists a good generic understanding of the potential impacts of climate change and climate variability on key factors and processes that influence recruitment, abundance, migration, and the spatial and temporal distribution of many fish stocks. The changes in fisheries productivity and potential yield will have socio-economic consequences. Such changes will have adverse socio-economic impacts on global fisheries which are already under pressure from other stresses including overfishing, loss of habitat, pollution, disturbance of coral reefs, and introduced species (Allison et al. 2005, 2009; Hoegh-Guldberg et al. 2007; Brander 2010). Allison et al. (2005) opined that the climate changes can lead to more frequent loss of fishing days due to bad weather, increasing loss of nets, traps and long lines, damage to boats and shore facilities, increased loss of life among fishermen, and increased damage to coastal communities, by means of houses and farmland. Based on the studies, Nicholls et al. (2007) confirmed that coasts are experiencing the adverse consequences of hazards to climate change and sea level rise and slow-onset changes. However, the impact of climate change depends on the magnitude of change, and on the sensitivity of particular species or eco systems (Brander, 2008).Vulnerability assessments of national fisheries in the face of climate change are essential as fisheries are of great importance for food and nutrition worldwide. But, as opined by Allison et al. (2009), different countries will reflect different combinations of climate exposure, sensitivity or fisheries dependence and adaptive capacity. Allison et al. (2009) remarked that understanding how these various factors combine to influence vulnerability provides a useful starting point for directing future research and climate change adaptation and mitigation initiatives.

Considering this, it is possible that the sea level may rise, which is ecologically harmful. The erosion due to sea level rise for Kerala is estimated as

7125 m3 per year, implying an erosion rate of -- 0.3 x 106 m3-- per year, which could be attributed to the effects of wave attack. Using the extreme conditions of wave height and sea level rise, future erosion potential is expected to increase by 15.3 per cent by the year 2100 (Dinesh Kumar, 2000). Besides destruction through increased rates of erosion, the sea level rise increases the risk of flooding. This will damage or destroy many coastal ecosystems such as mangroves and salt marshes, which are essential for maintaining many wild fish stocks, as well as supplying seed to aquaculture. Higher sea levels may make groundwater more saline, harming freshwater fisheries, aquaculture and agriculture and limiting industrial and domestic water uses.

Despite the growth of India's marine fishery from a subsistence level to an industrial one, resource depletion have been a firm issue affecting the sector. The leap from 0.6 million tonnes in 1950s to 3.0 million tonnes in 2008 have been facilitated mainly by the contributions of Kerala and Karnataka. Mechanisation along with the resource over exploitation in the coastal areas due to high fishing pressure has led to the situation of disappearance of many indigenous species, thereby disrupting the native ecological balance and the ecosystem. For instance, recent studies reveal the impact of climate change on marine resources, like the Sea Surface Temperature (SST), affecting the mackerel and sardine stocks, thereby creating an extension of their presence in north western side, indicating a growth in new fishing prospects, specifically of these species along the north western coast (Asokan et al; 2009). So due to climate change, some species suffer extinction and disappearance while some species finds it favourable to grow in warmer waters, and they thrive. Many studies have been conducted in this regard for determining such depleted fish species stocks, especially those that can sustain the fisheries, despite being a lesser proportion in the total catch.

1.7. Coastal Zone Management

Devaraj.et.al in their study on Coastal Zone Governance (1999) have stated that most of the coastal countries have taken measures for coastal zone management according to the UN Conference on Environment and Development held in 1992.

Australia, China, Spain, Sri Lanka, France, Israel, Japan, New Zealand, Oman, Thailand, Turkey, UK, USA, etc have pledged to promote the sustainable development of marine and coastal resources, especially taking into consideration the fact that coastal areas and zones that typically extends from the territorial limit to the tidally influenced limit, can be engaged in other uses like industries, transport, forestry, fisheries, agriculture among others, it is important to prioritize the sustainable development of the area. In this regard, several Integrated Coastal Zone Management (ICZM) plans have been adopted by various countries. The Environmental (Protection) Act, 1986 by the Ministry of Environment and Forest initiated the actions to protect the wet and dry sides of the coastal region in India.These rules and regulations are known as Coastal Regulation Zone Notification, which are legal instruments, issued by MOEF in 1999, protecting the area from Low tide line to the landward side. However, the Department of Ocean Development had extended the CRZ up to 12 nm from the lowest low water level. CRZ are classified into four categories, which are the following. It includes the ecologically sensitive areas such as marine reserves, mangroves, coral reefs, etc.; existing urbanised area that comes under the control of municipality; the relatively underdeveloped areas that do not belong to the previous categories. The finalone is the coastal region in Andaman and Nicobar and Lakshadweep islands. It aims at controlling and reducing the polluting activities, like the discharge of effluents and factory wastes into the sea, illegal construction of the fish processing and warehousing units, land reclamation, deeper groundwater harvesting, illegal mining and extraction of minerals and compounds, rampant constructional activities that affect the biodiversity, and also the activities that is against the agenda of common property resources. Similarly, the Biological Diversity Act, implemented in 1993, with a view to protect and conserve of ecological resources to facilitatethe sustainable development of the region. In Kerala, which is rich in exotic marine resources, the strategies of Coastal Zone Management are considered with the advice of marine and fisheries experts and also interdepartmental committees. Here, many socio economic and physiological characters affect the coastal regions.

1.8. Vulnerability of Fisheries in the Face of Climate Change

Climate change has already started showing its impact on fishery resources and the communities that depend on them. Scientists are linking changes in ocean temperatures to shifting fish stock distributions and abundances in many marine ecosystems, and these impacts are expected to increase in the future. In 2007, the IPCC has projected a global mean surface air temperature increase of approximately 0.2°C for the next two decades. The mean global sea surface temperature (SST) is expected to be approximately 1.0-2.0 °C higher than the 1990 mean before the end of the 21st century (Nurse, 2011). In addition, an increase in the intensity of storms is expected (Webster et al. 2005) as well as an observed trend of increasing sea surface temperatures (Nurse, 2011). In the specific case of tropical oceans, temperature is projected to be 2°C higher by the 2050s and 3°C higher by the 2080s, relative to the same baseline (Nurse, 2011). Sea level rise (SLR) is one of the major socioeconomic risks associated with global warming. Based on the outputs of the 20 models, it is estimated that the GrIS (Greenland ice sheet) will contribute 0--16 (0--27) cm to global SLR by 2100 (Yan Qing et al., 2013).

Global warming raises the average temperature of the Earth's surface and its atmosphere. The greenhouse gases, emission, aerosols and soot, solar activity all being the causes of it. The outcomes of this phenomenon being sea level rise, sudden and extreme weather fluctuations, climate changes, ecological imbalance, and other long and abrupt impacts. All of these, being the repercussions of one another, often creating imbalance in the vulnerable ecology and even human lives, like inundation from sea level rise disturbing the infrastructure and human settlements. For centuries, atmospheric carbon dioxide had never been above about 300 parts per million. However, the current level being 400 ppm, owing to the escalation in integration of technology in almost every aspects of human life. i.e., the harsh impact of the industrial development and the resultant fast urbanisation of the world. The potential causes for the various impacts can be related to anthropogenic (pollution and overexploitation) and climatic factors. Upon considering the views of the community level actors, both pollution and rising fishing pressure that leads to

increased exploitation of the marine resources, are also considered as major stressors on fisheries resources. Coastal zone has various uses or resourcefulness which the people exploit for livelihood and other purposes. They include, the use of land, habitations (urban and rural households, beach resorts), agricultural practices, agriculture/fishery related traditional and small scale industries, agriculture and fishery related trade, fish processing, storage, ice plants, boatbuilding and repairing yards, infrastructure amenities for port development, transport activities, waterfront expansion for recreation and tourism, mining, industries (heavy and medium), coastal mangrove deforestation, water, fishing, aquaculture, artificial reefs (fish habitats), shipping / transport, mining of minerals, corals and fossil shells from the sea, clay and sand mining from estuaries/backwaters, dumping, port development, recreation and tourism, water use for industries and near shore drilling for oil.

Degradation of resources, uncertain employment and earnings, limited livelihood assets and subsistence almost entirely from fishing impacts these community's livelihood options. Rao et al., (2005) and, Beck and Nesmith (2001) argue that there is a need to give greater attention to the role of Common Property Resources (CPR) in poor people's livelihoods. It helps occasionally in mushrooming of the illegal activities and attracts more and more unemployed youth. Thus, backwardness becomes the hallmark of fisherman. This vicious circle of poverty needs to be broken so that a virtuous circle of prosperity is set in motion by 2030. (John Joseph, 2015). Changes in marketing patterns brought about a change in sharing patterns, transforming fishing crew from shareholders to employees, although they still retain a share in the catches. (Venkateshsalagrama). On a larger scale, trade policy tools such as tariffs, subsidies, standards or eco-labelling impact on the pursuit of public policy objectives related to social development, employment and food security. In affecting the livelihood of the fisher folk, the indicators related to the vulnerability framework and concepts takes the aspects and dimensions, including geographical, social, environmental, technical, sectorial, equity related, policy related, gender specific, and so on. The relationship between changing climatic factors and fish distribution/abundance is complicated and subject to intense investigations and debate among scientists policy makers as well as the primary

stakeholders. Studies indicate that the impact of global warming in the Arabian Sea is the disruption of the natural decadal cycle in the sea surface temperature (SST) after 1995, followed by a secular increase in temperature which has resulted in decreased monsoon rainfall (Prasannakumar et al. 2009).

Climate change have had an increasing influence in the breeding, migratory and distribution patterns of the fish species like oil sardine and mackerel along the coast of India. The other side as pointed out by Nicholls et al. is that fishing communities and related industries are concentrated in coastal or low lying zones which are increasingly at risk from sea level rise, extreme weather events and a wide range of human pressures (Nicholls et al., 2007).

The vulnerability of fisheries and fishing communities depends on their exposure and sensitivity to change, but also on the ability of individuals or systems to anticipate and adapt. This adaptive capacity relies on various assets and can be constrained by culture or marginalization. Vulnerability varies between countries and communities, and between demographic groups within society. Generally, poorer and less empowered countries and individuals are more vulnerable to climate impacts, and the vulnerability of fisheries is likely to be higher where they already suffer from overexploitation or overcapacity (Daw, Tim. et al., 2009).

Fisheries sector play an important role in the economic activity of the nation, through its contribution to national income, foreign exchange, food and employment. About 12.49 lakh fisher folk operate using diverse types of craft-gear combinations with regional and seasonal variations all along the Indian coastline. The secondary sector provides employment to more than 15 lakh people and another two lakh people is employed in the tertiary sector. It is estimated that fishery and allied activities provide livelihood security to about 30 million people (Sathiadas et al, 2007). The fisheries sector, which is already facing a lot of issues like poverty and unemployment, is now under the threat of the harmful effects of climate change as well. This is in fact adding a new dimension to the existing issues in the sector. Even though climate change is a global phenomenon, it is increasingly being aggravated and boosted by unconventional and unsustainable practices and local

processes, making it necessary that the efforts to be taken to address the same must encompass all measures from the global level to the actions of the root level stakeholders. Often, it is the traditional and the small scale fishermen (fishers, fish processors, traders and ancillary workers, especially of rural coastal areas) who faces the negative effects of the climate variations more, due to the consequences from the changing fisheries ecosystems, habitat destruction and resource depletion, to name a few. According to the IPCC definition vulnerability is a combination of the exposure of groups or individuals or ecological systems to a hazard, such as rising sea level, their intrinsic sensitivity to the hazard, and their ability to adapt their practices in order to deal with the hazard. So far many studies have been conducted on the vulnerability of coastal zones and fishing communities to climate change at the global and national level (Allison et al., 2004; Coulthard, 2008). The corrective measures taken in the form of various plans and programmes must be implemented carefully by carefully addressing the issues of the vulnerable fishing groups as well. Coastal areas are mostly under stress due to the various planning figures, information, economic, market and policy intervention failures. Integrated coastal zone management measures are urgently required to guide the co-evolution of natural and human systems (Turner et al. 2006). The predominant emphasis of most of the studies in this regard was on the livelihood, resource depletion and poverty issues, stressing further the social, economic or political aspects of fishing communities, or by analysing and finding remedy measures for the various climate change impacts having a potentially harmful influence upon the local fishing communities.

In Kerala, the problems that arise in the coastal area, are mainly due to the high density of population, coastal erosion, sand mining, pollution, drastic morphological and shoreline changes due to shore structures, destruction and reclamation of wetland including mangroves, saline intrusion, resource depletion ,decreasing fish catch, degradation of the environment and violation of the provisions of CRZ. The coastal community, as a result of all these factors periodically loses dwelling places. The destruction of natural habitats in the form of reclamation of wetlands, cutting of mangroves and dumping of industrial and urban

wastes worsens the plight of the coastal communities. Even though the process of climate change is a global phenomenon, the regional or the local effects are far reaching, especially for the native vulnerable communities, like the marine fisher folk. The studies show that such effects on the local fishery communities will have far reaching consequences in the balance of the ecosystem as well as in the livelihood of the fishing communities. The main impacts of climate change that affects the change in sea level, uncertainty about upwelling, changes in sea-surface temperature, salinity, local rainfall and monsoonal variability, hazardous algal bloom, and increased illnesses.(Pavithran. A.P; Sachin et.al. (2014)).

The climate change causes seasonal variation, which in turn results in changes in the condition & chemical composition of fish. During the spawning season, water content will be maximum with more gaping and the nutritional status of the fish also changes. Thus, the quality of the fish changes with variation in season, due to changes in temperature, feed supply, maturation and so on. The sea surface temperature can affect the quality of the fish, as the number of worms, gaping, bruise and other factors can be different between the seasons. These are natural factors, but these can influence the value of the fish marketed. For instance, sea temperature can affect the requirement of the quantity of the ice needed to store the catch. However, if the climate change intensifies due to the rise in the emission of greenhouse gases, then it will be having severe consequence in the fishing industry as well.

With climate change gathering concern from all over the world, and numerous policy implications are being hatched upon by the governments and the organisation aiming to curb the process and promote the welfare of both people and nature. Marine and coastal ecosystems are very vulnerable to climate change issues like ocean warming and sea-level rise, that can result in direct impact upon the lives and livelihoods of coastal fishing communities. However, increased stress on technical studies is a major demerit on the measures currently taken upon to control the climate change after effects with the suggestions and perceptions of the fisher folk receiving little or no attention. So far, in the state and national level, there had

been no special focus on the well-being of the coastal fishing population, making them unable to avail the benefits and also pushing them down to being more marginalised and vulnerable to the responses of climate variations. There are a lot of studies proving the impact of climate change upon the marine environment and the fishing industry. But it is regional rather than global climate models that are appropriate for observation and study of climate change impacts (Clark, 2006). Studying various data on sea surface temperature (SST) and other parameters from a variety of global sources, Vivekanandan et al. (2009) concluded the presence of warming of the sea surface along the entire Indian coast. The sea surface temperature increased by 0.2°C along the northwest, southwest and northeast coasts and by 0.3°C along the southeast coast during the 45-year period from 1960 to 2005. It was predicted that the annual average SST in the Indian seas would increase by 2.0°C to 3.5°C by 2099(Vivekanandan et al (2009b).

1.9. Climate Change Vulnerability Assessment Frameworks

The Climate change has several after effects which affects the global ecosystem as well as the people all around the world. The fisheries sector is one of the most affected fields in this regard. The degree exposure of the system towards the harmful effects of climate change phenomena is related to the vulnerability level of the system. There are mainly two forms of approaches to the climate change vulnerability assessment. They are:

1. The natural science perspective: This uses a physical component related framework, emphasising on the cyclical flow of energy and matter in the system considered. These have major implications on evaluating the behaviour and nature of the systems concerned. For this they use system-dynamics diagrams as tools of representation.

2. The social science perspective: This utilises the actor-system framework, by means of influence diagrams. These deals with the exchange of information and the nature of interconnected factors affecting the working of the society and decision making in the economy (Fussel& Klein, 2006).

The vulnerability assessment in the case of climate change impacts can be done in various methods. However, generally the following steps are carried out, like the identification and specification of long term goals towards the reduction of climate change. Another measure is through resource allocation to the selected vulnerable groups and regions, for the purpose of research and to build the adaptive capacity. The main step involves the popularising of and imparting awareness on the various regions and sectors.

1.10. The Need for an Interdisciplinary Approach:

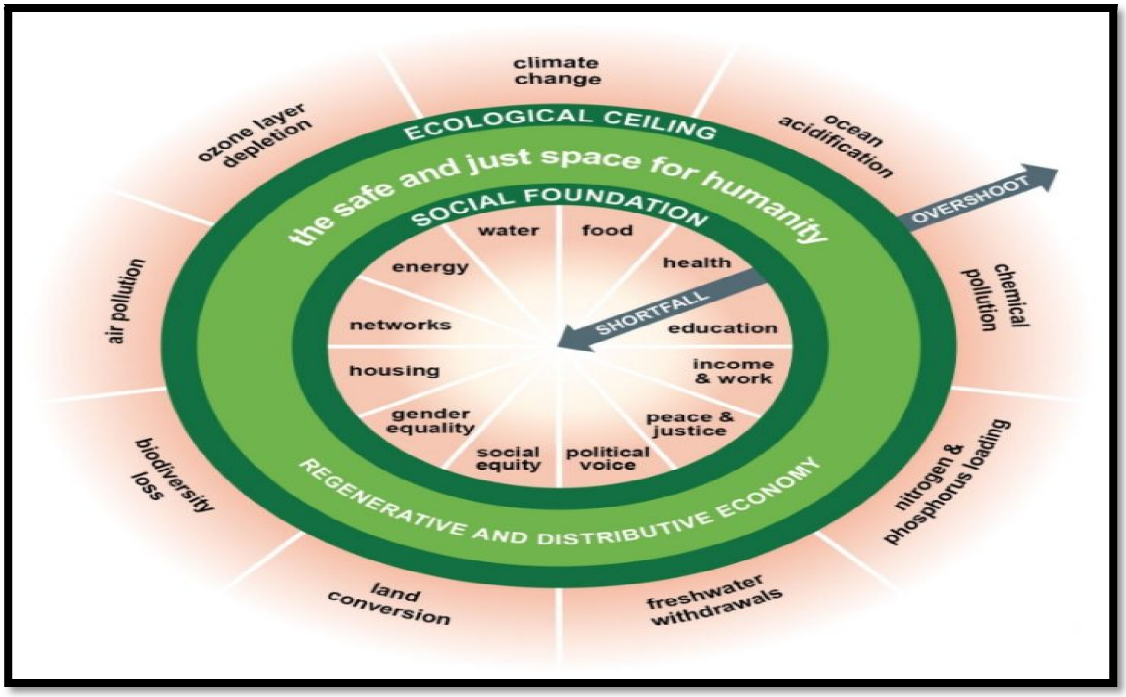
The marvellously complex problems of the modern society had urged the need for embracing the interdisciplinary framework in analysing them. When the market forces led growth models of the neo-classical schools proved inefficient to solve the various economic and social problems which has multiple dimensions, the need to shift to alternate economics became relevant. The methodologically individualist approach of the mainstream proved to be rather dysfunctional in addressing the interconnected problems addressing the society. Kate Raworth of Oxford University's Environmental Change Institute points out that Simon Kuznets who has standardised the measurement of growth, has stated, "the welfare of a nation can be scarcely be inferred from a measure of national income", and this shows that the economic growth concept could not signify wellbeing in all respects. Similar to the unreal concept of rational individual, the mainstream economics fails to identify the social and ecological surroundings, in which the economic system works, with energy, ecosystem, natural world, materials, human social interactions, power and the common property all becomes the subsystems. It is in this regard, that the concept of alternate economic is of great importance.O'Brien put forward the concept of 'Participatory Interdisciplinary', which deals with interactions of the participators of interdisciplinary collaborations. The information exchanged and the change in behaviour of the actors, along with the stronger focus on the research objectives aids in confronting the real world problems in a multidisciplinary model (Dorothy Sutherland Olsen, SiriBrorstad Borlaug, Antje Klitkou, Catherine Lyall and Steven Yearley; 2013). Even though the full outcome of the research will be

relatively delayed, the holistic approach applied, makes a strong base for addressing such problems in the future.

1.10.1 Climate Change and the need for an Interdisciplinary Approach:

Even from the earliest periods of intellectual traditions, the issue of climate change was discussed, but only as a static concept, specific to a few locations. However, with the problem finding new dimensions like physical, chemical, biological and even the social livelihood aspects, it gained much attention and scholarships are framed in this regard, so, with the economic, social and political effects of the same forming the various sub systems of the issue, along with the requirement for future research in this regard, the situation has demanded an interdisciplinary, holistic view. This is of utmost importance in identifying all the related impediments affecting the ecological and economic stability. According to Hadorn (2008), the study of climate change is of an interdisciplinary nature, as the development of the research field is depended on the knowledge and skills of people from all backgrounds. The situation demands the collaboration of scientific and social science disciplines as well as the scope for multilateral negotiations for framing effective policy measures. Such a model is presented in Figure 1.1.

Figure.1.1: Model of Representation of Social and Planetary Boundaries



Source: www.kateraworth.com (2017).

Figure.1.1. gives the satirical representation in the form of a doughnut, tells a lot about the social and planetary boundaries of the system, in order to preserve and continue a regenerative and distributive economy. According to Rockstorm et al (2009), the major 9 planetary boundaries include the freshwater withdrawals, land conversion, biodiversity loss, air pollution, ozone layer depletion, climate change, ocean acidification, chemical pollution and nitrogen & phosphorous loading. The rise in these, can affect the system and the livelihood aspects of the population. Energy, water, food, health, education, income & wealth, peace & justice, political voice, gender equality, social equity, housing and networks mainly constitutes the social foundation as per the SDGs of 2015. Beyond the planetary boundaries, the climate change and ecological degradation occurs, which can hamper the balance of the system as a whole. So, a balanced approach must be initiated incorporating all the aspects concerned.

Even social aspects like gender specific differentiation and income disparity adds to the issues existing in the communities. In fisher folk community, the

disparity in income between the fishermen and fisherwomen, despite their somewhat equal contribution towards the fisheries production, enhances the backwardness and poverty already rooted in the community. Along with the impacts of climate change, such factors of social and economic backwardness only add to the problem further.

This concept of the world as a single system, encompassing all the stakeholders as well as the factors affecting the system as a whole, is of great significance in studying about the issues affecting the people.

The integration of natural and social science in addressing the problems affecting the global system is a complicated concept, and the appropriate methodology must be chosen. However, in fields of environmental studies, such questions regarding the constraints of techniques and tools of study have found themselves answered with combined application of solutions for addressing the social, economic and ecological issues. Environmental economics deals with such complex research problems addressing both natural and social science questions.

1.11. Review of Literature:

Studies are going on in different parts of the world on the impact of climate change on the environment and the human beings. A review of the literature available relating to the impact of climate change on the fishery sector is given below;

1.11.1. Marine Fisheries Production and Exports

- Chakraborty, Nair, and Balakrishnan (1973), in their article examined the characteristics of marine fish production in India. India produced annually approximately 0.7 million tonnes of marine fish. Total production figures as well as landings from individual fisheries vary widely over the years. At present, increasing effort is being put to produce higher yields. A study of these figures has assumed importance for a proper understanding of the resources of important fisheries. The quarter wise catch figures of important

fishes have been studied and indices showing their seasonal and regional occurrences have been constructed and discussed.

- Srivastava (1983) had pointed out in his study, that fisheries is a potential employment generating sector and a source of animal protein at low prices. The authors have analysed the different aspects of fisheries development such as demand, supply, marketing infrastructure, investment opportunities, technology and organization. They also have focused on the inter-relationships between fish production, marketing and organization.

- Shukla(1990), had outlined the basic characteristics of the Indian fishery sector and stated that the contribution of Indian fisheries to world fisheries was just three per cent even though investment to employment ratio was very high. According to the author necessary provisions are to be made with regard to infrastructural, technological, financial, and managerial and policy strategy and other such inputs. A suitable national fishery policy has also to be evolved.

- Sekar, Senthilnathan and Isabella Rani (1993) had conducted a study with an objective of analysing the coastal region-wise, craft-wise, gear-wise and month-wise fish production in Tamil Nadu during the year 1992-93. Craft-wise fish production showed that mechanized crafts are contributing around 59 per cent of total catches. Among the gears used for fish production, gill net accounted for 39 per cent followed by trawl net 31 per cent of total fish catch. Month-wise analysis showed that July, August and September are the peak period for fishing activity. Region-wise fish production showed that Palk Bay recorded the maximum annual growth rate and the west coast has the lowest. However, production per Kilometre of coastal length was the higher in the west coast. Therefore, it was suggested that necessary steps to be taken to involve fishermen effectively by providing infrastructures needed to them for fishing, so that the west coast potential is tapped for increasing the marine fish production.

- Bakari and Kiangi (1999) had studied about the sustainable use of marine and coastal resources in Tanzania. The Coastal Zone (CZ) is a dynamic area surrounding the interface between land and sea. The coastal area and its natural resources offer great benefits and opportunities for human use. The authors focused their emphasis on marine fishing and tourism which are the predominate activities in the CZ on Tanzania. The challenge is to maintain and improve the resources base on which those activities are dependent, while developing new economic opportunities in a way that benefits the coast and the nations as a whole. A major constraint is the inadequate institutional and legal framework for coastal management. The CZ is made up of both renewable and non-renewable resources, which are finite. To avoid the unsustainable use of coastal resources both in its economic and social values, economic development and the wellbeing of the coastal population has to be reconciled in order to strike a healthy balance between marine and coastal conservation and development. This forms the main basis for sustainable development, which has a three-dimensional focus, namely, economic, ecological and socio-cultural approaches. The authors also assessed the implications of effort to revive the economy on the use of coastal resources.

- Devadasan (2003) had given an account of a good potential for India to increase its share in international fish trade by exporting value added fish products. It has been concluded that most of the market channels currently used are not suitable to trade value added products. Anew and an appropriate channel would be the super market chain, which would want to procure directly from the source of supply. Appearance, packaging and display are all important factors leading to successful marketing of any new value added product. The retail pack must be clean, crisp and clear and make the contents appear attractive to the consumer. The customer must be given confidence to experiment with a new product launched in the market.

- Namasivayam (2007), in his article entitled' India marine Exports; An over view, observed that the marine food export fetches several coves of foreign exchange to our country and provides employment opportunities for people directly and indirectly. To increase the export of marine food products to various countries, the hurdles such as exim duties, over tax in the exports is to be taken into consideration with immediate effect.

- Ganesh Kumar (2008) had conducted the study in all themajor coastal States and some selected inland states to understand the domestic marketing of fish in India. The marketing efficiencies for Indian major carps (IMC) sardine and seer fish have been found to vary from 34 per cent to 74 per cent depending on the length of market channel. The marketing efficiency has been found more in the case of marine species than freshwater species, since the latter travel longer distances from the point of production to consumption centre, passing many intermediaries as compared to the former. The fisherman's share in consumer's rupee has shown variations across species, marketing channels and markets. The infrastructure facilities at most of the surveyed landing centres, fishing harbours and wholesale and retail markets have been found grossly inadequate and poorly maintained. The study has highlighted the need for formulating a uniform market policy for fishes for easy operation and regulation, so that the country's fish production is efficiently managed and delivered to the consuming population, ensuring at the same time remunerative prices to the fishers.

1.11.2. Socio- Economic Conditions of Fishermen

- Cochin Marine Fisheries Research Institute (CMFRI) for the Annual Report (1977) pointed out that fishermen of our country have a distinct tradition of their own. They belong to all the major religions namely Hinduism, Christianity, Islam and several communities which differ from State to State. In the society, the fishing community occupies a low status. Majority of the fishermen belong to an economically weaker section and follow traditional methods of fishing employing indigenous crafts and gears. The average size

of the fisherman family varies between 4.7 and 8.6 in different States. By and large, they are perennially indebted to the middlemen who advance financial help to them in times of need in return for their entire catch assessed at a low price. Several factors such as a low social status, poor economic conditions, and illiteracy, heavy inter service of middlemen, traditional fishing equipments and methods of fishing, low production rate and income influence the socio-economic conditions of fishermen Right from the beginning of the first Five Year Plan, and this sector received considerable attention from the Government. Various schemes for providing housing facilities, dispensaries and community amenities, approach roads etc., are given priority. Organized attempts are made to promote fishery co-operatives in our country.

- Upon studying the coastal rural indebtedness in Vizhinjam, south of Trivandrum, Kerala, Pannikkar (1980) analysed the problem of indebtedness faced by the fishermen who could not repay the loan, either because the loans are larger or the income is not enough to pay off the debts. As such, the debt of the fishermen goes on increasing. This may be termed as coastal rural indebtedness. They borrow mainly from the moneylenders and boast owners since institutional credit is not available to them. They are charged high rate of interests and don't keep proper accounts of repayment. In this system, for getting a loan, the fishermen as a wage earner has to enter into a contract with the boat owner that he should work only in the boat of the owner from whom he has received the loan till it is repaid. Maximum amount of loan is spent for household expenditures or for construction or repairing of the houses. The extent of indebtedness is higher among higher income groups and lowers among the lower income groups. Considering all these facts, the author suggests that Rural Banks and Co-operative Societies should be established the activities of moneylenders should be regulated and interest rates must be limited to a reasonable level.

- Kalawar (1981), examined the living conditions of fishermen in Maharashtra, and found it to be quite deplorable. Owing to lack of economic development in this region, there is continuous exodus of labour from the coastal region. As a result, the females have to bear most of the burden of economic activity. Indebtedness in the fishermen community is widespread. Necessary infrastructure by way of communication and transport facilities, water supply and power should have to be provided on priority basis. This creates scope for setting up agro-based and fisheries-based industries.

- Cochin Marine Fisheries Research Institute (CMFRI) (1985) had analysed the living conditions of the small fishermen in India, and inferred that the artisanal fishermen landed 40 per cent of the marine fish production in India with traditional implements. They put in an effort of 8-12hours a day in the sea to earn an income of 10-20 or even less. With low standard of living, remote with little transport, communication and sanitation facilities they are also exposed to the fury of nature. Educational status is low and drop outs are found both among boys and girls. One of the major constraints in the development of artisanal fishing industry has been the lack of broad network of extension service with trained manpower reaching the fishermen at large and motivates them. The most important step in helping the fisher folk is to educate them and make them aware of the programmes available to them.

- Similarly, Sathiadhas (1988) have studied the small scale fishermen with emphasis on casts and earnings of traditional units along Thiruvananthapuram coast, Kerala. He had analysed the Socio-Economic conditions of fishermen in relation to new technology and participation in development schemes. The Catamarans with hooks and lines are found to be suitable for the small investors.

- King (1989) had pointed out that in a male-dominated world of fisheries, in many parts of the world, fisheries development for women has taken positive strides from production and post-harvest activities to management and policy decision-making. In most societies, fishermen are involved in fish handling,

processing and marketing, as in Papua New Guinea where women exclusively market fish caught by their own men in Ghana where they own business which involves leasing out fishing boats to men or in a Gambia where men process fish on a large scale for export while women transport the catch in pans loaded on their head from canoes to smoke huts. Great potentials exist for integrating women into fisheries development but these potentials remain untapped mainly because women's views are not considered in planning. Women articulate their needs and aspirations in the given opportunity.

- In the paper, "Fisheries Development in India", Ibrahim (1992), assessed the socio-economic impact of the introduction of mechanized techniques of production into a traditional and labour intensive sector which employs indigenous and conservational technology and pointed out the pitfalls of a strategy of development through technological up gradation without due care to protect the socio-economic interests of traditional fishermen.

- Nuruddin (1994) had analysed the socio-economic conditions of fisher folk in Kuala Sepetang, a coastal village in the west coast of peninsular in Malaysia. This village has all the public amenities like transport, sanitation, telephones, drinking water etc. The illiteracy rate is low. Fishing is the primary income generating activity in the village. Majority of the fishing households are vessel–owners and they are mainly involved in shrimp trawling. About 29 per cent of the total households are involved in fishery–related activities excluding active fishery which includes aquaculture, fish trading, marketing and processing.

- Siddiqui(1995) made a comparison on the socio-economic conditions of fishermen in Tamil Nadu and Orissa. The main livelihood of fishermen wholly depends on the catch of fish from fishing and marketing. Fishing season starts from August and continues up to March. Fishing is generally not undertaken for about 60 days in a year when the sea is rough or due to cyclonic weather. On the other hand mechanized fishing vessel owners are

able to carry out their normal operations during the off-season also. The funds raised for the purchase of traditional craft or mechanized vessels are partly from their own sources and partly through money lenders. They are hesitant to avail bank finances because of the conditions of repayment of loans and lots of formalities they have to undergo. About 70 per cent of the persons interviewed were indebted for meeting their day to-day maintenance in time of poor catch or poor marketing, marriage expenses etc.

- Korakandy (1996), in his study titled "Economics of Fisheries Management - A Critique in Third World Perspective" outlined the multiple objectives of fisheries development, viz., enhancement of food supply, employment, national income, foreign exchange earnings, regional development etc. The study has concluded that the global theories of fishery management floated by the Food and Agriculture Organization have made it virtually impossible to fulfil the various national objectives of the developing countries to expand their fisheries management to the Exclusive Economic Zone.

- Verduijin (2000) on behalf of the Bay of Bengal Programme had conducted a survey in Kanyakumari district to find the basic needs of 39 coastal fishing communities, which inhabit the 68 km stretch of the coast. Over the years, the intensity of fishing has increased partly on account of the increase in the active fishing population, partly due to the lack of alternative income generating opportunities and partly due to motorization and mechanization of fishing crafts. The resource has not kept up with the increase of effort, which results in a sharp reduction in catch per unit effort. Since the usage of mechanization in 1958, artisanal fishers have with dismay compared the landings of the mechanized crafts with their own meagre catches. Besides, the artisanal fishers have often seen their nets destroyed by mechanized boats. With this background, the survey points out that the major problem as given by respondents is the non-availability of safe drinking water followed by sanitation and health care.

- Balasubramaniyan (2001), in his study compared the economic status of fishermen in two marine fishing villages of Orissa State viz., Pentakota and Belinoliasahi. They measured the economic status and the mean scores of respondents in the two villages, which differed significantly at one per cent level.

- Sheela Immanuel and G.Sydarao, in 2012 studied the Social Status of Hook and Line Fishermen in Vishakhapatnam and analysed the socio economic profile of the fisher folk who practice hook and line fishing. They selected 100 fishermen of Pedajalaripeta in Vishakhpatnam and found that 43% of the respondents belonged to Jalari caste of Hindu religion. About 72 % of men practised hook and line fishing, that too mostly long line and hand line types and their income remained varying from Rs.150 and Rs.1000 daily. When 32% owned fibre catamaran only 9% had wooden catamaran. Women had impressive participation in the marketing activities, however, this remained to only 28% of the fisher folk families. The study also put forward measures to tackle the socio economic problems they are facing.

1.11.3. Problems in Marine Fisheries Sector

- The Status and Problem of Fishermen in the Marine Fishing Industry was studied by Nammalwar and Prakasam in 1979, and they pointed out that over-fishing threatens the fishery resources of our country and therefore regulation of a type, leading to a reduction in the number of units is desirable to conserve valuable resource to forestall economic difficulties and to reduce the clashes among different groups is desirable. Although advances have been made in fishing technology, practically it has not reached the poor fishermen. Several factors such as low social status, poor economic conditions, illiteracy, heavy interference of middlemen, traditional fishing equipments and methods etc. influence the socioeconomic conditions of fishermen.

- While discussing the status of marine fisheries of Tamil Nadu, Srinivasan (1981), had drawn the attention to the problems faced by traditional fishermen due to the increasing competition from mechanised boatmen following the prawn boom. He cautioned that if the tempo of trawling continues unabated, the Madras coast may also experience the diminishing returns which had already set in on the West Coast. The author also stressed the importance of diversified techniques in maximising production and improving the productivity of artisanal fishermen. Further, the author has suggested that the present system of financially helping a few big boat owners may be changed in favour of helping a large number of small boat operators.

- Upon studying the Management Aspects of Shrimp Fishery with particular reference to India in 1984, Saxena, showed that the Indian shrimp fishery after 1975 has been experiencing a decline, which has been substantiated by reduction in catch per unit effort. In the light of the decline of the Indian shrimp fishery, three types of tools to manage the same has been suggested: (i) an exhaustive techno-economic survey should be undertaken to study the production, processing and marketing costs, margins, practices, channels, etc. along with the socio-economic conditions to the local fishermen in order to provide alternative employment opportunities and financial compensation, (ii) the type of management tools includes regulatory measures and (iii) relate to the encouragement of shrimp culture.

- SubbaRao (1986) in his study titled "Economics of Fisheries" pointed out that the insufficient financial resources allotted to the fisheries sector and the number of schemes proposed in five-year plans, majority of them were not completed in the respective plans are the reasons for the low production of fish in India. The author also found that fishermen refuse to adopt new techniques because of their illiteracy and conservatism and there was lack of coordination among the agencies connected with the implementation of different fisheries programmes which also add to the misery of the sector.

- Upon evaluating the project jointly undertaken by the Post-Harvest Fisheries Project (PHFP) and the Kanyakumari District Fishermen's Sangams Federation (KDFSF) on commercial operation for marketing rack-dried anchovies on a pilot scale in the year 1992 in Kanyakumari District, George Mathew (1997) studied the main aim of the project, which was to promote the use of drying racks for drying anchovies in order to avoid the physical and value losses sustained by Kanyakumari district through sand-drying of anchovies. The rack dried fish got good prices 10 times more than that of sanddrying fish because of its high quality, but the market potential is very limited. Only the metropolitan markets of Chennai and Hyderabad require such a superior quality product. Even though, the project's planning, problem shooting and precautionary foresight were just right, but failed in its effort to market the anchovy product on its own and replace the middlemen since the anchovy fishery collapsed in 1994. Consequently, two years after the project wound up the anchovy-drying activity. But one positive outcome is that some individual fishermen have taken up rack-drying of anchovies. The rack-drying fishes will definitely get high prices for its high quality than that of sand-drying fish.

- Chand and Nityananda Das (2OO2) had given an account of basic requirements for an organized Fish Market. They have specified the essential infrastructure facilities needed for an organized market. It has been suggested that to make the entire fish marketing system successful, apart from having an organized fish market, right marketing strategies are essential. For this, identification of consumers' needs and nature of demand for products and services is necessary.

- RagupathyVenkatachalam (2005), in his article, examined the threat to the substantially of the fisheries in India and in particular in the Gulf of Mannar region. It is widely quoted that the depletion is due to the introduction of trawler fishing techniques, which scrape the bottom of the sea and end up catching juvenile fish. In viewing this problem of over fishing (by the

trawlers) as a negative externality to the traditional fishing community, the best way to internalize the social cost inflicted by the people who over fish is the question that this study attempts to seek the answer for. One of the most commonly practiced techniques to sustain the fisheries resource is the blanket ban on fishing during specific months of the year like the one practiced in the coastal regions in India. The researcher has attempted to critically evaluate the effectiveness of this method of resource conservation. The researcher has also proposed an alternative model for sustaining the resources, which would be an effective solution for the problem.

- Upon studying about "Indian marine resources: optimistic present, challenging future" by Sathianandan, T.V., et.al. (2011) found that along with increase in capture fisheries output in the past few decades, the export earnings from marine sector have also increased, crossing 12000 crore in 2010-11. With over 100 countries to which the marine products are exported, the necessity to monitor the fishing activities is important when the planning and implementation of sustainable production strategies at sea are considered. The marine fishery resources were classified into 26 groups and their landing pattern changes were studied. Out of these, 18 were abundant, while 5 were less abundant one category of resources were found each in declining, depleting and collapsed classes. However, 73% fell under the abundant category, indicating that these resources are available. The other categories need protective and sustainable measures to prevent their depletion.

- Selvin Pitchaikani, J. and Lipton, A.P. (2012) studied the Impact on Environment Variables on Pelagic Fish Landings: Special emphasis on Indian Oil Sardine off Tiruchendur coast, Gulf of Mannar, and found that the correlation relation of different variables like chlorophyll a, oxygen, primary productivity, salinity, sea surface temperature and meteorological indicators from 2008 January to 2010 December, with the sardine fish landing along the Tiruchendur coast in Gulf of Mannar. These contribute around 18.24% of the

total fish-catch are observed to be abundant in January and minimum in August. Upon studying, they found that medium temperature along with the abundance of chlorophyll a and phytoplankton rich waters can enhance sardine population however, even subtle changes in ecological or chemical factors can affect their breeding, availability, distribution and abundance.

1.11.4. Climate Change and its Impacts on Fisheries

- Studies relating to coastal upwelling in the south-west coast of India were carried out by Johannessen, O.M, in 1981. He found that coastal upwelling is a repetitive phenomenon in the Kerala coast during the south- west monsoon period. According to them, a north flowing coastal current from November to December through January – February is associated with the influx of low salinity water from the south.

- The Indian coast, in general, experiences seasonal erosion and some of the coastal areas regain their original profiles. Sanil Kumar et al. (2006) reported that 50 per cent of the coastal areas, which do not regain their original shape over the annual cycle, undergo net erosion. According to him, 23 per cent of the shoreline along the Indian mainland is affected by sea erosion.

- Regarding the impact of climate change in the livelihood of the fisher-folk, the observation made by Allison (2007) is very important. He observed that fishing livelihoods may be profitable but precarious in conditions where future production is uncertain in the long-term and fluctuates extensively in the short-term, where access rights over resources are insecure, working conditions unsafe and exploitative, and where there is a lack of social and political support for community development and poverty reduction. It is in this 'risk environment' that the added stress of future climate change takes place.

- Brander, K M (2008) examined the historical background and evidence of impacts of past climate variability faced by the fisheries sector. They studied about the anthropogenic climate change and how it studied the ocean

climate, especially after 19th century industrial revolution and biogeochemical changes; and the impact on various marine eco systems. When they studied about the sensitivity of growth of species to temperature changes, during life history, it was greatest for cod in early life. Sensitivity of growth to temperature can be influenced by early life survival and stress of fishing, among others. To tackle the problems, robust and adaptive management strategies, especially in planning can be adopted.

- Allison, E.H. et al. (2009) in their study onVulnerability of national economies to the impacts of climate change on fisheries, Fish and Fisheries, dealt with the influence of anthropogenic global warming in physical and biological processes at global and regional scales. 132 national economies were compared in terms of vulnerability to climate change impacts on their capture fisheries. The Central and Western African countries, North Western South America, along with some of the tropical Asian countries were the most vulnerable. This can be attributed to the combined effect of global warming, the related significance of fisheries in national food security, and limited societal adaptive capacity. The level of vulnerability increased in the least developed countries. They suggested that these climate change impacts can lead to further economic hardships or rise in opportunity cost for development in fisheries dependent nations.

- Analysing data on sea surface temperature (SST) and other parameters from a variety of global sources, Vivekanandan et al. (2009) found warming of the sea surface along the entire Indian coast. The SST increased by 0.2oC along the northwest, southwest and northeast coasts and by 0.3 o C along the south-east coast during the 45-year period from 1960 to 2005. The team has predicted that the annual average SST in the Indian seas would increase by 2.0 o C to 3.5o C by 2099.

- Tim Daw et.al. in their study on Climate change and capture fisheries: potential impacts, adaptation and mitigation (2009), emphasised on the direct and indirect impacts on fresh water and marine water capture fisheries, with

influence on coastal communities. Capture fisheries, being largely dependent on fossil fuels, can in turn add to the greenhouse gases emissions. With rapid change in governance, markets and exploitation in fisheries, the socio economic trends along with the climate change impacts can interact with or raise the biophysical impacts on fish ecology. The sudden developments in technology make it difficult to predict the future impacts of climate change on fisheries. Apart from the sensitivity to change, the vulnerability of fishing communities also depends on the fisher folk. Vulnerability changes with county to country, and is likely to be more in the case of least developed countries. Many adaptive measures like preferring alternative occupations, changing operations, issuing warnings, awareness, etc. are affected by the governance of fisheries. Though costly, sustainable and equitable measures, accepting the uncertainty in the sector, must be adopted.

- Vivekanandan, E (2010) had studied about the Impact of Climate Change on Indian Marine Fisheries and Options for Adaptation. He discussed about the open access to this sector, aiding to the existing intense competition among the stakeholders with varied interests to share the limited resources in the coastal waters, which has resulted in overfishing and decline in stocks of a few species. this can have strong impact on fisheries along with the effects of climate change, like acidification , salinity, sea level rise, change in currents, etc. so strategies for evolving adoptive mechanisms, increasing awareness on effects of climate change, adoption of code of conduct for responsible fisheries and development of knowledge base is required.

- Vivekanandan, E (2013) have pointed out that changes in main oceanic climate features as a result of climate change influences the food utilisation and spawning of fish species. As a result some species that adapt becomes dominant and others at their threshold limits are vulnerable and become endangered. This along with habitat destruction, pollution, fisheries, aquaculture, mining, etc will alter the habitat and function of ecosystems. So, indicators are to be developed and analysed. These problems also affect the

effectiveness of fisheries development strategies and measures. Reduction of fishing pressure and a concerted effort to address the issues related to sustainability of tropical marine fisheries and ecosystems by considering climate change as a component of a suite of anthropogenic interventions is needed.

- Shyam S. Salim et.al. (2013) have studied about climate change awareness, preparedness, adaptation and mitigation strategies based on fisher folks perception in Kerala. The study was conducted in Chethy ,Thumboly and Arthungal fishing villages of Alappuzha district, selecting 971 fisher households. They studied the socio economic profile and assess the awareness level of the fisher households in the context of climate change, to deduce the causal factors of climate change as perceived by the fishermen households and consequent vulnerability assessment impact of the fisher households , and to develop a to develop a participatory awareness, preparedness , adaptation and mitigation (APAM) framework for climate change based on the result of the study that aid the fishers in proactive participation in disaster management strategies. A bottom up approach in formulating location specific plans and promoting sustainable development is needed.

- According to a Report by the IPCC, each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. The period from 1983 to 2012 was likely the warmest 30-year period of the last 1400 years in the Northern Hemisphere, where such assessment is possible. The globally averaged combined land and ocean surface temperature data as calculated by a linear trend show a warming of 0.85 [0.65 to 1.06] Cover the period 1880 to 2012 (IPCC, 2014).

- Pavithran.A.P, Sachin et.al (2014) have studied the various coastal issues in Kerala and pointed out that increasing intensity and frequency of environmental hazards due to climate change made it clear that unless governments and resource users take appropriate action, the degradation of

the coastal environment will become uncontrollable and there will be no possibilities for sustainable use of resources from these waters. The problems of the coastal zone include high density of population, coastal erosion, sand mining, drastic morphological and shoreline changes, salinity, low fish catch, violation of CRZ, habitat destruction, etc. The comprehensive need for management of the coastal region through conflict resolution mechanisms which acknowledges the diversity of the coastal environment and by ensuring participation of local communities.

- Shyam S Salim and Manjushadevi, in their paper on Climate Change impacts: Implications on marine resources and resource users (2015), emphasised the impacts of climate change in fisheries sector, stressing on the susceptibility of marine pelagic systems and the conditions of livelihood of coastal fishing communities in rural India different species respond differently to the impacts, like changes in composition, extension of boundaries or phonological changes. Displacement of family members, income effect, social standards and infrastructural stability are the factors relating to fisher folk which are influenced by the climate change impacts. They studied the community perception on climate change. A vulnerability model was constructed and adaptation measures, like adapting the code of conduct of responsible fisheries, increase awareness on climate change impacts, strategies for evolving adaptive mechanism and ecosystem restoration, etc. were explained.

- Bimal Mohanty et.al. (2017) in their study on 'The Impact of Climate Change on Marine and Inland Fisheries and Aquaculture in India', discussed the significance of the sector in terms providing food and livelihood security to many countries including India, to which it contributes 1% of the GDP. However, the challenge of climate change has affected both marine and inland fishing; directly by way of change in physiology, behaviour, breeding, mortality and distribution and migration. In 25 years, the ecosystem services of India's east coasts can decline by 25% amounting to a loss of about

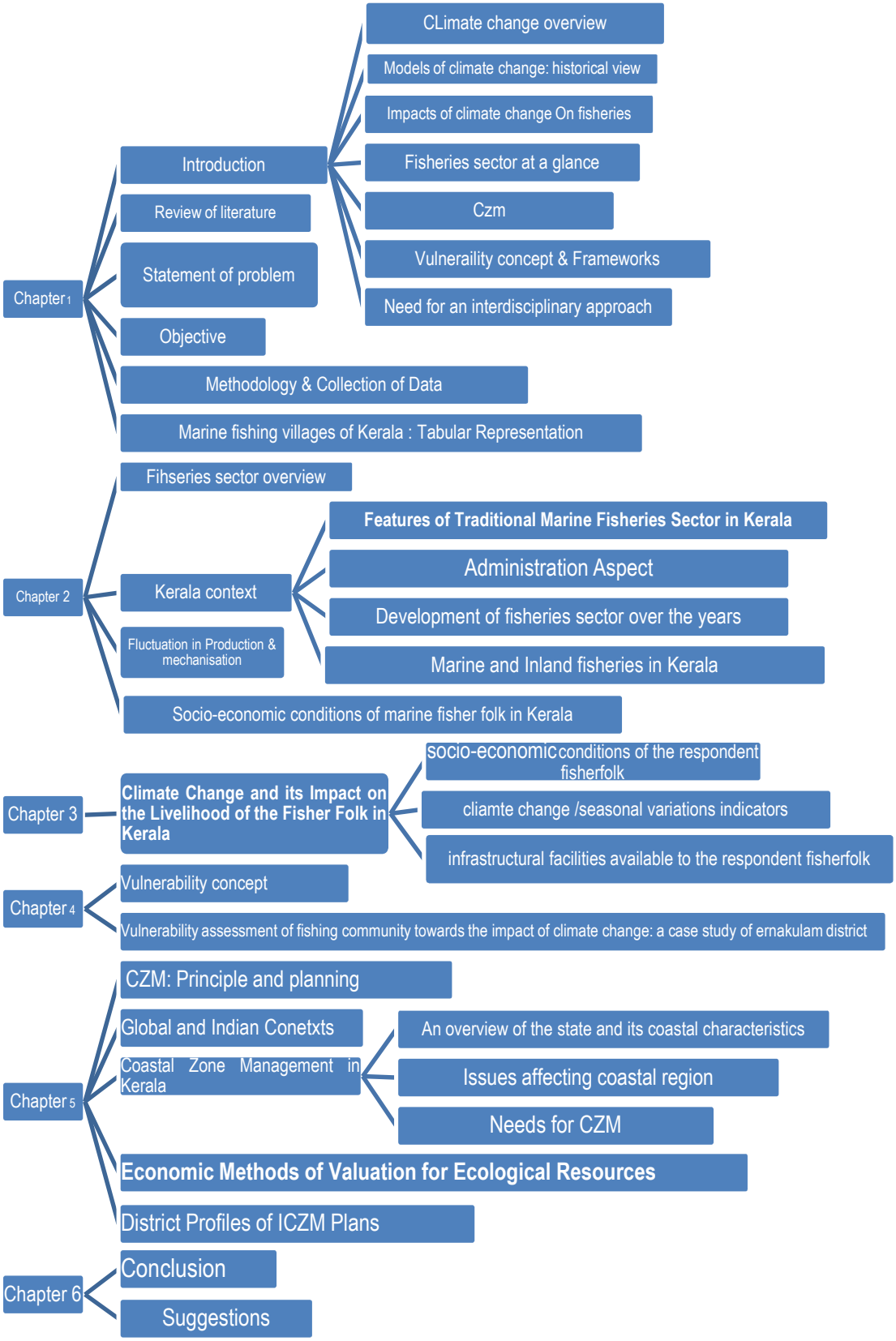
US$17 billion. The work dealt with the impacts of climate change in fisheries and suggested sustainable measures and migration action plans, in order maintain and enrich the food security.

- Zacharia, P.U., et.al. (2017) in their study on 'Climate Change Impact on Coastal Fisheries and Aquaculture in the SAARC Region: Country Paper-India', analysed the impacts on fisheries sector, which were evident from scientific studies carried out by the leading institutes. Variability in climate and oceanographic parameters induced habitat change, and rise in sea temperature affected the Indian fisheries mainly. This was accompanied by change in phenology, spawning season shift, changes in maturity, mean length reduction and distributional shift of fish species, which indirectly affects the catch, availability and even the national economy. Generating adaptive capacity, popularizing integral farming methods, multi-scale understanding of the impacts and cooperation among research institutions are important. Existing management plans must be revised, and stress must be given to climate change related policies and programmes, dealing mainly with global commons, food security and trade.

1.12. Framework of the study

The framework of the study is given in figure 1.2.

Figure 1.2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1.13. Statement of the Problem

Understanding the impacts of climate change on fisheries is crucial as fisheries are important for food security, livelihood and employment and the generation of foreign exchange for national governments throughout the world (Monnereau et al., 2013, Allison, E.,2011, FAO, 2012). The impacts of climate change are expected to be different within and between regions and nations, and thus it is important to investigate where climate change impacts on fisheries have greatest social and economic significance (Allison et al. 2009).

The marine and inland fisheries sectors in Kerala are likely to take a major hit as climate change affects fish stocks, resulting in decreased yield and loss of livelihood of fishermen. According to the State Action Plan on Climate Change prepared by the Department of Environment and Climate Change, diseases and migration of species could lead to the depletion of fish stocks, while the damage or loss to coastal infrastructure could enhance the vulnerability of the fishing community. Changes in water temperature and variables such as sea level rise, wind velocity and wave action could trigger ecological and biological changes in marine and freshwater ecosystems, impacting on the distribution and abundance of fishes. The report notes that sardines and mackerels, which were abundantly available off the Kerala coast, had moved away to deeper waters in recent years. Production from marine capture fisheries has been stagnant during the past 10 years because of overfishing, unregulated fishing, habitat destruction and pollution; climate change may exacerbate this situation (Bay of Bengal News - March - June 2008).

Kerala has only 10 per cent of India's coastline, but is home to 25 per cent of the country's fishing population, and a correlating proportion of its fish production. The fishing communities are concentrated here because the seas are notably rich, a wealth attributed to a unique phenomenon called Chaakara, during the monsoon season, the rains flush out clay particles from the banks of the 41 rivers leading down to the coast. Rich in nutrients, the clay particles create a feeding ground for fish and prawns, resulting in unusually high sea yields. Needless to say, if the monsoon is poor, this stock will be among those critically affected.

The south-west coastal region has certain unique features that influence the fishery fluctuations of the important commercial species to a great extent. The area is subject to two monsoons viz. the south-west monsoon and the north-east monsoon. Any variation in the monsoon and the temperature in the sea are likely to result into changes in the volume of fish landings in the state. This will directly and indirectly affect the economic and social condition of the fisher folk in the coastal districts of Kerala. Therefore, a study on the impact of climate change on the socio-economic condition of the fisher folk will help to formulate policies for minimizing the negative effects of climate change. It is in this background, the present study has been undertaken.

1.14. Objectives:

The following are the specific objectives of the study

1. To assess the socio-economic and ecological pressures on the marine fisher folk in Kerala.
2. To study the vulnerability level of marine fishing community to the impacts of climate variability and change.
3. To appraise the infrastructure facilities available for the marine fisher folk of Kerala.
4. Coastal Zone Management measures and its impact on society.

1.15. Methodology:

Both primary and secondary data are used for the study

Area Covered

Kerala has 14 districts. But the entire coast of Kerala (590 KMs) is spread over only 9 districts. The districts are Thiruvananthapuram, Kollam, Alappuzha, Ernakulam, Thrissur, Malappuram, Kozhikode, Kannur and Kasaragod.

Sampling

There are 222 marine fishing villages spread over the nine coastal districts mentioned above. It is decided to cover 35 marine fishing villages under the sample and also to collect data from 30 households from each fishing village. The marine fishing villages are selected using stratified random sampling method giving proportionate representation to each district. For the selection of the sample fishing villages, lottery method was followed. After selecting the sample fishing villages the households were selected using Table of Random numbers. Thus, a total number of 1050 households were selected for detailed study.

1.16. Collection of Data

- **Pilot Study**

The survey was carried out in 12 marine fishing villages selected randomly from the 222 marine fishing villages spread over the nine coastal districts. From each fishing village, 30 households were selected and data were collected from the head of the family. Thus, data were collected from 360 families. Data showing their living conditions, earnings, expenditure, savings, health condition, education, fish catch, species, influence of climate change on their earnings, living conditions, facilities available in the marine sector, etc. were collected and analysed. The data were collected with the help of an interview schedule developed for this purpose. This interview schedule was revised on the basis of the pilot survey.

- **Primary Data Collection**

The final survey covered 35 marine fishing villages from the nine coastal districts of Kerala. The number of fishing villages from each district has been decided after giving due weight to the total number of marine fishing villages in each district. Data were collected from 1050 respondents covering the 9 coastal districts. Primary data so collected were supplemented by information collected through focussed group discussions.

- **Focussed Group Discussions (FGDs)**

Focussed Group Discussions were organized at Poonthura and Poovar in Trivandrum, Kanjhangad in Kasargod, Kadalundi & Chaliyam in Kozhikode, Sakthikulangara in Kollam and Pollethei in Alappuzha. Traditional fishermen were the main participants in the FGDs. Their observations in the sea during different seasons, reasons for variations in fish catch, etc. were shared during discussions. Such information are also incorporated while interpreting the data.

Secondary Data

Secondary data were collected from published reports of the Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology, Marine Products Export Development Authority, Department of Fisheries, Government of Kerala, Kerala state Planning Board, Indian Meteorological Department, published research articles, etc.

1.17 Limitations:

There have been few difficulties faced while pursuing this study. Assessment of sustainable development encompassing their socio-economic and ecological aspects related to fisher folks in the wake of climate change related aspects is a maiden venture. Though, questions relating to inclusive aspects have been incorporated in the questionnaire, the researcher failed to obtain the requisite data on such aspects. There is also non-availability of precise and comprehensive database with respect to socio economic indicators and biological indicators related to marine fisher folks at different levels. The major limitation is that the nature of studyis restricted only to marine fisheries sector of Kerala and does not include the inland/ aquaculture fisheries, where there is further scope of conducting research.

Chapter 2

FISHERIES SECTOR: AN OVERVIEW

2.1. Brief History of Fisheries Sector

The absence of rent, as an element of prices, is one of the significant points put forward by Adam Smith in his great work, “An enquiry in to the nature and causes of the wealth of nations”, as a specific characteristic of the traditional fisheries sector. In this sector mostly only the wages and capital constitutes the price of the product.

Being one of the oldest and primitive sectors of the mankind, which had evolved into one of the important profitable primary sectors of the world, it is a major income source to a lot of coastal countries, both advanced and less developed nations. Apart from an employment provider, the sector offers food security and nutritional food supply. The National Commission on Agriculture asserts that in earlier times fishing activities had been concentrated more on near shore areas and the prohibition or discontent in venturing into the open sea made it a less explored field of occupation, especially by the general population. This in turn gained a rather ‘lower’ reputation for the sector leading to lower capital investment and organisational participation from other groups. Before independence, unlike the states like Madras Province, almost all other provincial governments saw fisheries merely as a revenue source only. In spite of this, the Indian marine fisheries had developed over time, with their own indigenous technical knowledge in this regard. However, the poorly equipped rather underdeveloped nature of the fisheries sector

remained as a curse over the sector during the 1900s, till mechanisation and further development facilitated the progress of the sector.

Different studies on fisheries sector highlight the fact that the fisheries sector represents an “island of poverty”.

2.2. Marine Fisheries Sector: Indian Context

Coming to the Indian perspective, even though the intertwined evils of rural unemployment and malnourishment are rampant, the Indian fisheries sector is gathering speed with the introduction and implementation of mechanised devices and technology, which helps in increasing the yield. Even though this aids in gaining foreign exchange considerably, still there are many issues faced by the fishing population which should be addressed to by proper and planned utilization of available local resources through involvement of local people (Datta and Kundu, 2007).

According to the CMFRI Census 2010, there are 3,288 marine fishing villages and 1,511 marine fish landing centres in 9 maritime states and 2 union territories. The total marine fisher-folk population was about 4 million comprising in 864,550 families. Nearly 61% of the fishermen families were under BPL category and the small scale fisheries sectors are trapped in severe poverty. With poor awareness of the socio economic conditions of marginalised fishing community, the governments cannot properly implement the needed policies and welfare schemes (Devi et al, 2012 and Devi et al, 2014). For achieving the required and feasible solutions to the existing problems, attempts in multidimensional direction needs to be adopted, that encompasses the problems and suggestions on the part of the fisher folk and other stakeholders amply, and thereby concludes in formulating and implementing necessary action plans and welfare schemes. For this, the issues that concern the various aspects of the livelihoods of the fisher folk need to be taken into consideration, thereby ensuring the active participation by all the participants. This acts as the main inputs for formulating necessary development strategies (Bijayalakshmi, AjithKumar2014).

Indian fisheries are an important component of the global fisheries and the sectors have been recognised as a powerful income and employment generator. The contribution of this sector to foreign exchange earnings is substantial and forms 1.4 percent of GDP more than 6 million fishermen in the country depend on fisheries for their livelihood. The country with a long coastline of 8129 kms has an exclusive economic zone extending to 2.02 million sq km and is a major marine fish producer ranking seventh in the World. The country's rich marine and inland water resources, fisheries and aquaculture offer an attractive and promising sector for employment, livelihood and food security.

Fish products from India are well received by almost half of World's countries, creating export- driven employment opportunities in India and greater food security for the world. During the past decades the Indian fisheries and aquaculture has witnessed improvements in craft, tackle and farming methods. To harvest the economic benefits from fishing, India is adopting exclusive economic zone, stretching 200 nautical miles (370 km) in to the Indian Ocean, encompasses more than 2 million square kilometres. In the mid-1980s, only about 33 percent of that area was exploited. The potential annual catch from the area has been estimated at 4.5 million tons. Indian marine fisheries had a total production of 3.49 million tonnes.

The sector is facing a lot of related pressures like disguised unemployment, extra capacity and increased fishing pressure in addition to the resource depletion and open access nature of the sector. This can hamper the productivity very much.

Table 2.1: *State-wise Profile of Marine Fishing Sector*

State/ U.T.	Coastal length (km)	Landing centres	Fishing villages	Fishermen families	Fisher folk population
West Bengal	158	59	188	76981	380138
Orissa	480	73	813	114238	605514
Andhra Pradesh	974	353	555	163427	405428
Tamil Nadu	1076	407	573	192697	802912
Puducherry	45	25	40	14271	54627
Kerala	590	187	222	118937	610165
Karnataka	300	96	144	30713	167429
Goa	104	33	39	2189	10545
Maharashtra	720	152	456	81492	386259
Gujarat	1600	121	247	62231	336181
Daman & Diu	21	5	11	7374	40016
Total	6068	1511	3288	864550	3999214

Source: Marine Fisheries Census of India, 2010, CMFRI.

Table 2.1 shows that, after Gujarat, which possess 1600 km of coastline, Tamil Nadu, Maharashtra and Kerala has the lengthiest coastlines. Kerala, with 118937 fishing families, comes in the third place after Tamil Nadu and Andhra Pradesh, indicating the sector's massive role in employment generation in these states. Tamil Nadu ha the largest number of landing centres, i.e., 407 units, followed by Andhra Pradesh with 353 units and Kerala with 187 units. Among the above considered states and union territories, Daman and Diu come in the last position in all the categories. Kerala has a relatively high fishermen population, despite the moderate number of fishing villages. This attributes to the high population density in the state.

Table. 2.2: *Major fish producing States in India from 2011-12,2012-13, 2013-14, 2014-15.(Production in '000 tonnes)*

Year	Andhra Pradesh	West Bengal	Gujarat	Kerala	Tamil Nadu
2011-12	1603.17	1472.04	783.72	693.21	611.49
2012-13	1675.44	1490.01	848.79	677.78	620.40
2013-14	2018.42	1580.65	793.42	708.65	624.30
2014-15	1964.43	1617.319	809.93	632.256	697.61

Source: Fisheries Profile of India

Upon analysing the data from 2011-12 to 2014-15, it is evident that Andhra Pradesh had always maintained its top position as the leading fish producing state, followed by west Bengal. The largest production was 2018420 tonnes in 2013-14 by Andhra Pradesh. Gujarat holds the third place in terms of fish production. Kerala is the 4th largest fish produces, with 708650 tonnes of fisheries production in 2013-14. However, Kerala holds a rather declining trend in terms of marine fisheries production (Economic Review, 2016). But, marine fisheries production have somewhat reached the optimum level.

2.3. Export of Fisheries Products from India

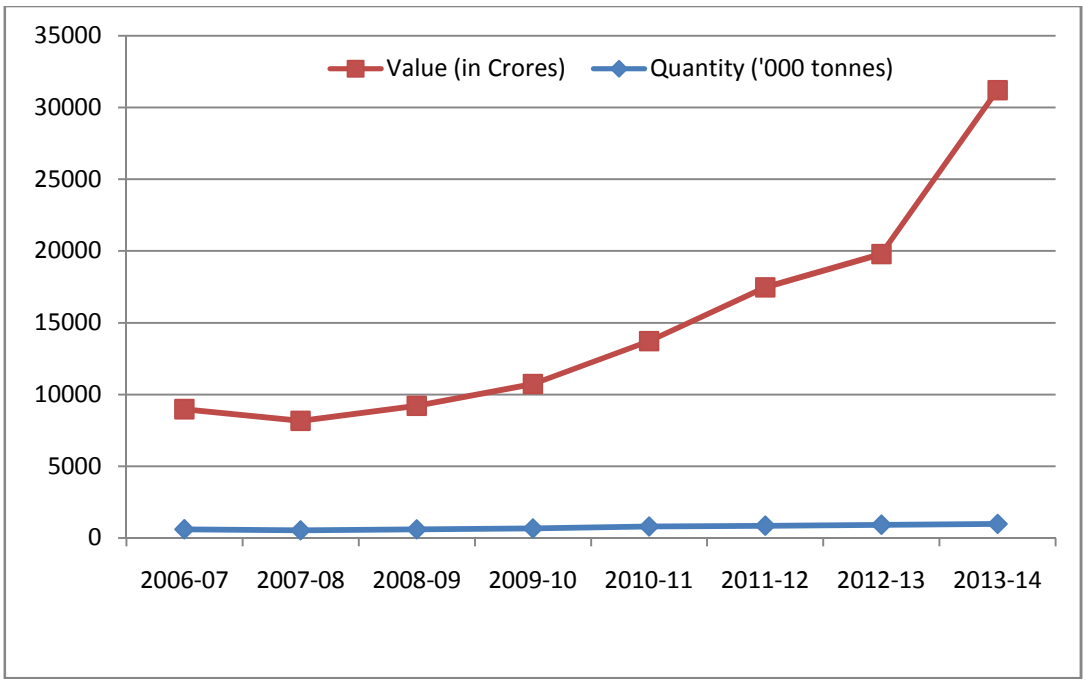
Table. 2.3: *Export Quantity and Value of Fisheries Exports of India*

Year	Quantity ('000 tonnes)	Value (in Crores)
2006-07	612.641	8363.52
2007-08	541.701	7620.92
2008-09	602.835	8607.94
2009-10	678.436	10048.53
2010-11	813.091	12901.47
2011-12	862.021	16597.23
2012-13	928.21	18856.26
2013-14	983.75	30213.26

Source: Fisheries Profile of India

From 2006 to 2014, the 2013-14 was the year with the largest export quantity of fisheries products from India, with a value of 30213.26 crore rupees obtained for 983750 tonnes of the quantity exported. The least was 541701 tonnes in 2007-08 that earned only 7620.92 crores rupees.

Figure 2.1: Trends of Export Quantity and Value of Fisheries Exports of India



Source: Fisheries Profile of India

Apart from a slight decline in the year 2007-08, the fisheries export has grown impressively over the 8 years considered, from 612641 tonnes in 2006-07 to 983750 tonnes in 2013-14. And the export earnings has increased from 8363.52 crore rupees to a whopping 30213.26 crore rupees, which is absolutely a positive trend.

2.4. Kerala Context:

Kerala , the south western State with a terrestrial area of 38863 sq km, total coastline of 590 km and coastal density of 2168 persons per sq km, holds fishing communities forming a total of 10 lakh people providing for the source of livelihood, both directly and indirectly, to about 8 lakh marine fishermen. Of this, 2 lakh fishermen inhabits 222 coastal villages, engaging actively in fishing. Kerala has

an influential and unique place when it comes to fishing, especially in contributing to the major share of exports in the sector from India, contributing to around 3 percent of the state's gross economic output. However, the backwardness and conditions of poverty prevails in the sector, consisting mainly of traditional fisher folk. And they lead a marginalised life, compared to the general population, owing to the poor and below average living standards.

As per the Economic Review 2016 by the Government of Kerala, with the total fishermen population of 10.24 lakh, forming 3.1 % of the state's total population in 2015, the fisheries sector is a major employment provider, with a total of 7.88 lakh fisher folk in 222 marine fishing villages along the coast and 2.36 lakh fisher folk in 113 inland fishing villages across the state. With 233126 active fishermen and 77694 allied workers, fisheries and aquaculture contributed 8.9 percent of GSVA of the state in 2015-16. Despite a lot of troubling issues that affects the productivity of marine resources negatively, in 2013-14 Kerala had become the 2nd largest marine fish producing state in India.

2.5. Features of Traditional Marine Fisheries Sector in Kerala

The marine fisheries sector, with the open access to resources, seems to be a golden chance for free riders. However, this has become a bane when it is very difficult to manage the resource utilisation without proper regulations and rules. It is in such a state, the importance of Exclusive Economic Zone arises, enabling the countries to exercise powers and rules in controlling the free riders and over exploitation of marine resources. Similarly, coastal zone management measures can be executed in conserving the coastal ecosystem and ensuring sustainable development.

The modern and traditional fisheries sector can be distinguished in various degrees, by the characteristics of specialisation, sale objective and technology used.

In traditional sector, there is no specialisation and all members did all tasks in the fishing activity whereas, in modern sector, there is the division of labour. In traditional fisheries sector, the main aim is to produce for self consumption or

subsistence, rather than marketing the produce for profits. Similarly, the sector lacks in modern technological facilities and tools, which reduces its productivity and the sector faces stagnation, without much progress. The first one hinders the division of labour and therefore, skill and output. The second one partly flows from the first, as the surplus of sale cannot emerge with output expansion handicapped by lack of specialisation. In its turn it limits the extent to which specialisation can be carried out. It also sets limits to the improvements in the methods of production. Features of modern sector on the other hand, the modern sector are essentially an exchange sector of the economy. It is characterised by output surpluses meant for sale and is set up on capitalist lines. It exhibits the following three features. One is the use of reproducible capital like machines, buildings etc. It marks the dependence more on man-made capital, rather than on land or natural resources. Second, is the existence of wage-labour. The workers are not owners of capital-equipment. They only sell their labour for which they get wages as remuneration. Third, is the profit making that provides the motivation for the entrepreneurs who undertake production in this sector.

The major characteristics of traditional sector include the sense of social spirit in the sector, subsistence nature, heavy dependence on land and other natural resources, low capital input and slight equipment, elementary or outdated technology, labour intensive and very low productivity, localised nature and alienation from urban markets, low bargaining power, common ownership of means of production, economy based on religion, caste, tradition and beliefs and lack of specialisation among others.

The present day traditional fisheries has various aspects like the market oriented production instead of subsistence oriented. However, it still is influenced by the natural factors like the weather and biological factors, making the sector unable at times to cater to the market needs effectively. Similarly, even though the sector is dependent on nature and land, these days the fishermen are using technical tools like board engines, synthetic gear, tackles, etc. As a result, with the mechanisation, the sector has increased the use of capital, and simultaneously a reduction in manual

labour needed is also found. Lack of specialisation is a myth these days, with the traditional sector having adopted the specialisation of various fishing activities in different levels. For instance, there are different craft and gear combinations, dedicated for different species, fishing grounds and zones. However, these are not fully adopted and incorporated in all fishing and management activities. The wage system is rare and instead the traditional system of income and profit distribution among all the fishermen is adopted. In spite of a lot of middlemen and local traders, the traditional sector has extended their reach to foreign markets as well. Another interesting feature of present day traditional fisheries sector is that they are price takers, instead of price makers, owing to a reduced bargaining ability and thus, the reduced profits. The earlier feudal system has made way for collective ownership of capital and income sharing, which is a positive change.

2.6. Administration Aspect

Under the British India, the responsibility for the regulation and development of marine fisheries were given to the respective provincial governments. This was followed in India after the independence also. However, the development of deep sea fishing was monitored by the Central Government. The credit facilities State Fisheries Departments manages and monitors the inshore and inland fisheries development, providing assistance to the fishermen for mechanisation of fishing boats, providing housing facilities, enhancing adaptive capacity through various training programmes, and the formulation of policy measures. Apart from this, they establish Fisheries Corporation, various small factories for net making, boat building yards, etc.

The Ministries of Agriculture, Commerce and also the Ministry of Food Processing Industries deals with the various stages and activities of development and monitoring of fisheries sector. It can range from facilitating of credit facilities, or exploration to marketing activities. Apart from this, the government establishes various research and development institutions and fisheries development agencies all over the country, especially in the coastal districts. The Marine Products Export Development Authority (MPEDA), Inland Fisheries Projects, Reservoir Fisheries

Projects, Angling and Aquatic Conservation Society of India, Fishery Survey of India (FSI), Central Institute of Fisheries and Nautical Engineering Training (CIFNET) Integrated Fisheries Projects (IFP), Central Institute of Coastal Engineering for Fishery (CICEF), Deep Sea Fishery Organisation (DSFO), Exploratory Fisheries Project (EFP), Fish Farmers Development Agency (FFDA), Indian Ocean Fishery Agency (IOFA), Central Inland Fisheries Research Institute (CIFRI), Central Institute of Fisheries Technology (CIFT), Central Marine Fisheries Research Institute (CMFRI), and Central Institute of Fisheries Education are some of them.

Some other institutions or establishments like the Export Inspection Council, Shipping credit and Investment Company, co-operatives, commercial banks, NABARD, etc. also facilitate in the smooth functioning and development of the sector. In 2019 interim Union budget finance minister announced the creation of a separate central department for fisheries that will ensure development in the sector. The need for a separate department had been along pending demand from the fishermen.

2.7. Development of Fisheries Sector Over the Years

Fisheries Development during the Five Year Plans was mostly concentrated around the mechanisation of the crafts and gears used for fishing, provision of infrastructural facilities like housing, transportation, etc., setting up of processing units, warehouses and storage facilities. It was given much significance as a primary sector like the agrarian sectors. The famous Blue Revolution was carried out in this regard. Many foreign countries actively assisted the country with their collaborations in developing the fisheries sector. Norway, Soviet Union, West Germany and Canada are in this list. For instance, the Indo-Norwegian Project was implemented in 1962.

The Indo- Norwegian Project was introduced in Neendakara and Sakthikulangara of Kollam District in Kerala initially. With the aim of area development and of establishing the Integrated Fisheries Complexes, and the

objectives of increasing FOREX earnings by increased productivity and the socio-economic development of the fishing communities through capacity building. By 1965, the mechanised fishing boats gained popularity soon after their introduction in Neendakara. Since the Indian prawns were a most demanded fisheries product in the foreign market, to make use of this advantage, a class of capital extensive techniques using entrepreneurs emerged. Subsidies were provided for procurement of trawlers. However, with 1970s, when the contributions of traditional sector got reduced, the over exploitation by mechanised fishermen were taken seriously. The 1980s saw a sharp decline in the productivity of the traditional sector. The increased competition between the traditional and motorised or mechanised fishermen and the declining profits of the traditional fishermen affected their livelihood in a negative manner, making them fall further into the vicious cycle of poverty. Later, recently the trawl bans were implemented, in order to protect the resources, and to support the traditional fisher folk.

Similarly, the sector includes a lot of middlemen and intermediaries who influences the marketing of the products up to a great extent. The prices for fish mostly depends up on the market forces, and the poor storage facility coupled with the perishable nature also are other reasons. Often the fishermen are not receiving sufficient income for their hard work as a result the governments have issued several welfare funds and grants for them which include subsidising of support prices, etc.

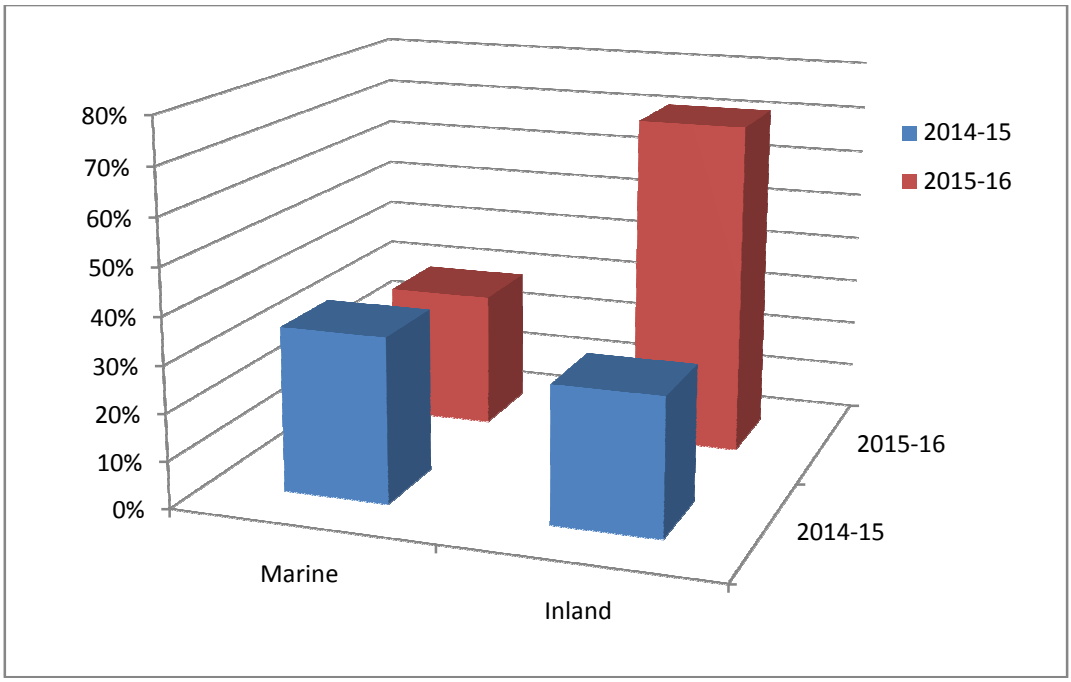
Many policy frameworks were put forward by the government for providing credit facilities to the fishermen. The regional development measures were adopted. All these activities were successful up to an extent in bringing about considerable progress in the socio-economic conditions of the fisher folk.

With the declaration of EEZs and CRZs and active measures in this regard, the coastal communities are on the path of progress, in a sustainable manner, despite the still existing poverty and backwardness. The MSY or Maximum Sustainable Yield have gained popularity and it became the focus of fishery management. However, all the measures are yet to be implemented efficiently in order to be completely successfully in attaining a sustainable development of the fisheries

sector, while at the same time conserving and preserving the coastal and marine resources as well as the ecological balance.

2.8. Marine and Inland Fisheries:

Figure 2.2: Share of the State's marine and inland fisheries in 2014-15 and 2015-16



Source: Economic Review 2016

The figure indicates the fluctuation or change in the contribution of the state's marine and inland fisheries in the total fisheries production of Kerala. In 2014-15 inland fisheries production was 65% and that of marine was 35% only. However, the next period, i.e., 2015-16 saw a declining change in marine fisheries rom 5.24 lakh tonnes to 5.17 lakh tonnes. However, Kerala despite many odds, have established its place as a leading fish producer and exporter. Economic Review, 2016 shows that for the year 2015-16, Kerala exported 149138 tonnes of fish products, at a value of 4644.42 crore rupees. This was however, a declining trend.

In terms of Marine fisheries, Kollam is the leading producer, with Kozhikode and Ernakulam in the 2nd and 3rd places. They provide around 50 percent of the total marine fish production. Meanwhile, Alappuzha, Thrissur and Palakkad together contributes to most of the inland fish production, upon considering the aggregate

fisheries output, Alappuzha, Ernakulam and Kozhikode contributes the massive portion of it.

The district wise analysis of the fisheries sector in Kerala shows that Trivandrum has the largest fishing population of 50899 fisher folk, across the 78 km of coastline. Followed by this is Malappuram, Alappuzha, Kozhikode and Kollam (Kerala Fishermen Welfare Fund Board, at Directorate of Economic and Statistics, 2016). The following table shows the district wise profile of fisheries sector in the State.

Table. 2.4. District Profile of Fisheries Sector in the State.

District	Landing centres	Fishing villages	Fishermen families	Traditional fishermen families	BPL Families	Fisher folk population
Thiruvananthapuram	51	42	33340	32859	19377	146326
Kollam	18	26	12488	12273	8488	63300
Alappuzha	16	30	20278	20024	10244	92033
Ernkaulam	20	21	9318	8898	4405	42083
Thrissur	21	18	5448	4880	3163	27572
Malappuram	11	23	14940	14747	6760	98120
Kozhikode	19	35	14157	13983	7452	82129
Kannur	12	11	4331	4157	2315	27949
Kasargod	19	16	4637	4500	3255	30653
Total	187	222	118937	116321	65459	610165

Source: Marine Fisheries Census of Kerala, 2010.

With the largest fisher folk population and most number of fish landing centres (52 units), Thiruvananthapuram also has the maximum number of fisher folk families and fishing villages. There are 32859 traditional fishermen. Kannur possess the least number of traditional fishermen families, i.e., 4157 in 11 fishing villages. Kerala has a total of 187 landing centres distributed across the 222 fishing villages with 610165 total fisher folk population, consisting of a total of 116321 traditional fishermen families. After Thiruvananthapuram, Thrissur, Ernakulam, Kozhikode, Kasargod and Kollam has the maximum number of fish landing centres. In terms of

BPL families, after Thiruvananthapuram, Alappuzha, Kollam, Kozhikode and Malappuram follows.

2.9. Fluctuating Productivity in Fisheries' Sector:

Regarding the prevailing fluctuations in the catch, many reasons can be attributed to it, the major one being the natural factors and the seasonal changes which results in resource scarcity and abundance. The inefficiency of the fishermen in terms of gears and crafts makes this situation much worse. Thus, the fish resources in the deeper ocean remained unexploited. The increased risk to life of the fishermen and fishing gears or vessels were another side of the problem. Prior to mechanisation in 1960s, the sector remained rather primitive with depending upon man and wind power for venturing into the sea.

The period of mid-1950s saw the government intervention in the form of Indo- Norwegian Project (INPI) that gave significant stress on the use of mechanised boats. These boats, which were to be operated from ports and harbours, brought in many innovations in technology, which was aided by large capitalisation prospects. Further, the sprouting up of several conflicts among the traditional fishermen and coastal trawlers, especially with the sudden global demand for prawns in the 1960s made the situation worse. The government had also aided in expanding the exporting prospects of the sector. The simultaneous innovations like use of nylon nets, and other gears, boosted the marine output, which peaked in 1973. However, the rise in fishing pressure and competition lead to resource depletion and a decline in the production in 1980s. This was somewhat rectified with the introduction of outboard motors (OBM) and ring seine, facilitating the fishermen to venture into offshore areas as well (Mahesh, R., 2006).

2.10. Mechanisation:

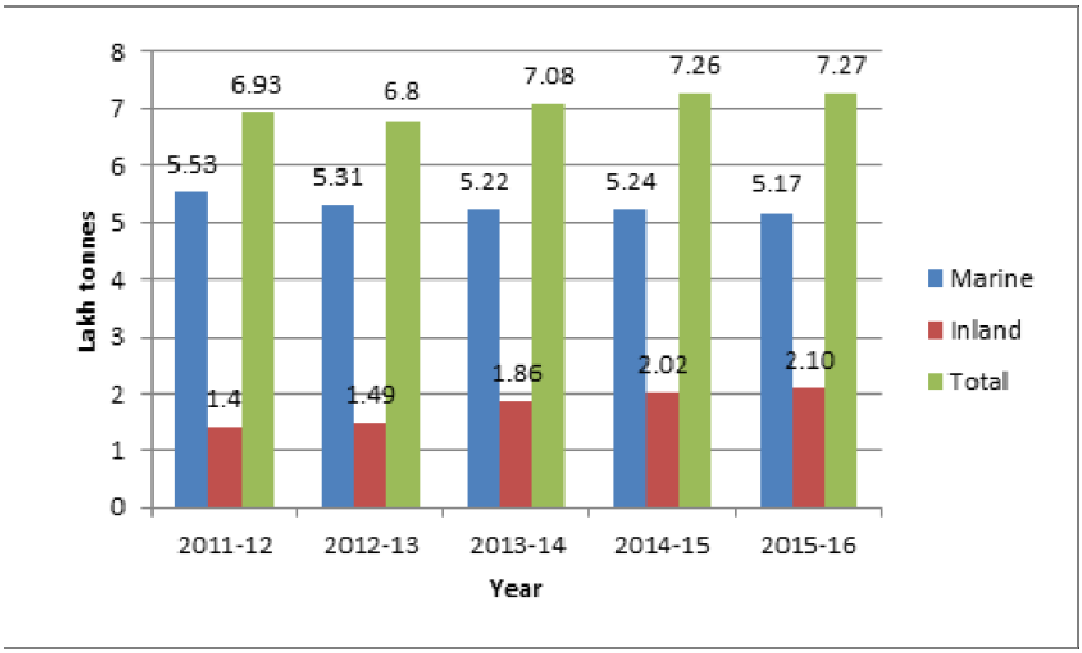
Mechanisation was introduced in Kerala from mid 1960s, which led to the further marginalisation and poverty of traditional fishermen, who with their canoes and small vessels were unable to compete effectively with the trawlers, thereby affecting the livelihood of the traditional fisher folk adversely. As a result to escape

poverty, they tried to avail loans in banks, many of which were rejected owing to the lack of required collateral security needed for the same. So they borrowed from money lenders and other such unconventional sources like middlemen, with exorbitant interest rates, which often worsened their situations. However, a new class of entrepreneurs, the moneylender-cum-boat-owners emerged, who increasingly took economic control of the villages, which has often acted as catalysts for clashes between the mechanised boat owners and traditional fisher folk (Chekutty, N.P., 2010). Salagrama (2006) had identified that, even if the fisheries sector as including various types of livelihood activities, from production and processing to marketing and ancillary functions, still many of the people engaged in this activity remained unrecognized. So, to reduce the poverty and vulnerability of the fishing community multidimensional policies and sustainable development strategies are to be implemented.

With the beginning of 1990s, a lot of fishermen started to use motorised fishing boats. This helped them to engage in the fishing activities in deep seas, without much risk created by the natural forces like wind and tide. However, the condition of traditional fishermen, which are comparatively larger in number, still remains rather backward. This is because of the heavy competition from the large boats and mechanised vessels, juvenile fishing, and tools that 'clear' the ocean bed. As a result the traditional fishermen with man power and less efficient gears will find it extremely difficult to acquire a good catch, especially in the background of resource depletion. The trawling ban, however, brought in a restriction to the massive decline in fisheries resources. Thus, the open access nature of the sector and excessive fishing pressure has brought in several adverse impacts, despite a positive output production.

Seasonal changes in pre-monsoon, monsoon and post- monsoon have much impact upon the fish stock available. This is because, this have effects on the fish breeding, growth, distribution and migration. The fish migration, especially of certain species like oil sardine, etc. towards the north-western coast of India is an example.

Figure 2.3: Fish Production in Kerala (2011-12 to 2015-16)



Source: Directorate of Fisheries, Government of Kerala

While analysing the recent trends in total fish production in Kerala from 2011-12 to 2015-16, it is evident that even though there has been a fair decline in the marine fisheries output, the inland fish production has balanced it, thereby adding to the rise in aggregate fisheries output of the state. This is evident from the following figure. In 2011-12, the marine fish production was 5.53 lakh tonnes which got reduced to 5.17 lakh tonnes in 2015-16. Also, a simultaneous rise in inland fisheries output is seen from 1.4 lakh tonnes in 2011-12 to 2.10 lakh tonnes in 2015-16, thus, contributing to the rise in aggregate fisheries production. In 2011-12, the total fishery output in Kerala was 6.93 lakh tonnes, which increased to 7.27 lakh tonnes in 2015-16. (Economic Review of Kerala, 2016).

It is the open-access or common property nature of the sea that attracts large numbers of poor people to find their livelihoods there, and they are badly affected when the terms of access to the resource change. Open access allows the entry of bigger players into the sector, which come to dominate or even monopolize access to resources – often with the facilitation of the state – and marginalize traditional stakeholders. Development efforts have given rise to a hierarchy based on economic criteria in the villages. The diffusion of new technologies has benefited a few

people, with the large majority becoming wage earners and several others becoming redundant. Changes in marketing patterns brought about a change in sharing patterns, transforming fishing crew from shareholders to employees, although they still retain a share in the catches (Venkateshsalagrama).

2.11. Socio-Economic Conditions of Marine Fisher-folk in Kerala

2.11.1. Types of fisher folk:

Mainly the fishermen can be divided into groups according to the nature of their employment, namely as traditional fishermen, motorised fishermen, mechanised fishermen, local fish traders, middlemen traders and fish exporters. Traditional fishermen have relatively poor economic situations leading to the limited investment in gears, especially like catamarans and canoes, thereby limiting them exploring various fishing grounds effectively and instead stay in near shore waters mostly. Motorized fishermen and Mechanized fishermen use outboard engines or motors in canoes due to slightly better economic status and therefore be able to utilize the resources better as the fishing ground exploration percentage is higher than for the traditional fishermen community.

Local fish traders form the first line traders between the fishermen and the local markets with very limited investment in trading. Middlemen fish traders have much better investment and proper trading strategies. They buy fish from the local fishermen and sell it at higher prices.

Finally, fish exporters are investment-wise better off with higher profits based on the quantity and quality of their exports (Pavithran. A.P, Sachin, Moors, Eddy. Singh, Tanya. Menon. N.R, 2015).

2.11.2. Demographic Status:

Upon studying the demographic status of the community, age and gender are considered. Sujathkumar (1988) in his study on adoption behaviour of the traditional fishermen reported that 38.33 percent of the fisher folk belonged to middle age group, 48.33 percent belonged to old age group and among the trawler owners most

of them belonged to middle (43.33 percent) and old age (35.00 percent) groups respectively.

Immanuel (2004) upon studying about the linkages among research, extension and clientele systems in marine fisheries in Kerala had found out that 52.67 percent of the fishermen belonged to middle age group followed by old age group (27.33 percent) and young (20.00 percent) age group.

From a study by Joshua (2009) on socioeconomic condition of fishers in Kollam, stated that 46.7 percent of the fishermen belonged to medium age group while 42.5 percent and 10.8 percent belonged to young and old aged group, respectively. So it is evident that around 43 percent population belongs to the middle age group on an average. They constitute most of the working population.

The number of aged people is very less among the marine fisher folk in Kerala. Around 94percent are below 60 years of age. People above 60 years constituted only around 5.93 percent.

Table.2.5. Population Distribution Structure of Marine Fisher folk

Districts	Male			Female			Total	Average family size	Sex ratio
	Adults	Children		Adults	Children				
		Upto 5 yrs	Above 5 yrs		Upto 5 yrs	Above 5 yrs			
Thiruvananthapuram	52548	6230	16424	48904	6537	15683	146326	4.39	946
Kollam	22767	3537	6407	21372	3504	5713	63300	5.07	935
Alappuzha	34832	3476	8469	34289	3290	7677	92033	4.54	967
Ernakulam	16323	1398	3645	16316	1345	3053	42083	4.52	970
Thrissur	10924	872	2037	10951	902	1886	27572	5.06	993
Malappuram	32213	5624	12055	31859	5826	10543	98120	6.57	967
Kozhikode	29611	3943	7697	30611	3626	6641	82129	5.80	991
Kannur	10113	1257	2714	10022	1323	2520	27949	6.45	984
Kasargod	11271	1312	2691	11496	1320	2663	30653	6.61	1007
Total	220602	27649	62139	215820	27676	56179	610165	5.13	966

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

Total fisher folk population of Kerala being 610165, Thiruvananthapuram occupies the leading position with 146326 registered fishermen. Thrissur has the least population of fisher folk. Apart from Thrissur, Kozhikode and Kasargod, all other districts have more fishermen than fisher women. Sex ratio is the least in Kollam with 935 women for every 1000 men in fisherfolk community. And Kasargod has the highest ratio of 1007 females for 1000 males in the community. Among children also this trend isthere, with more male children, than female children, except in a few districts. Coming to the family size, average value across the districts is 5.13. The smallest average family size value of 4.39 was found in Thiruvananthapuram, whereas Kasargod got the highest value of 6.61.

In Kerala, fisher-folk still continue the joint family system, despite a general shift to the nuclear ones generally. About 79 percent families (approx.) were nuclear families and only the remaining 21percent are joint families (mostly in Malappuram and Kozhikode districts). Sharma (2000) found that 64 percent of the farmers under the adult literacy campaign had nuclear family and 36.00 percent had joint family.

2.11.3. Educational Status:

73 percent of fisher folk had different levels of education, about 33percent had primary education, 34 percent had secondary level, 6 percent had above secondary level and the rest 27 percent were unschooled (Marine Fisheries Census of CMFRI, 2010). According to the population census 2011, literacy rate of Kerala was 93.91 per cent (Economic Review, 2014).

Table 2.6: *Educational Attainment by Fisher Folk across the Various Districts.*

District	Up to Std.8	Std. 9 to 12	Graduate & Professional Technical	Nil
Trivandrum	41.72	34.99	19.18	4.11
Kollam	36.98	50.00	8.89	4.29
Alappuzha	50.29	35.40	2.90	10.44
Ernakulam	59.23	32.25	5.07	3.45
Thrissur	46.77	35.92	14.47	2.84
Malappuram	50.29	40.50	7.60	1.61
Kozhikkode	40.99	41.76	15.05	2.20
Kannur	22.46	45.34	19.92	12.29
Kasargod	36.76	46.11	4.98	12.15

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

From Table 2.6 we can infer that Kannur, Kasaragod and Alappuzha have the most number of illiterates, who have not attained any formal education. Similarly, Malappuram, Thrissur and Kozhikode have the least number of illiterates. Among the three stages or levels of educational attainment considered, a majority amounting to around 40 percent have attained high school education up to 8th standard.

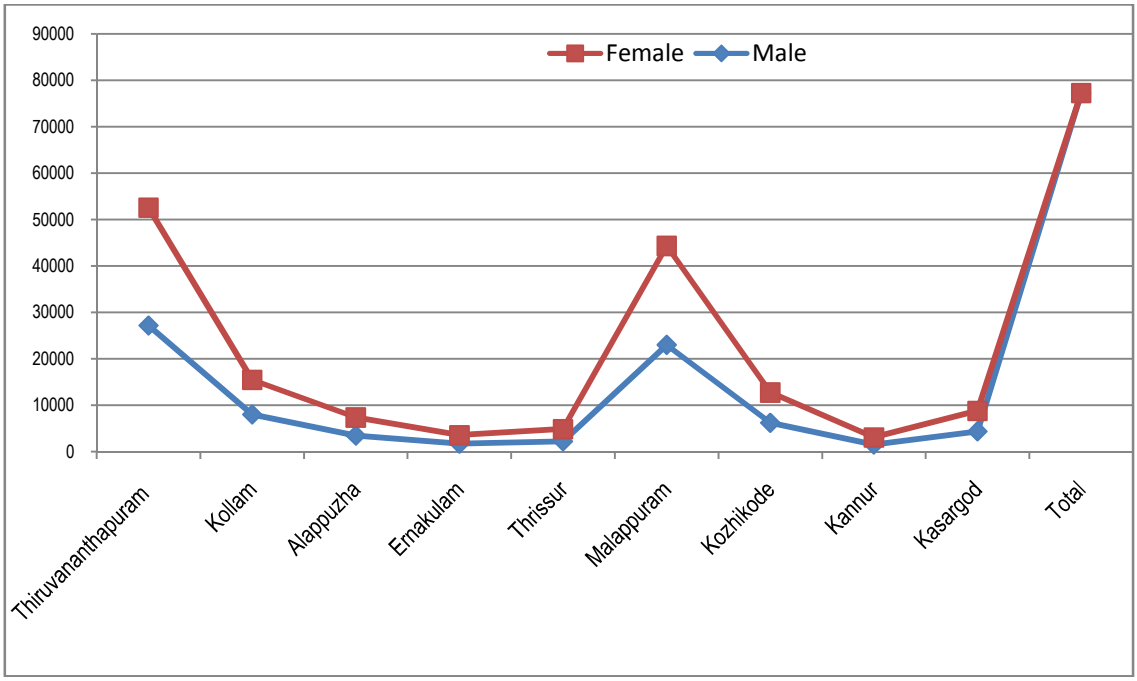
Table 2.7: *District wise Educational Profile of Marine Fisher folk*

District	Primary		Higher secondary		Above Higher secondary		Unschooled	
	Male	Female	Male	Female	Male	Female	Male	Female
Thiruvananthapuram	19098	18331	18191	16674	4560	4156	27123	25426
Kollam	6573	5668	11961	11500	2702	2420	7938	7497
Alappuzha	17509	16940	19542	17885	2828	3201	3422	3940
Ernakulam	8682	8450	8045	7250	1559	1836	1682	1833
Thrissur	4458	4303	5753	4886	585	983	2165	2665
Malappuram	12474	12265	8057	8155	772	637	22965	21345
Kozhikode	13509	12034	15872	15916	1784	2704	6143	6598
Kannur	6178	5506	4372	4405	800	1052	1477	1579
Kasargod	5099	5104	3971	3811	581	673	4312	4471
Total	93580	88601	95764	90482	16171	17662	77226	75354

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

From Table 2.7, it is clear than in primary and higher secondary level education, relatively more males have attended than females in the marine fisher folk community of the state. However, in the case of above higher secondary education, the numbers of females are rather higher than that of males. This may be due to the pressure on them to pursue occupational activities at an early age in order to earn a livelihood. Poverty and backwardness are the root causes for this dropout, along with indebtedness, reluctance lack of awareness and poor prospects.

Figure 2.4: District-wise trend of Unschooled Males and Females among Marine Fisher folk in Kerala



Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

Here, from the figure(2.4), it is evident that Thiruvananthapuram has most of the unschooled fishermen and fisherwomen amounting to 27123 and 25426 respectively, followed by Malappuram with 22965 and 21345 unschooled fishermen and fisherwomen respectively. In the state, there are 77226 and 75354 officially illiterate marine fishermen and fisherwomen respectively. This is a key reason for the prevailing backwardness of the community. Without proper formal education, they find it difficult to pursue other modes of occupation, as they are either rejected or they lack awareness about the same. This also affects in effective availing of

various government welfare schemes and funds, which are implemented and issued for them. Thus, even in situation of indebtedness, or low catch and off season, etc. they find it difficult to pursue alternate means of income.

2.11.4. Religious Status:

On considering the religion, Hindu fisher-folk are mostly found in the central and northern districts of Kollam, Allapuzha, Thrissur and Kasargode districts of Kerala. In Kerala, fisher folk belong to the caste groups of '*arayans*', '*velan*', '*mukkuvas*' and the '*marakkans*', respectively. Christian fisher-folk are concentrated in the southern and central parts of Kerala, whereas the Muslim fisher-folk live mostly in the northern districts of Kerala.

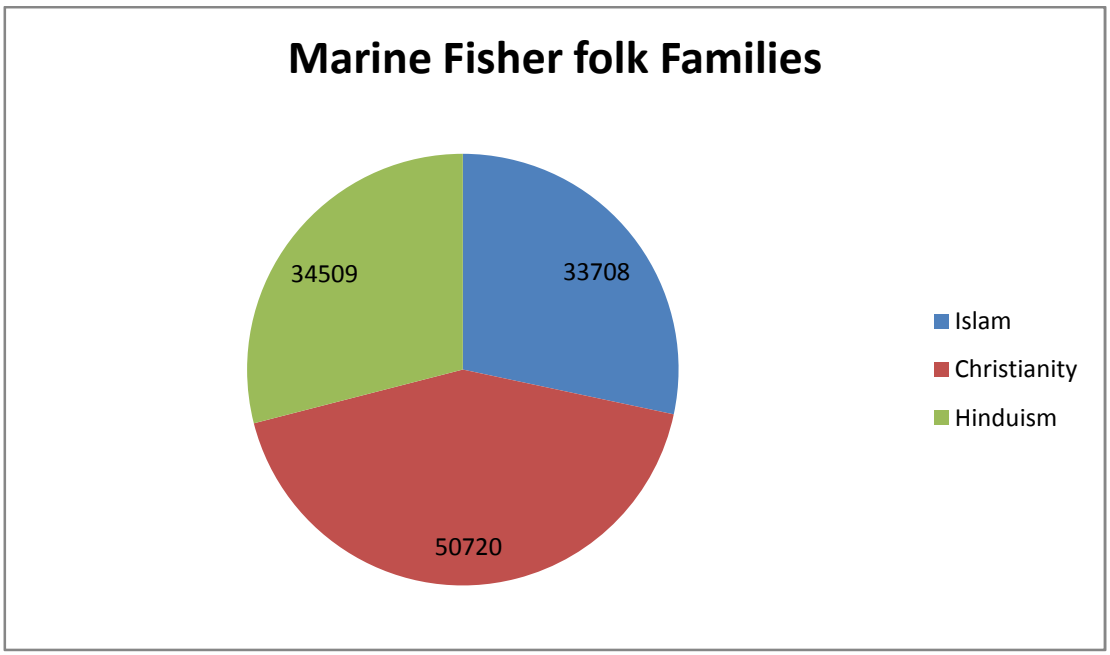
Table 2.8: *District-wise Distribution of Religion and Community Among Marine Fisher folk in Kerala (No. of Families).*

District	Religion				Community
	Hinduism	Islam	Christianity	Total	SC/ ST
Thiruvananthapuram	608	4788	27944	33340	638
Kollam	3924	1545	7019	12488	138
Alappuzha	8187	1015	11076	20278	107
Ernakulam	4464	636	4218	9318	638
Thrissur	3645	1772	31	5448	211
Malappuram	421	14516	3	14940	236
Kozhikode	7577	6568	12	14157	19
Kannur	2220	1724	387	4331	221
Kasargod	3463	1144	30	4637	31
Total	34509	33708	50720	118937	2239

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

From the Marine Fisheries Census, 2010 by CMFRI, it was found that the marine fishermen belonged to three religions, Hinduism, Islam and Christianity. Among these, a large proportion of them belongs to Christianity, i.e., 50720 fisher folk families in 2010.

Figure 2.5: District wise Distribution of Religion among Marine Fisher folk in Kerala (No. of Families).



Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

There are 34509 Hindu families and 33708 Muslim marine fisher folk families in the state. Kozhikode has the highest number of Hindu marine fisher folk, with 7577 families. Malappuram has the largest number of Muslim marine fisher folk, and Thiruvananthapuram possess the highest position in the case of number of Christian marine fisher folk, with 14516 and 27944 marine fisher folk families respectively.

Thiruvananthapuram and Ernakulam has the highest number of SC/ ST category fisher folk, amounting 638 fishing families in each of the two districts. They are followed by Malappuram and Kannur with 236 and 221 SC/ST marine fisher folk families. Kozhikode with 19 SC/ST marine fisher folk families, comes in the least position. Overall, there are 2239 marine fisher folk families in the state who belongs to SC/ST category.

2.11.5. Occupation:

Table 2.9: *Distribution of Fishermen Engaged in Fishing and Allied Activities*

District	Active fisher folk	Fishing Allied Activities						Other jobs	Total
		Marketing of fish	Making/ Repairing of net	Curing/ Processing	Peeling	Labour	Others		
Trivandrum	35314	11922	1137	2280	126	5422	153	2130	58484
Kollam	16677	1991	891	1095	328	1651	72	636	23341
Alappuzha	23256	686	457	614	6269	827	78	3608	35795
Ernakulam	8934	438	86	438	2486	553	47	404	13386
Thrissur	5704	391	141	396	239	238	15	322	7446
Malappuram	222238	501	129	63	38	4220	44	1059	28292
Kozhikode	20200	590	68	628	257	540	145	1122	23550
Kannur	5404	631	142	158	19	458	144	1335	8291
Kasargod	7669	3268	317	5	55	482	38	77	11911
Total	145396	20418	3368	5677	9817	14391	736	10693	210496

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

From Table 2.9 it is evident that, a majority of the members of the marine fishing community are engaged in active fishing. They constitute 145396 individuals, which much more than each of the allied activities of the sector. Thiruvaananthapuram has the highest number of active fishermen amounting to 35314 individuals, and Kannur comes the last with only 5404 active fisherfolk. Marketing of fish, making and repairing of net, curing and processing, peeling, labourers and other odd jobs constitute the allied activities mainly. Among the allied activities, marketing of fish occupies more individuals, amounting to 20418 persons across the 9 coastal districts of the state. This is followed by working as labourers, in which 14391 fisher folk are engaged. In total, 210496 members belonging to the marine fishing community are employed. Out of this,10693 individuals are engaged in activities offered in sectors other than fishing. The rest of the community depends upon the fisheries sector for their livelihood, either through active fishing or by allied activities.

Table 2.10: *District-wise Distribution of Active Marine Fishermen*

Districts	Active fishing		Fish seed collection				Total
	Full time	Part time	Full time		Part time		
			Male	Female	Male	Female	
Trivandrum	30879	2997	641	191	205	401	35314
Kollam	13558	847	1378	671	106	117	16677
Alappuzha	22066	1173	5	3	0	9	23256
Ernakulam	8066	834	2	6	15	11	8934
Thrissur	5464	234	0	1	0	5	5704
Malappuram	19598	2554	50	23	0	13	22238
Kozhikode	19452	728	7	4	1	8	20200
Kannur	4833	556	7	2	1	5	5404
Kasargod	7006	659	0	0	0	4	7669
Total	130922	10582	2090	901	328	573	145396

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

Table 2.10 shows that out of the active fishermen, 130922 are engaged full time and 10582 are part time active fishermen. The rest of them are engaged in fish seed collection, with a total of 2991 engaged full time and 901 members being part time fish seed collectors. Males are more active in fish seed collection than fishermen as evident from the table. Also Thiruvananthapuram and Kollam are the two districts in which fisher folk are engaged morein fish seed collection, followed by Malappuram.

From a study by Jasna, Sanghamitra, (2016), it was seen that highest percentage of respondents in the motorized fisher folk lived in Pucca houses (26.7 per cent) followed by semi Pucca (23.3 per cent). In the mechanised boat using fishing folk about 34 per cent of the respondents lived in Pucca houses followed by semi Pucca (16 per cent).

2.11.6. Income and Earnings:

Fishery sector earnings are highly uncertain, often seasonal, and unevenly distributed within the sector; fishers owning boats and/or fishing gear earn substantially more net income, than crew labourers. District-wise, unemployment among the fisher folk is higher (66.04 percent in Kasargod followed by Malappuram (61.99percent) and Kozhikode (61.66 percent) respectively. The unemployment range is comparatively lower in Ernakulam and Alappuzha.Based on the study by Jasna and Sanghamitra (2016), in Kozhikode district alone, around, 48 per cent of the fisher folk earned their monthly income in the range between Rs.10000 to Rs.15000, followed by the income group above 15000 (37.3 per cent) and income group between Rs.5000 to Rs.10000.

2.11.7. Indebtedness:

Owing to the uncertainty and seasonality of occupation, poor earnings, low savings, fishermen are forced to borrow money. Due to lack of awareness, incapability of providing collateral security and inherent non-repayment characteristics, they depend on money lenders to meet day-to-day expenses at an exorbitant rate of interest. The study shows 53.33percent have borrowed funds. The remaining 46.67 percent had no borrowings. Studies show that nearly 25percent of the households have debt amounting to more than Rs.1 lakh (KUFOS, 2010). The burden of indebtedness was high in Trivandrum (78.33 percent), followed by Kollam (68 percent), with FGDs reports showing that they borrow money from the money lenders in the landing centre at unbelievably higher rate of interest of 1921 percent p.a.

They also depended on the cooperative banks or cooperative (26percent), and 5.14 percent from the National Backward Classes Development and Finance Corporation. When only 2.67 percent of the respondents borrowed from the nationalised banks, 7.71 percent were found borrowing from money lenders.

2.11.8. Maintenance of Bank Accounts:

It was found that about 93.43 percent of the fishermen have bank- or post office accounts, 49.05 percent have opened accounts with nationalised banks, 22.67 percent with scheduled banks, 20.38 percent with cooperative banks and 1.33percent with post offices, whereas, 6.57 percent have no bank account. More than 90percent maintaining bank account is a sign of financial literacy among them. The district-wise figures revealed the number of fisher folk without bank account being highest in Malappuram (28.33percent) followed by Trivandrum (12.22 percent) and Thrissur (12.22 percent) respectively. In Kollam, Ernakulam, Kozhikode and Kannur, all the respondents had bank accounts.

2.11.9. Savings Habit:

Mostly they spend the money on liquor, playing cards or other purposes than saving. During dry days, fisherman demanding money for alcohol may lead to miserable situations at home, with children as the victims of this domestic violence. Studies reveals that 54.1percent of the respondents had no savings. Out of 1050 households, 32.48percent have monthly savings up to Rs.1000, and 13.43percent were able to save more than Rs.1000 monthly.

2.11.10. Membership in Cooperatives:

Table 2.11: *District wise distribution of Membership in Co-operatives*

Districts	Membership in Co-operatives		
	Fisheries co-operatives	Other co-operatives	Total
Trivandrum	30618	17941	48559
Kollam	11307	3368	14675
Alappuzha	23797	11693	35490
Ernakulam	9210	9117	18327
Thrissur	5649	4817	10520
Malappuram	13979	610	14589
Kozhikode	17461	7353	24814
Kannur	5265	2219	7484
Kasargod	7685	2364	10049
Total	124971	59536	184507

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

Table 2.11 reveals the number of marine fisher folk who are registered members in various co-operatives. It can be fisheries related or not, but these have helped them a great deal in fighting the evils of indebtedness, poverty and backwardness. Co-operatives helps in ensuring financial security, thereby preventing the members from falling into clutches of vicious cycle of poverty. Out of the total co-operatives accessible to them, there are 124971 fisheries co-operatives, in which they are members. The rest of them are members of various other co-operatives amounting to 59536 one of them. Thiruvananthapuram has the most number of fisheries o-operatives, followed by Alappuzha and Kozhikode, with 30618, 23797 and 17461 fisheries co-operatives respectively. The same districts have the highest number of other co-operatives in which the marine fisher folk have membership.

2.11.11. Fishing Crafts and Gears Used:

The major fishing crafts and vessels used by the fisher folk is of utmost significance while analysing the total productivity. It can affect the catch of the fish, by influencing the efficiency of fishing activity and the deeper waters ventured. Trawlers, gill netters, ring seiners, liners, purse seiners, mechanised, motorised and non- motorised are the main categories. Among these, the non-motorised and the traditional crafts used by the traditional fishermen are the most vulnerable to the deep sea challenges like high tides and storms. Since they lack sufficient mechanisation it also affects their efficiency to get a good catch.

Table 2.12: *District wise Distribution of Major Fishing Craft used by the Marine Fisher folk*

Districts	Trawlers	Gill netters	Ring seiners	Liners	Purse seiners	Total mechanised	Motorized	Non-motorized	Total
Trivandrum	0	0	0	0	0	0	2880	2304	5184
Kollam	950	5	35	3	0	993	546	299	1838
Alappuzha	30	0	8	0	0	38	1503	1980	3521
Ernakulam	1020	403	90	15	60	1588	531	146	2265
Thrissur	130	0	65	0	0	195	670	217	1082
Malappuram	200	2	150	1	0	353	1571	186	2110
Kozhikode	950	0	110	5	0	1065	1831	260	3156
Kannur	237	50	33	5	0	325	542	97	964
Kasargod	161	0	4	0	0	165	1101	395	1661
Total	3678	460	495	29	60	4722	11175	5884	21781

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

From Table 2.12, it is clear that Trivandrum district possess only motorised and non- motorised crafts. Whereas in Kollam, Kannur and Ernakulam, trawlers, mechanised and motorised crafts are also used increasingly along with non-motorised ones. In these districts, they also use gill netters, ring seiners, and rarely only the use of liners and purse seiners are found.

On an aggregate level, a majority of the fishermen use motorised crafts, amounting to 11175, followed by non- motorised (5884 crafts) and totally mechanised (4722 crafts) along with trawlers (3678 crafts).

Mechanisation has definitely added to the expansion in the fisheries export and increased productivity of the sector. Despite the trawler ban during monsoon, they still contribute a lot in acquiring good catches. Similarly, the introduction of ring seiners which is a surface gear was one of the novel innovations in the sector.

However, with mechanisation and popularisation of motorised and mechanised crafts, the disparity between the traditional and the motorised fishermen has increased rapidly. This is because of the growing disparity in ability to catch, resource depletion caused by trawlers and extensive fishing which makes it difficult for the traditional fishermen to survive the heavy competition.

Despite the trawler ban and other protective measures like restriction on juvenile fishing, etc. still the condition of disparity and conflict among the fisher folk prevails. A lot of varieties of fishing gears are used by the fisher folk, depending on their gears, seasons and coastal conditions.

Table 2.13: *District-wise Distribution of Major Fishing Gears owned (100%) by the Marine Fisher folk*

Types	Trivandrum	Kollam	Alappuzha	Ernakulam	Thrissur	Malappuram	Kozhikode	Kannur	Kasargod	Total
Trawl net	371	375	288	12	13	450	155	32	57	1753
Gillnet	1819	23	754	207	292	598	1048	269	653	5663
Driftnet	341	25	1218	572	49	64	155	122	62	2608
Ring seine	33	35	244	54	32	1017	111	56	57	1639
Purse seine	35	11	72	4	26	25	14	8	1	196
Boat seine	303	12	64	14	5	23	11	2	3	437
Bagnet	55	2	35	38	77	2	6	78	10	303
Shore seine	187	7	7	4	35	29	60	63	93	485
Cast net	25	30	31	309	63	182	300	37	104	1081
Hooks and lines	746	66	1	16	0	1	18	9	0	857
Troll line	155	4	0	0	0	0	1	2	0	162
Fixed net	2	2	26	13	0	0	0	1	0	44
Traps	4	0	0	0	0	0	0	0	0	4
Scoop net	144	7	9	5	2	0	0	8	5	180
Others	50	335	60	45	17	5	8	9	0	529

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

Fishing gears can range from trawl nets, gill nets, drift net, ring seine, purse seine, boat seine, bag net, shore seine, cast net, hooks and lines, troll line, fixed net, traps, scoop nets to other gears. Among these, gill nets, trawl nets, drift nets, purse seine and cat net are the most commonly used varieties in the state.

2.11.12. Infrastructural Facilities

Table 2.14: *Infrastructure - Housing & Education (In the Fishing Villages)*

District	No. of villages	No. of families	Housing		Education			
			Kutcha	Pucca	Primary	Secondary	College	Technical Institutions
Trivandrum	42	33340	5901	27439	51	14	4	7
Kollam	26	12488	1797	10691	50	18	0	11
Alappuzha	30	20278	2103	18175	51	17	4	9
Ernakulam	21	9318	648	8670	45	23	1	4
Thrissur	18	5448	1365	4083	46	20	4	2
Malappuram	23	14940	4645	10295	33	22	9	4
Kozhikode	35	14157	562	13595	104	27	12	10
Kannur	11	4331	59	4272	51	26	3	9
Kasargod	16	4637	397	4240	38	15	1	2
Total	222	118937	17477	101460	469	182	38	58

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

Upon considering the basic infrastructure facilities in the fishing villages along the Kerala coast, it was found that there were 118937 fisher folk families in a total of all the 222 villages. There were 17477 kutcha or poorly built houses or huts or thatched huts, and 101460 pucca or well-constructed or concreted houses. Among the districts, Trivandrum, Alappuzha and Kozhikode have highest number of pucca houses, i.e., 27439, 18175 and 13595 respectively. This indicates the better infrastructural conditions of the fishing villages in these districts. The fisher folk face a lot of damages generally from the seasonal changes in climate, in the form of high tides, storms and cyclones, which will be having a greater effect upon their houses and properties. Storm surges and high tides often damages their huts and dwellings. So, the necessity of pucca houses is of utmost importance to fight the high tides and thrashing waves. When educational facilities are considered, all the districts have sufficient number of primary and secondary schools. Apart from Kollam, Ernakulam and Kasaragod, all other districts have more than 2 colleges. Technical institutions are also present in the vicinity of the coastal villages. Kollam, Kozhikode, Kannur and Alappuzha have more number of technical institutions near the fishing villages. However, despite having these many facilities, a vast

proportionof the fisher folk are not availing these facilities effectively. A majority of them are dropouts after high school or higher secondary education. This is due to their indebtedness and poor living conditions that forces them to earn a livelihood rather early. And owing to this poor educational attainment, in the time of low catch or off season, they find it more difficult to pursue alternate modes of livelihood or to continue the education. Reluctance and lack of motivation are other factors, which is again due to poor awareness.

Table 2.15: *Public Infrastructure / Facilities (In the Villages)*

Districts	No. of fishing villaes	Villages having:							No. of:					
		electricity	Bus stop	Hospital	Police station	Post offices	Mobile coverage	Internet facility	Fisheries Cooperatives	Other co-operatives	Community centres	Cinemas	Liquor shops	Banks
Trivandrum	42	42	42	30	13	24	42	42	64	51	56	5	3	32
Kollam	26	26	26	17	7	20	7	6	35	24	12	7	7	34
Alappuzha	30	30	30	17	8	21	30	30	30	34	17	7	43	51
Ernakulam	21	21	21	14	3	12	21	20	30	22	15	9	32	22
Thrissur	18	18	18	14	2	17	17	11	15	18	11	3	3	19
Malappuram	23	23	23	18	6	19	14	12	15	16	4	3	0	13
Kozhikode	35	35	30	35	10	25	35	21	47	46	14	10	32	59
Kannur	11	11	8	11	5	11	10	5	21	31	13	7	7	40
Kasargod	16	16	8	11	2	10	16	0	19	13	11	6	1	19
Total	222	222	206	167	56	159	192	147	289	255	153	57	128	289

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

The public infrastructural facilities like electricity, transportation, hospital, police station, internet facilities, community centres, cinemas, banks, etc are necessary for social development of the villages. Out of the 222 villages, all are having electricity, co-operatives and banking facilities. Transportation facilities in the basis of bus stops are found in only 206 villages. Apart from hospitals and police station, all other facilities are found almost evenly distributed across the fishing villages. 147 villages have internet facilities. However, the presence of 128 liquor shops is also to be noted. Liquor addiction is a major reason that can be attributed to

low saving habits and indebtedness of the fishermen. Fisheries co-operatives and other co-operatives are found in almost all the villages. There are 289 fisheries co-operatives and 255 other co-operatives for 222 villages. They together helps in maintaining financial security and fighting the indebtedness and poverty of the fisher folk. They help in providing small credits and self-employment programs too. The 289 banks distributed widely in the 222 villages also help the fishermen in this regard. Various welfare schemes and credit facilities are provided through banks.

Table 2.16: *Infrastructure – Fisheries Related (In the Fishing Villages)*

Districts	Boat yards	Ice factories	Cold storage	Freezing plants	Curing yards	Peeling sheds	Processing plants	Extraction plants	Fish meal plants
Trivandrum	15	22	0	2	0	0	2	0	0
Kollam	24	40	3	14	14	33	0	0	0
Alappuzha	8	52	15	12	0	106	0	0	0
Ernakulam	26	69	8	9	4	40	5	0	0
Thrissur	4	22	0	2	14	2	2	0	1
Malappuram	2	30	0	0	38	0	0	0	0
Kozhikode	29	66	2	1	171	11	0	0	1
Kannur	11	34	0	0	29	0	0	1	1
Kasargod	0	16	0	0	0	0	0	0	0
Total	119	351	28	40	270	192	9	1	3

Source: Marine Fisheries Census of Kerala, 2010, CMFRI.

Considering the fishery related infrastructure facilities prevailing in the villages, the state has a total of 119 boat yards, with Kozhikode (29), Ernakulam (26) and Kollam (24) having the most numbers. All the districts possess ice factories, with Kozhikode and Ernakulam having the most numbers of 69 and 66 respectively. However, there are only 28 cold storage and 40 freezing plants across the coastal fishing villages of the state. With a higher concentration of curing yards in Kozhikode (amounting to 171), there are a total of 270 units, with Kasaragod, Trivandrum and Alappuzha having not a single unit. There are 192 peeling sheds, 9 processing plants and 3 fish meal plants in the state. However, there is only 1

extraction plant, which is in Kannur. The lack of storage facilities, freezing plants, and extraction plants has adverse effects on the total productivity and export capacity of the sector. On a gender perspective, even if the fisherwomen (around 5 lakhs) play a substantial role in the secondary sector of fisheries in aquaculture production, pre harvesting (net making), harvesting and about 50 percent relatively lower capital intensive post-harvest activities of fish drying, prawn peeling, sorting, grading, fish packing and fish vending, they are more vulnerable than men; facing discrimination, especially by those engaged in handling, transporting and storage.

2.11.13. Gender Perspective:

The fisheries sector is highly male dominated despite women contributing well in post-harvest activities, resource management and decision making, covering both their household and community together. The pitiable situation of the fisher folk, in a grip of subsistence economy, indebtedness, mass poverty (79 percent of fisher households) and isolation, in order to have gender equality through inclusive development on an enduring basis, addressing the poverty and empowering the women to enhance capacity building, public participation, to address the social and economic crises of suppression and also to mark their place in political forefront.

When the traditional fishing communities practice gender based division of labour; pressurised also by the taboos related with women going to the sea, women involve mainly in near shore and shore based activities, thereby limiting their role in actual fishing, especially for subsistence. The absence of viable alternate jobs makes them try forming groups and adhere to their occupation, facing the burdens of extended area covered, extra trading time (nearly 8-10 hrs) and indebtedness.

In the dry fish trade of northern Kerala, women produce and sell directly to consumers, or to merchants. Some self- help groups have promoted production and marketing, due to development in processing industry. But many others work for low wages as labour, processors and sorters for huge units and landing centres in both the unorganized sector and the organized sector where they dominate in prawn/shrimp processing and peeling work (Bhatta, 2003). However, development

of peeling industry was a curse to them. “In Kerala, peeling work dominates the occupation scene with nearly 45 percentof the total work force, followed by small fish traders (23 percent), processing plant workers (16 percent), fish curers/ dyers constituting 7percent, beach workers (6 percent), and remaining constituting in value addition”(Sathiadhas, 2005).

The role of women in handling and management of coastal resources, their understanding of the reasons for environmental degradation and laws and regulations pertaining to use of coastal resources gender issues involved in sustainable development was conducted in Kerala and Tamil Nadu (Krishna, 2002). Upare (2002) had highlighted the effective fisheries management through community and development based participation in improving standard of living, initiatives for credit availability, nutrition and self-reliance. Major issues confronting the women in capture fisheries such as social, economic, institutional etc. are discussed and their perception towards social, economic and institutional issues are discussed (CMFRI, 2001). Women empowerment and thereby the community development is the holistic approach required. A study by Ashaletha,et al.,(2001) envisages the direct and indirect role of women in marine sector and their perception on various social, economic, institutional, technological issues. Nair (1998) aims at identifying the multi-faceted role of fisherwomen and emancipating them through the programmes of Matsyafed.

Table 2.17: *Gender-wise Role of Fisher-folk in Various Activities in General*

Category	Female fishers	Male fishers
Fishing ground	Near shore fishing (Choices depend on accessibility, ability to attend home affairs, severity of the fishing operation due to weather, available opportunities, scale of operations)	Off shore fishing
Target fish	Mostly invertebrates (Choices depend on accessibility, ecosystem, value, quantity, fishing technology, scale of operations)	Mostly on fin fish and valuable invertebrates
Work	Less risky (Choices depend on fishing technology, distance from the shore, sea condition, responsibilities, obligations, working conditions)	More risky

Category	Female fishers	Male fishers
Income	Main/Supplementary (Depends on fishing duration, culture, household condition (male/female headed, marital status), quantity, household economy, vulnerability, policy changes)	Main
Engagement	Pre and post harvesting (Depends on home affairs, demographic factors (age, marital status, and age of children) commitment, working hours, culture, safety)	Basically harvesting
Fishing time	Day time (Depends on home affairs, child caring, weather, dedication, economy, safety, Culture)	Both day and night
Relationships in the governing system	Poor	Good
*Table from Koralagama, Dilanthi; Gupta, Joyeeta ;Pouw, Nicky R. M., 2017, "Inclusive development from a gender perspective in small scale fisheries"		

On a gender perspective, in Kerala, the various women welfare measures by the government have aided in attaining social and livelihood security for the fisher folks upto a large extent (KSPB,2014). Owing to the criticism on the exclusionary pattern of Kerala government Kudumbasree or Janashree about certain vulnerable communities not enjoying its benefits fully (Shihabudheen,2013) ; programs specifically for fisherwomen, like Society for Assistance to Fisherwomen which initiates, encourages and strengthens the locally organised social organisations among fisherwomen, aids in enterprising the skill of expertise, to have access to the various women welfare schemes, promote their education , basic infrastructure and health facilities. Micro enterprises and SHGs linked to any financial institution in order to obtain credit facilities, like RashtriyaMahilaKosh, NABARD, banks; can be assisted technically or financially by local self-government or NGOs, GramaPanchayat, Municipalities, Corporation, or resource departments. The flagship programmes of SAF, and the Theeramythri mainly aims at the social and economic emancipation through encouraging employment. This can act as a great

relief for BPL fisherwomen, who does jobs like vending and trading of fish, apart from household support, as it helps to achieve a financial stability; and non SHG members, can organise occupational ones to start micro enterprises. In Kerala, 80percent of the income generating groups were formed by the women beneficiaries. Similarly, Mahatma Gandhi National Rural Employment Guarantee Act was implemented, with over 91percent beneficiaries as women in Kerala.

The lack of gender equality in division of labour is evident from the table. Despite lots of women empowerment programmes and self-help groups and them playing a remarkable role in balancing the credit requirements and acting as investors; limitations in active decision making, male dominated organisational setups, superstitions and patriarchal setup, deepens the inbreeding disparity.

2.11.14. Social Coherence and Ties:

Kerala's fishing communities have coherently utilised the marine resources and fostered close social and economic relation with each other despite cultural and religious differences. According to the study by Chekutty, N. P (2010), with the advent of globalisation and mechanisation in fisheries. This paved way for attaining international subsidies, and there arose the stringent conditions of global trade, and intense competition for fishing. All these led to a sharp decline in fish catch and thereby the subsequent profits will decline, leading to poverty, deprivation and consequent anger and discontent amongst the fisher folk. This has even paved way to causal factors for increasing instances of communalism and violence among the fisher folk in Kerala over the last few years.

This chapter analyses the secondary data and gives a kaleidoscopic view of socio-economic and living standards of members of the fishing community. The socio economic condition of the Kerala fisher folk is not par with the general community and for their improvement multidimensional policies and sustainable development strategies are to be implemented. A detailed analysis with respect to various socio economic aspects, fishing activity, marketing, infrastructural facilities, and effectiveness inter alia their perception is attempted in Chapter 3.

Chapter 3

SOCIO ECONOMIC AND INFRASTRUCTURAL CONDITIONS OF FISHING COMMUNITY IN KERALA

In this chapter existing socio-economic status of the marine fisher folk of Kerala has been assessed based on the sample study. Important factors indicating the socio-economic condition of the fisher folk and the infrastructural facilities available to the fisher folks were collected, analysed and conclusions are drawn.

The tools used in the study are correspondence analysis, chi-square test, bi-plot graph, clustered bar chart and multinomial regression. Correspondence analysis is being carried out between districts of Kerala and the attributes associated. The association between the attributes considered is being tested between the districts of Kerala using the statistical tool Correspondence Analysis. In case of attributes having two categories we use Chi-Square Test directly to get the inference. The study results are discussed below:

3.1. Religion-wise Categorisation of Respondents

The three major religions in Kerala are Hindus, Christians and Muslims. The total number of respondents covered under the present study are categorised according to the religion. It shows that, out of the 1050 respondents, 40.29 per cent are Hindus, 37.14 per cent Christians and the remaining 22.57 per cent are Muslims (Fig.3.1). Hindus dominate in the coastal areas of Thrissur (96.67 per cent), Kannur (88.33 per cent) and Kasargod (100 per cent). Christians have majority in Trivandrum (80 per cent), Kollam (50.67 per cent), Alappuzha (60 per cent), and Ernakulam (77.50 per cent) districts. Muslims are more in the coastal areas of Malappuram (100 per cent) and Kozhikode (64 per cent). **(Appendix1**.)

Table 3.1: *Correspondence Table between Religion and Districts*

District	Religion			
	Hindu	Christian	Muslim	Active Margin
Trivandrum	29	144	7	180
Kollam	74	76	0	150
Alappuzha	42	72	6	120
Ernakulam	27	93	0	120
Thrissur	87	0	3	90
Malappuram	0	0	120	120
Kozhikode	54	0	96	150
Kannur	53	5	2	60
Kasargode	60	0	0	60
Active Margin	423	390	234	1050

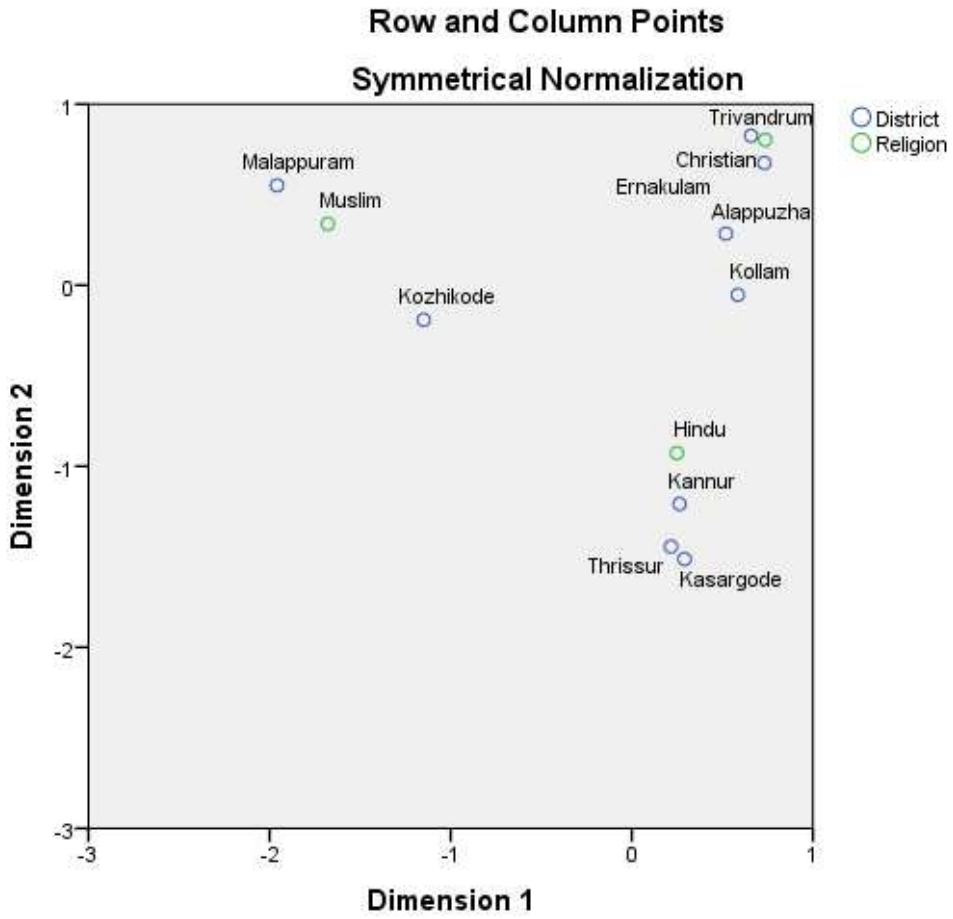
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.857	.734			.661	.661	.014	.139
2	.613	.376			.339	1.000	.020	
Total		1.110	1162.011	.000[a]	1.000	1.000		

a. 16 degrees of freedom

Here, Chi- square statistic value is 1162.011, with a significance value less than 0.05. So, there is significant association between district and religions. Here, as we consider three religions, Hindu, Muslim and Christians, there are two dimensions obtained. Dimension 1 yields 66.1per cent information about the district, while 2nd dimension provides 33.9per cent information.

Figure 3.1: Bi-plot between Religion and Districts



Source: Primary Data

Here, the bi-plot graph shows that among the respondents, Christians form a majority in Trivandum, Alappuzha, Kollam and Ernakulam. Muslims dominate mainly in Malappuram and Hindus are more in Kannur, Kasargode and Thrissur. Kozhikode includes both Muslims and Hindus mostly.

3.2. Socio-economic Status of Respondent Households

The respondents covered under the study were categorised into three groups viz.,those coming under Above Poverty Line (APL) , Below Poverty Line (BPL) and Andhyodaya scheme. It was found that 62.76 per cent of the respondents fall under the BPL category which indicates the poor economic status of the marine fisher folk of Kerala. Approx. 37 per cent are in the APL category.

District-wise data shows that the number of marine fisher folk falling under the BPL category is more in the case of Kozhikode (90.67 per cent), Kannur (91.67 per cent) and Kasargod (73.33 per cent) (**see Appendix 2**).

Table 3.2: *Correspondence Table Between Socio-economic Status and Districts*

District	Status			
	APL	BPL	Andhyodaya	Active Margin
Trivandrum	79	101	0	180
Kollam	57	93	0	150
Alappuzha	66	54	0	120
Ernakulam	53	67	0	120
Thrissur	36	51	3	90
Malappuram	62	58	0	120
Kozhikode	14	136	0	150
Kannur	5	55	0	60
Kasargode	16	44	0	60
Active Margin	388	659	3	1050

Source: Primary Data

Summary

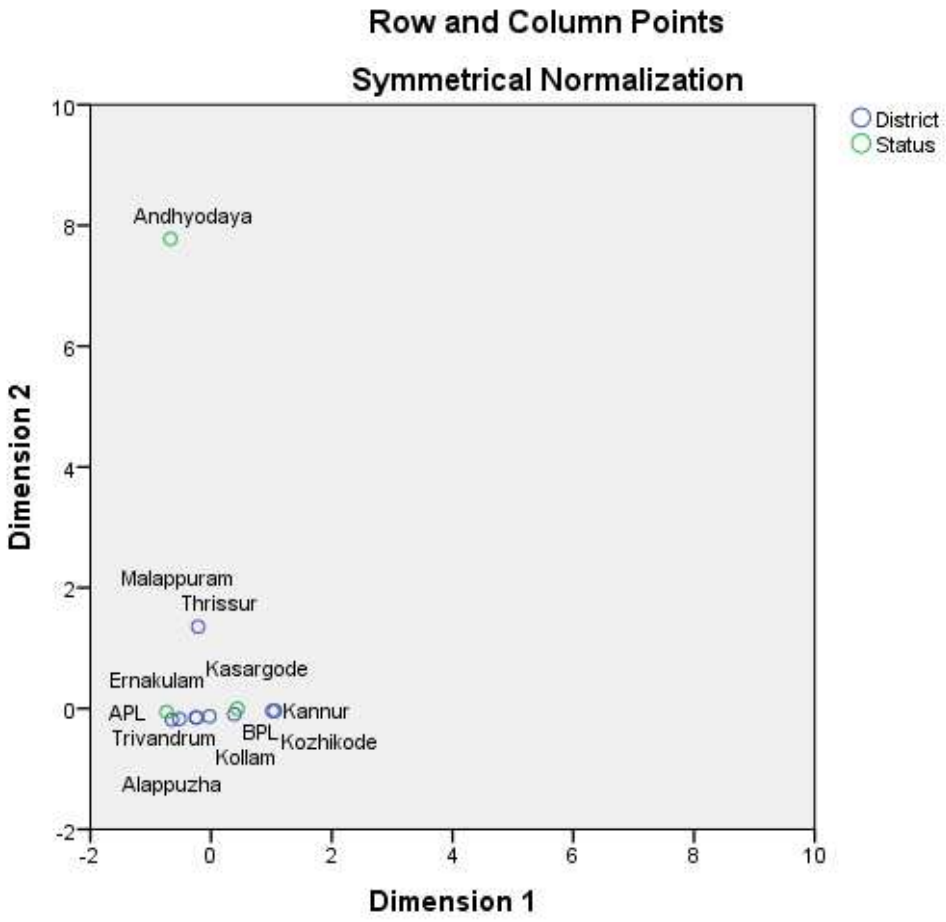
Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.321	.103			.773	.773	.024	.027
2	.174	.030			.227	1.000	.049	
Total		.134	140.306	.000[a]	1.000	1.000		

a. 16 degrees of freedom

Here, the Chi-square value is 140.306. the analysis shows that $p< 0.05$. i.e., there is significant association between districts and the attribute. Here, the socio economic status of respondents is considered and categorised it into BPL, APL and Andhyodaya. Under the proportion of Inertia, the 1st dimension accounted for

77.3per cent information about districts and 2nd dimension accounted for 22.7per cent information.

Figure 3.2: Bi- plot between Socio-economic Status and Districts



Source: Primary Data

Here, the respondents belonged to APL and BPL classification in all districts, except Thrissur. Respondents belonged to Andhyodaya group only in Thrissur (3 persons). A majority of them belonged to BPL category (659 respondents) across the districts, followed by 388 APL card holders.

3.3. Nature of Family

The impact of modernization has led to the decay of age-old joint family system and paved the way to the emergence of nuclear households. The condition is not different among the fisher folk too. The data collected from 1050 families reveal that 79 per cent (approx.) of them are nuclear families and only the remaining 21 per cent are joint families. Joint family system is seen mostly in Malappuram and Kozhikode districts where respondents belonging to Muslim community are more (**Appendix. 3**).

Table 3.3: *District and Nature of Family Crosstabulation*

Count

		Nature of family		Total
		Nuclear	Joint	
District	Trivandrum	151	29	180
	Kollam	131	19	150
	Alappuzha	101	19	120
	Ernakulam	109	11	120
	Thrissur	77	13	90
	Malappuram	63	57	120
	Kozhikode	100	50	150
	Kannur	54	6	60
	Kasargode	43	17	60
	Total	839	221	1050

Source: Primary Data

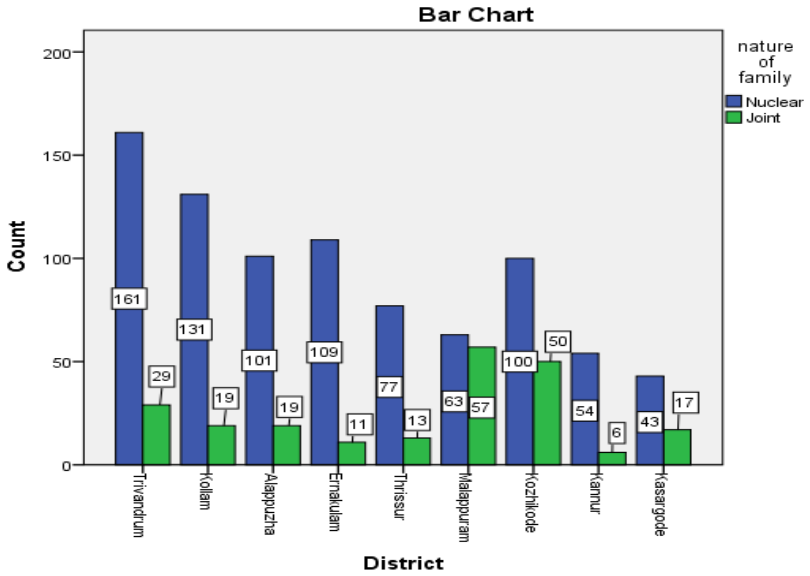
Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	95.801[a]	8	.000
Likelihood Ratio	88.715	8	.000
Linear-by-Linear Association	27.076	1	.000
N of Valid Cases	1060		

a. 0 cells (0.0per cent) have expected count less than 5. The minimum expected count is 12.51.

Here, Chi- square test is done as there are only two attributes to the variable. Statistical analysis showed highly significant (p ▪ 0.01) relationship between the nature of family and districts covered under the study. (Chi-square = 95.801, df=8). Thus, it is evident from the above that the nature of family and districts are related.

Figure 3.3: Bar Chart between Nature of Family and Districts.



Source: Primary data

A comparison of the figures relating to the nature of family in various districts indicates that, nuclear family is maximum (83.89per cent) in Trivandrum and most of the respondents belonged to jointly family in Malappuram. Malappuram

district has comparatively equal share of respondents who belongs to nuclear and joint family respectively.

3.4. Gender -wise Categorisation of Respondents

The total number of members in the households covered under the sample is 4835. Gender wise categorisation shows that 50.92 per cent are males and the remaining 49.08 per cent are females (**Appendix 4**). Slight variation in the ratio is found among the districts covered. According to the Marine Census 2010, women formed 49 per cent of the population and the female to male ratio was 966 for 1000 males. This ratio was maximum in Kasaragod district (1007) and minimum in Kollam (935) district (CMFRI, Marine Fisheries Census 2010).

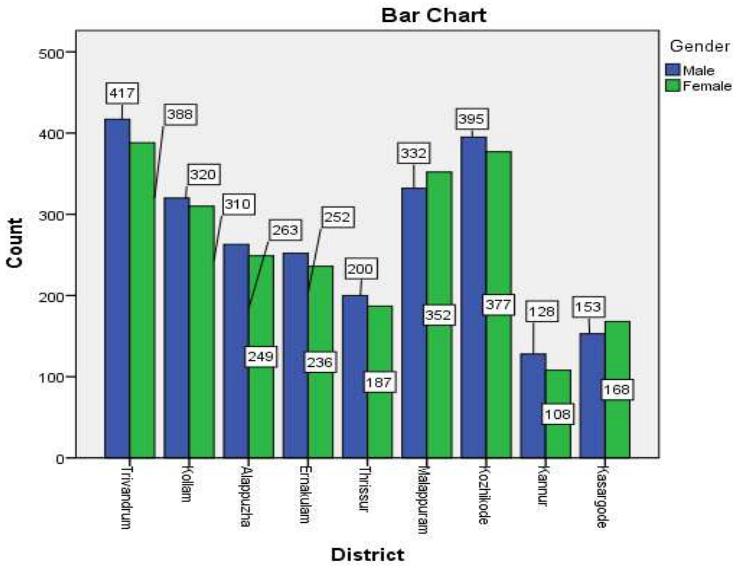
Table 3.4: *District and Gender Crosstabulation*

Count

		Gender		Total
		Male	Female	
District	Trivandrum	417	388	805
	Kollam	320	310	630
	Alappuzha	263	249	512
	Ernakulam	252	236	488
	Thrissur	200	187	387
	Malappuram	332	352	684
	Kozhikode	395	377	772
	Kannur	128	108	236
	Kasargode	153	168	321
	Total	2460	2375	4835

Source: Primary data

Figure 3.4: Bar Chart between Gender and Districts



Source: Primary Data

The comparison between the districts in terms of distribution of genders shows that Trivandrum had more number of both male and female respondents (417 and 388 individuals respectively). Similarly, Kannur had the least number of respondents from both genders. Only a slight variation between the two gender groups were observed with a total of 2460 and 2375 male and female respondents.

3.5. Age - wise categorisation of Respondents' Family Members

Age -wise grouping of the family members of the respondents is shown in table 3.5.

Table 3.5: *Age wise grouping of the Family Members*

Age Group	Percentage to Total
Up to 10	10.50
11 - 20	17.54
21 - 30	22.13
31 - 40	17.68
41 - 50	15.55
51 - 60	10.63
61 - 70	4.67
71 and Above	1.26

Source: Compiled from primary data

The Table 3.5 and 3.6 bring into light a very serious fact that the number of aged people is very less among the marine fisher folk in Kerala. Around 94 per cent are below 60 years of age. People above 60 years constituted only 5.93 per cent. It points towards the short life span of fisher folk. The average life expectancy of men in Kerala was 71.5 years and 76.9 years in the case of women, according to 2010 estimates. The district- wise classification, based on age, of the members covered under the study is given in **Appendix 5.**

Table 3.6: *Correspondence Table between Age groups and Districts*

District	Age								
	Up to 10	11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 & Above	Active Margin
Trivandrum	107	152	182	122	133	72	25	12	805
Kollam	68	114	125	103	104	76	25	15	630
Alappuzha	70	93	95	85	82	50	37	0	512
Ernakulam	45	95	76	83	87	72	30	0	488
Thrissur	46	53	71	68	64	51	26	8	387
Malappuram	76	140	166	123	75	59	31	14	684
Kozhikode	55	115	222	146	122	77	25	10	772
Kannur	24	39	58	37	42	25	11	0	236
Kasargode	18	47	75	88	43	32	16	2	321
Active Margin	509	848	1070	855	752	514	226	61	4835

Source: Primary data

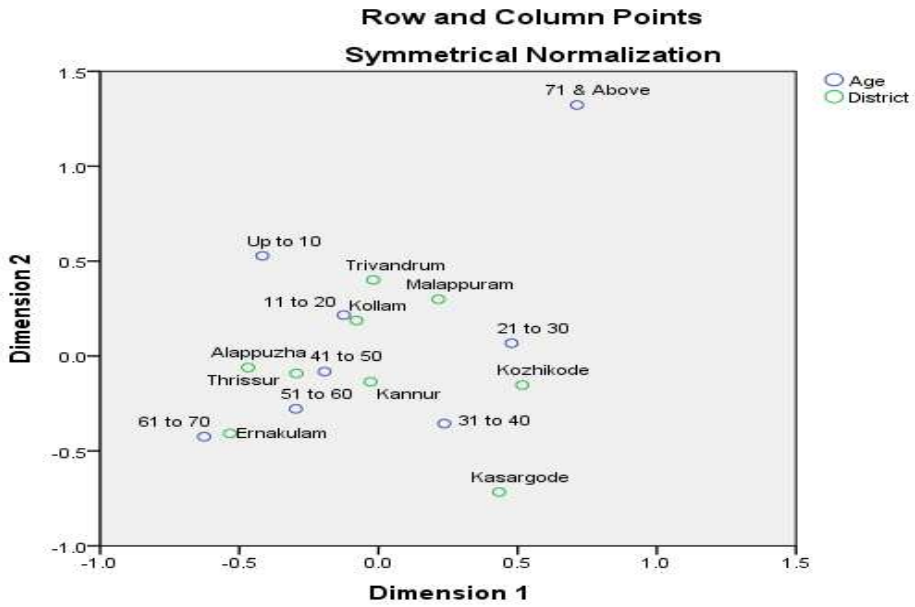
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.121	.015			.399	.399	.014	-.030
2	.101	.010			.274	.673	.014	
3	.068	.005			.126	.799		
4	.066	.004			.118	.917		
5	.046	.002			.057	.974		
6	.030	.001			.025	.999		
7	.005	.000			.001	1.000		
Total		.037	178.833	.000[a]	1.000	1.000		

a. 56 degrees of freedom

Here, the attribute variable is age. For the 8 age groups considered, the correspondence analysisis done between age and districts. The Chi-square statistic is 178.833 and it is highly significant, because p< 0.05. so there is very significant association between age groups and districts.

Fig. 3.5: Bi plot between Age groups and Districts.



Source: Primary Data

Here, majority of the respondents were of 21- 30 years group. Respondentsupto 20 years age belonged mostly to Trivandrum, followed by Malappuram, Kozhikode and Kollam. After 30 years age, most of them belonged to Kollam, Malappuram, Trivadrum or Alappuzha. Only a few of the respondents were above 71 years and above.

3.6. Education

Data relating to the level of education among the family members of the 1050 households reveal that 43.91 per cent have primary education and 39.94 per cent have obtained secondary education (see Appendix 6). Only 11.02 per cent have education at graduate or professional degree level. In total, 94.87 per cent have formal education and the remaining 5.13 per cent do not have formal education. (As per the Marine Fisheries Census of CMFRI, 2010, 73 per cent of fisherfolk (excluding children below 5 years) were educated with different levels of education.About33 per cent of the fisherfolk had primary level of education, 34 per cent had secondary level, 6 per cent had above secondary level and the rest 27 per cent of the population was unschooled). According to the population census 2011, literacy rate ofKerala was 93.91 per cent (Eco.Review, 2014).The district –wise position is shown in Table 3.8. It is clear that the percentage of educated fisherfolk is higher in Malappuram district (98.39 per cent), whereas it is the lowest in Kannur district (87.71 per cent) (see **Appendix 6**).

Table 3.7: *Distribution of Family Members According to Education (per cent)*

District	Up to Std.8	Std. 9 to 12	Graduate, Professional& Technical	Nil
Trivandrum	41.72	34.99	19.18	4.11
Kollam	36.98	50.00	8.89	4.29
Alappuzha	50.29	35.40	2.90	10.44
Ernakulam	59.23	32.25	5.07	3.45
Thrissur	46.77	35.92	14.47	2.84
Malappuram	50.29	40.50	7.60	1.61
Kozhikode	40.99	41.76	15.05	2.20
Kannur	22.46	45.34	19.92	12.29
Kasargod	36.76	46.11	4.98	12.15

Source: Compiled from primary data

It is evident from Table 3.7, that the education level of the fisherfolk, particularly in Kannur, Kasargod and Alappuzha has to be improved. It is also clear that education at graduate level is very less among the fisherfolk in Alappuzha, Kasargod, Ernakulam and Kollam districts.

Table 3.8: *Correspondence Table between Education and Districts*

District	Education				
	Up to Std.8	Std. 9 to 12	Technical	Nil	Active Margin
Trivandrum	335	281	154	35	805
Kollam	232	315	56	27	630
Alappuzha	260	183	15	54	512
Ernakulam	284	159	25	20	488
Thrissur	181	139	56	11	387
Malappuram	344	277	52	11	684
Kozhikode	316	322	112	22	772
Kannur	53	107	47	29	236
Kasargode	118	148	16	39	321
Active Margin	2123	1931	533	248	4835

Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.192	.037			.484	.484	.013	-.045
2	.169	.029			.375	.859	.016	
3	.104	.011			.141	1.000		
Total		.076	369.184	.000[a]	1.000	1.000		

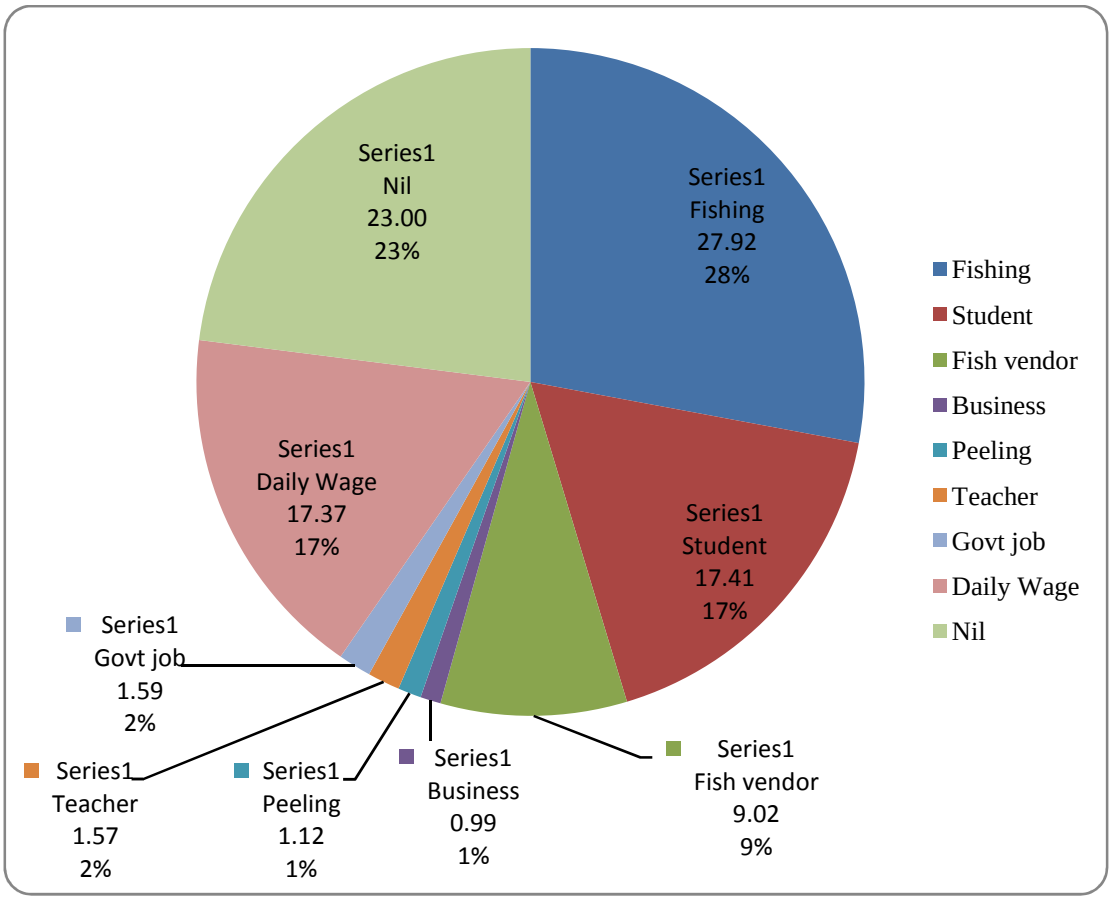
a. 24 degrees of freedom

Here, the attribute variable is education. For the attributes considered, the correspondence analysisis is done between education attainment and districts. The Chi-square statistic is 369.184 and it is highly significant, because $p< 0.05$. so there is very significant association between educational attainment in various districts.

3.7. Occupation

The family members of the respondents were categorised into 9 groups on the basis of occupation. As shown in fig.3.8, 27.92 per cent of the fisher folk are engaged in fishing. (According to the Marine Fisheries Census of CMFRI, 2005, 62.43 per cent of the coastal fisher folk were active fishermen (full time). The present study shows that the total number of family members, including the respondents, engaged in fishing and fishery related activities is only 38.06 per cent. It requires, special mention, here, that the category 'daily wage' (17.37 per cent) includes works in the landing centres, transportation of fish and fishing implements, distribution of ice blocks and repair of nets and engines. Nearly 9 per cent of the fisher folk are engaged in fish vending and only 1.12 per cent were found engaged in peeling works (see **Appendix 7**). According to the Marine Fisheries Census of CMFRI, 2010, in Kerala, 69.07 per cent of the active fishermen (numbering 210496) (pp.97-114) are engaged in fishing, 9.7 per cent are engaged in Fish marketing and 4.67 per cent in peeling works.

Fig. 3.6: Distribution of Family Members Based on the Occupation



Source: Primary Data

Students constitute 17.41 per cent of the total number of family members covered under the study; while 1.57 per cent is engaged in teaching job. It is to be highlighted that 23 per cent of the fisher folk are totally unemployed. Only 1.59 per cent is government employees. The above figure point towards the fact that the number of fisherfolk who are engaged in fishing and activities directly related to fishing is coming down considerably. A notable issue raised in the FGDs was that now youngsters are not interested in fishing; Even if they remain idle, they are not willing to go for fishing. One important reason pointed out for this attitude is the uncertain/ very poor earnings from this employment.

An analysis of the district-wise figures indicate that except in Kasargod, the number of persons engaged in fishing, fish vending and peeling works is less than 50 per cent of their total population. In Kasargod, 50.78 per cent of the fisherfolk are

engaged in these types of activities. In the case of Kollam district, it is 43.49 per cent while it is only 31.18 per cent in Trivandrum district. In some marine fishing villages covered under the present study, the number of persons engaged in fishing, fish vending and peeling is even less than 30 per cent. For instance, in Kovalam only 14.56 per cent of the fisherfolk are engaged in these works. Cheriakadavu in Ernakulam (25.2 per cent), Pollethei in Alappuzha (27.78 per cent),and Kadalundinagar in Malappuram (28.57 per cent) are examples.

Table 3.9: *Correspondence Table between Occupation and District wise distribution*

District	Occupation									
	Fishing	Student	Fish Vendor	Business	Peeling	Teacher	Govt. Job	Others	Nil	Active Margin
Trivandrum	192	123	59	17	0	18	24	138	234	805
Kollam	177	106	60	6	37	8	11	48	177	630
Alappuzha	125	85	39	2	6	5	6	93	151	512
Ernakulam	131	95	36	2	6	20	6	96	96	488
Thrissur	98	68	54	1	0	9	6	66	85	387
Malappuram	189	141	55	5	0	5	10	136	144	685
Kozhikode	228	103	88	9	5	8	9	172	150	772
Kannur	71	80	21	2	0	2	0	40	20	236
Kasargode	139	40	24	4	0	1	5	52	55	320
Active Margin	1350	841	436	48	54	76	77	841	1112	4835

Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.208	.043			.464	.464	.018	.068
2	.142	.020			.216	.680	.013	
3	.111	.012			.132	.813		
4	.083	.007			.075	.887		
5	.072	.005			.056	.943		
6	.057	.003			.035	.978		
7	.044	.002			.021	.998		
8	.012	.000			.002	1.000		
Total		.093	450.102	.000[a]	1.000	1.000		

a. 64 degrees of freedom

Here, occupational distribution in various districts is studied. For the attributes considered, the correspondence analysis is done between occupation and districts. The Chi-square statistic is 450.102 and it is highly significant, because p< 0.05. So there is very significant association between occupational distribution among the respondents and various districts.

Table 3.10: *Education and Occupation Cross Tabulation*

		Occupation									Total
		Fishing	Students	Fish Vendors	Business	Peeling	Teacher	GovtJob	Daily wages	Nil	
Education	Up to 8 Std	700	500	180	10	20	0	0	90	623	2123
	Up to 9-12Std	500	200	171	3	14	0	20	650	373	1931
	Degree/ Profesional	50	142	25	5	0	76	57	100	78	533
	Nil	100	0	60	30	20	0	0	0	38	248
	Total	1350	842	436	48	54	76	77	840	1112	4835

Source: Primary Data

Chi-Square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2343.581[a]	24	0.000
Likelihood Ratio	1805.960	24	0.000
Linear-by-Linear Association	18.732	1	.000
N of Valid Cases	4835		

4 cells (11.1 per cent) have expected count less than
5. The minimum expected count is 2.46.

Statistical analysis showed highly significant (p · 0.01) relationship between the level of education and occupation of the members covered under the study. (Chi-square = 2343.58, df=24). Thus, it is evident from the above that the level of education and occupation are related. A comparison of the figures relating to education and occupation indicates that, 14.26 per cent of those having graduation, professional or technical qualification are employed in government departments or schools.

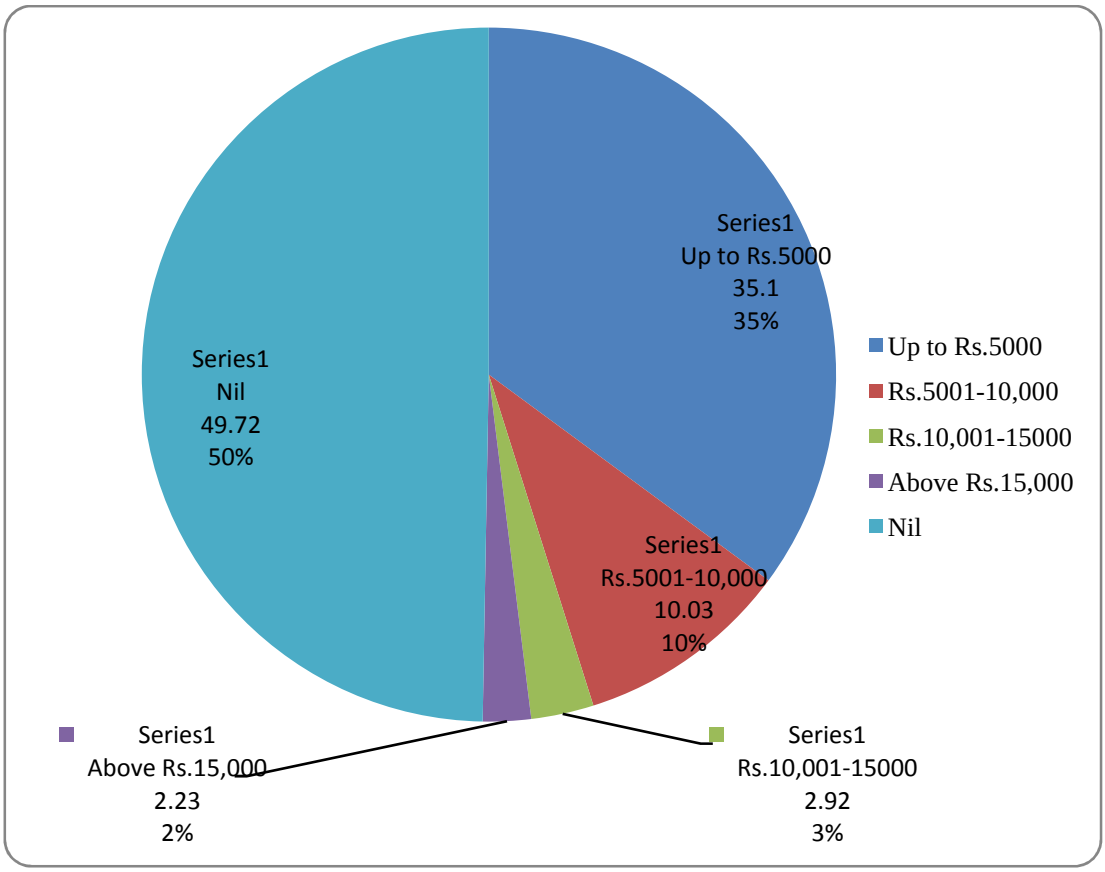
The above analysis clearly brings into light the fact that there is a change in the way of thinking among the fisher folk as far as their occupation is concerned. Education also plays its role in this respect.

3.8. Monthly Income

The family members of the respondents were grouped into five categories on the basis of their individual income per month (see **Appendix 8**). The categorisation shows that 49.72 per cent of them do not have any income. Of course, this represents 23 per cent having no occupation and 17.41 per cent students. As shown in fig.3.7, the average monthly income of 35.1 per cent of the members is below Rs.5000. Monthly income of 10.03 per cent of the family members is between Rs.5000 and Rs.10000 and 2.23 per cent have income of more than Rs15000 per month. The fishery sector earnings are highly uncertain, often seasonal, and are not evenly distributed within the sector; fishers who own boats and/or fishing gear earn

substantially more, in terms of net income, than crew labourers paid a share of the value of the catch.

Fig 3.7: Distribution of Family Members on the basis of Monthly Income



Source: Primary Data

District-wise figures indicate that unemployment among the fisherfolk is higher (66.04 percent) in Kasargod district followed by Malappuram (61.99 percent) and Kozhikode (61.66 percent) districts respectively (see **Appendix 8**). The intensity of unemployment is comparatively lower in Ernakulam and Alappuzha districts.

Table 3.11: *Correspondence Table between Monthly Income levels and District wise distribution*

District	Monthly Income					
	Up to 5000	5001 – 10000	10001 - 15000	Above 15000	Nil	Active Margin
Trivandrum	262	83	53	83	324	805
Kollam	246	108	25	8	243	630
Alappuzha	234	55	20	7	196	512
Ernakulam	178	78	23	2	207	488
Thrissur	115	60	14	5	193	387
Malappuram	211	46	3	0	424	684
Kozhikode	264	30	2	0	476	772
Kannur	94	13	0	0	129	236
Kasargode	93	12	1	3	212	321
Active Margin	1697	485	141	108	2404	4835

Source: Primary Data

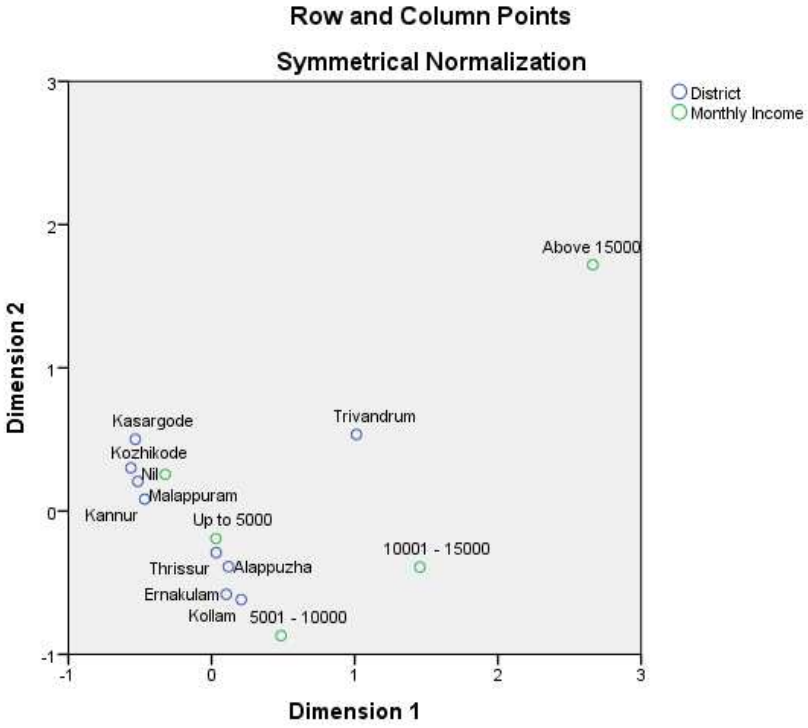
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.296	.088			.662	.662	.014	.293
2	.192	.037			.278	.940	.015	
3	.086	.007			.056	.996		
4	.023	.001			.004	1.000		
Total		.133	641.052	.000[a]	1.000	1.000		

a. 32 degrees of freedom

A correspondence analysis of the monthly income distribution in various districts is done. Here, the 4 dimensions contribute information on proportion of inertia. The Chi-square statistic is 641.052 and it is highly significant, because $p<0.05$. So there is highly significant association between the income distribution pattern and various districts.

Fig. 3.8: Bi-plot between Monthly Income and Districts



Source: Primary data

Here, majority of respondents from Kozhikode and Trivandrum earn below 5000 Rs as monthly income. Upto Rs. 15000, Kollam and Trivandrum districts have more respondents who earn in this category. For income above 15000 Rs per month, Trivandrum have the most of the respondents.

3.9. Household Expenditure

The state of Kerala has achieved significant improvements in material condition of living, reflected in indicators of social development that are comparable to that of many developing countries even though the state's per capita income is comparatively lower. The monthly expenditure on food items such as rice/wheat, grocery, vegetables, fruits, milk and fish, egg, meat and expenditure for education, clothing and medicine, were collected from the respondents. The data relating to this indicates a poor level of intake by the fisherfolk of Kerala.

3.10. Holding Bank Accounts

The study found that 93.43 per cent of the respondents have accounts with banks or post offices (**Appendix 9**). It was found that 49.05 per cent of the respondents have opened accounts with nationalised banks, 22.67 per cent with scheduled banks, 20.38 per cent with cooperative banks and 1.33 per cent with post offices. It is noted that 6.57 per cent of the respondents do not have bank account. The fact that more than 90 per cent of the fisher folk maintain bank account is a sign of financial literacy among them. The district wise figures show that the number of fisher folk who do not have bank account was highest in Malappuram (28.33 per cent) followed by Trivandrum (12.22 per cent) and Thrissur (12.22 per cent) respectively. In the case of Kollam, Ernakulam, Kozhikode and Kannur districts, all the respondents were found having bank account.

Table 3.12: *Correspondence Table between Bank Accounts and District wise distribution*

District	Bank Account					
	Nationalized	Scheduled	Co-operative	Post Office	No Bank Ac.	Active Margin
Trivandrum	137	10	5	4	22	178
Kollam	75	23	51	3	0	152
Alappuzha	56	18	43	3	0	120
Ernakulam	12	53	54	1	0	120
Thrissur	53	21	3	2	11	90
Malappuram	50	7	29	0	34	120
Kozhikode	84	44	22	0	0	150
Kannur	3	53	4	0	0	60
Kasargode	43	9	5	1	2	60
Active Margin	515	238	216	14	69	1050

Source: Primary Data

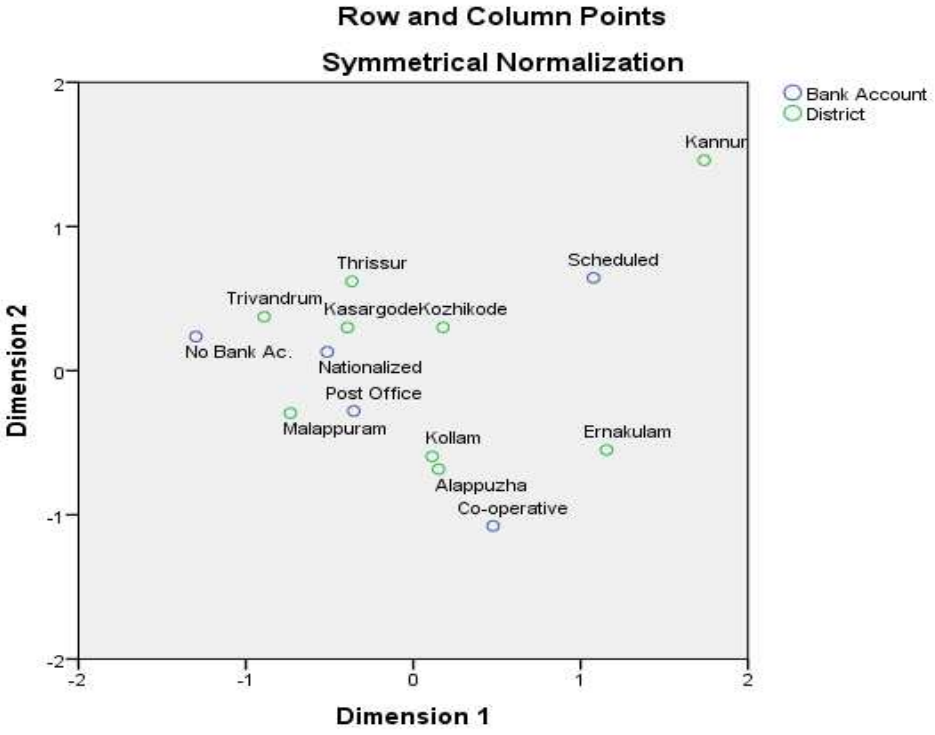
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.551	.303			.577	.577	.021	.107
2	.345	.119			.226	.803	.027	
3	.315	.099			.189	.992		
4	.067	.004			.008	1.000		
Total		.526	553.451	.000[a]	1.000	1.000		

a. 32 degrees of freedom

Here, Correspondence analysis between maintenance of bank accounts and district wise distribution is done. The 5 attributes gives 4 dimensions, which are accounted for the information totalling to unity. The Chi-square statistic gives 553.451 value. Here, $p<0.05$ and so there is highly significant association between maintenance of bank accounts and district wise distribution.

Fig. 3.9: Bi- plot between Bank Accounts and Districts



Source: Primary data

In the above figure 3.9, symmetrical normalization is shown. The analysis between bank accounts and districts gives that Kollam, Alappuzha, Malappuram and Ernakulam have more number of respondents with co-operative bank accounts. For Nationlaised banks, Trivandrum, Kozhikode, Kollam and Alappuzha have the more number of respondents. However, some respondents from Thrissur, Malappuram and Trivandrum do not hold a bank account, all other districts' respondents hold accounts in any category of banks selected.

3.11. Savings Pattern

Most of the people in the fishermen community do not save money but spent it on the same day by consuming liquor or playing cards or by spending for other purposes. During dry days some fisherman demands money for alcohol from his wife. This may further lead to miserable situations at home, children, especially the school going, are often the victims of this domestic violence. Data relating to the amount of monthly savings of the respondents reveal that 54.1 per cent of the respondents do not have any savings. Out of the 1050 households, 32.48 per cent have monthly savings uptoRs. 1000. It was found that 13.43 per cent of the respondents were able to save an amount of more than Rs.1000 per month (**Appendix 10**).

Table 3.13: *Correspondence Table between Monthly saving and Districts*

District	Monthly Saving				
	Up to 1000	1001 to 2000	Above 2000	Nil	Active Margin
Trivandrum	109	18	13	40	180
Kollam	38	8	2	102	150
Alappuzha	37	60	0	23	120
Ernakulam	59	5	2	54	120
Thrissur	3	2	0	85	90
Malappuram	25	7	11	77	120
Kozhikode	38	5	2	105	150
Kannur	9	0	0	51	60
Kasargode	23	6	0	31	60
Active Margin	341	111	30	568	1050

Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.526	.277			.636	.636	.029	.394
2	.363	.131			.302	.938	.032	
3	.164	.027			.062	1.000		
Total		.435	457.240	.000[a]	1.000	1.000		

a. 24 degrees of freedom

A correspondence analysis of the monthly saving distribution in various districts is done. Here, the 3 dimensions contribute information on proportion of inertia. The Chi-square statistic is 457.240 and its is highly significant, because $p<0.05$. So there is highly significant association between the saving distribution pattern and various districts.

3.12. Indebtedness

Mainly owing to the uncertainty and seasonal nature of occupation, poor earnings, lack of saving habits, fishermen are forced to borrow money for different purposes. Loan facilities are not availed to the illiterate fishermen from financial institutions due to lack of awareness, incapability of providing collateral security and inherent non-repayment characteristics. Hence, they depend on money lenders to meet day-to-day expenses at an exorbitant rate of interest. The study found that 53.33 per cent of the respondents have borrowed funds for meeting their household expenditure (**Appendix 11**). The remaining 46.67 per cent of the respondents do not have any borrowings. It is evident that nearly 25 per cent of the households have debt amounting to more than Rs. 1 lakh. The burden of indebtedness was high in Trivandrum district (78.33 per cent) which is followed by Kollam district (68 per cent).

It was reported during the FGDs that the fish vendors borrow money from the money lenders in the landing centre at unbelievable higher rate of interest. In the morning they collect Rs. 950 (Rupees Nine Hundred and Fifty only) for which they return Rs.1000 (Rupees One Thousand Only) in the evening. It means that the rate of interest is 1921 per cent p.a.

The fisher-folk were found depending mostly on the cooperative banks or cooperative societies for borrowing money. It was found that 26 per cent of the respondents have borrowed from cooperative banks or societies and 5.14 per cent availed financial support from the National Backward Classes Development and Finance Corporation. Only 2.67 per cent of the total respondents borrowed from the nationalised banks. On the other hand, 7.71 per cent of the respondents were found borrowing from money lenders.

For analysing borrowings, Multinomial Regression was done.

Table 3.14: *Mutinomial Regression on Districts to Borrowings Model Fitting Information*

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	448.594	263.150	40	.000
Final	185.445			

Table 3.15: *Goodness-of-Fit*

	Chi-Square	df	Sig.
Pearson	.000	0	.
Deviance	.000	0	.

Here, categorical variable is borrowings. it is the independent variable and district is the dependent variable. If we consider only extraneous factor and fit a model, it will not be apt, as there is no measure of significance.

Table 3.16: *Pseudo*

R-Square

Cox and Snell	.222
Nagelkerke	.225
McFadden	.059

Here, as per Cox and Snell method, borrowings give 22.2per cent information on district. Similarly, Nagelkerke provides 22.5per cent and McFadden provides 5.9per cent.

Table 3. 17: *Likelihood Ratio Tests*

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	185.445[a]	.000	0	.
Borrowings	448.594	263.150	40	.000

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

Here, $p<0.05$ and there is a highly significant association between Borrowings and district, Chi-square statistic is 263.150.

Table 3.18: *Parameter Estimates*

District[a]		B	Std. Error	Wald	df	Sig.
Kollam	Intercept	.208	.216	.928	1	.335
	[Borrowings=1]	.289	.402	.517	1	.472
	[Borrowings=2]	-.208	.448	.215	1	.643
	[Borrowings=3]	-1.306	.844	2.393	1	.122
	[Borrowings=4]	-.747	.399	3.494	1	.062
	[Borrowings=5]	-.726	.280	6.733	1	.009
	[Borrowings=6]	0[b]	.	.	0	.
Alappuzha	Intercept	.344	.209	2.697	1	.101
	[Borrowings=1]	-.786	.476	2.726	1	.099
	[Borrowings=2]	-.076	.424	.032	1	.859
	[Borrowings=3]	-2.136	1.100	3.767	1	.052
	[Borrowings=4]	-1.037	.411	6.369	1	.012
	[Borrowings=5]	-1.516	.307	24.416	1	.000
	[Borrowings=6]	0[b]	.	.	0	.
Ernakulam	Intercept	.880	.190	21.333	1	.000
	[Borrowings=1]	-1.573	.501	9.873	1	.002
	[Borrowings=2]	-1.653	.529	9.762	1	.002
	[Borrowings=3]	-1.978	.838	5.568	1	.018
	[Borrowings=4]	-2.448	.527	21.567	1	.000
	[Borrowings=5]	-3.519	.464	57.630	1	.000
	[Borrowings=6]	0[b]	.	.	0	.
Thrissur	Intercept	.025	.225	.013	1	.910
	[Borrowings=1]	-.467	.483	.936	1	.333
	[Borrowings=2]	-.981	.572	2.937	1	.087
	[Borrowings=3]	-.208	.646	.103	1	.748
	[Borrowings=4]	-1.412	.509	7.694	1	.006
	[Borrowings=5]	-1.237	.320	14.928	1	.000
	[Borrowings=6]	0[b]	.	.	0	.

District[a]		B	Std. Error	Wald	df	Sig.
Malappuram	Intercept	.952	.189	25.476	1	.000
	[Borrowings=1]	-2.492	.664	14.104	1	.000
	[Borrowings=2]	-1.907	.559	11.639	1	.001
	[Borrowings=3]	-22.081	.000	.	1	.
	[Borrowings=4]	-2.520	.527	22.912	1	.000
	[Borrowings=5]	-3.591	.463	60.214	1	.000
	[Borrowings=6]	0[b]	.	.	0	.
Kozhikode	Intercept	.464	.204	5.145	1	.023
	[Borrowings=1]	-.905	.474	3.655	1	.056
	[Borrowings=2]	-.084	.414	.041	1	.839
	[Borrowings=3]	-.869	.677	1.647	1	.199
	[Borrowings=4]	-.697	.369	3.572	1	.059
	[Borrowings=5]	-1.283	.284	20.412	1	.000
	[Borrowings=6]	0[b]	.	.	0	.
Kannur	Intercept	-.573	.267	4.610	1	.032
	[Borrowings=1]	-.457	.585	.610	1	.435
	[Borrowings=2]	-1.299	.805	2.605	1	.107
	[Borrowings=3]	-1.219	1.113	1.201	1	.273
	[Borrowings=4]	-.303	.461	.431	1	.511
	[Borrowings=5]	-.863	.365	5.594	1	.018
	[Borrowings=6]	0[b]	.	.	0	.
Kasargode	Intercept	-.296	.245	1.460	1	.227
	[Borrowings=1]	.365	.445	.673	1	.412
	[Borrowings=2]	-1.576	.798	3.897	1	.048
	[Borrowings=3]	-.802	.853	.886	1	.347
	[Borrowings=4]	-1.090	.518	4.426	1	.035
	[Borrowings=5]	-2.343	.489	22.994	1	.000
	[Borrowings=6]	0[b]	.	.	0	.

Here, there are 6 categories of borrowings, namely 1(uptoRs 25000),2(from Rs 25001 to Rs 50000), 3 (Rs 50000- Rs 75000) ,4 (Rs 75001 to Rs 1,00,0000), 5 (Rs 100,001 and above), and 6 (no borrowings). In Kollam, borrowing level 5 is significant (p=0.009, which is less than 0.05). In Alappuzha, borrowing 4 and 5 are significant with $p<0.05$. Here, B values are -1.037 and -1.516 respectively. In

Ernakulam and Malappuram relation between districts and all the borrowing levels are significant. In Thrissur borrowing levels of 2,4 and 5 are significantly related to the district. In Kozhikode, apart from 2 and 3 levels of borrowings all others are significantly related to the district. In Kannur there is a significant relation between borrowing level 5 and the district. In Kasargode, borrowing levels 2,4 and 5 are significantly related to the district.

3.13. Land Holdings

The data relating to land holdings of the respondents brings into light the fact that 2.76 per cent (29 households) do not own land. As shown in Table 3.19, out of the 1050 households, 90.19 per cent have own land, but less than 10 cents. Only 2.38 per cent has land holdings above 15 cents.

Table 3.19: *Distribution of House Holds According to Ownership on Land*

Area (Cent) of land	No. of Respondents	Percentage
Upto 5 cents	687	65.43
5 to 10 cents	260	24.76
10 to 15 cents	49	4.67
Above 15 cents	25	2.38
Nil	29	2.76
Total	**1050**	**100.00**

Source: Primary Data

The district wise details on land holdings of the fisherfolk shows that the percentage of landless fisherfolk is higher in Thrissur district (5.56 per cent) followed by Alappuzha and Malappuram districts (5 per cent each) (see **Appendix.12**). Percentage share of landless fisher-folk is less in Trivandrum district (0.56 per cent).

Table 3.20: *Correspondence Table between Land Ownership and Districts*

District	Land Ownership					
	Up to 5 Cents	5 to 10 Cents	10 to 15 Cents	Above 15 Cents	Nil	Active Margin
Trivandrum	145	27	6	1	1	180
Kollam	69	66	7	5	3	150
Alappuzha	67	35	8	4	6	120
Ernakulam	104	10	2	0	4	120
Thrissur	28	37	10	10	5	90
Malappuram	51	54	5	4	6	120
Kozhikode	132	14	1	0	3	150
Kannur	47	9	3	0	1	60
Kasargode	44	8	7	1	0	60
Active Margin	687	260	49	25	29	1050

Source: Primary Data

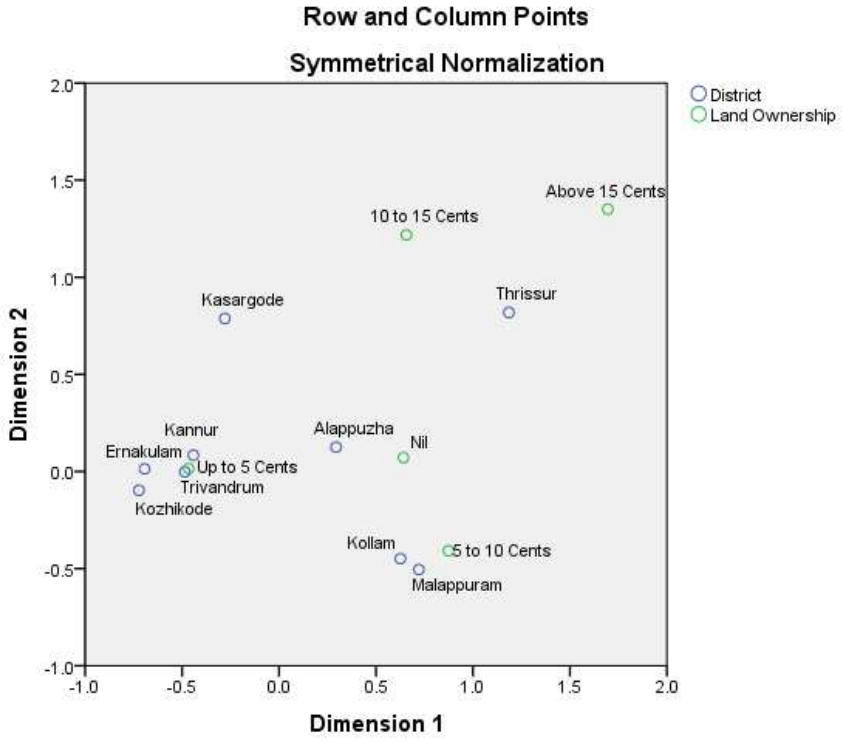
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.431	.186			.833	.833	.027	.096
2	.154	.024			.107	.940	.040	
3	.100	.010			.045	.984		
4	.059	.004			.016	1.000		
Total		.223	234.475	.000[a]	1.000	1.000		

a. 32 degrees of freedom

A correspondence analysis of the land ownership in various districts is done. Here, the 4 dimensions contribute information on proportion of inertia. The Chi-square statistic is 234.475 and its is highly significant, because $p<0.05$. So there is highly significant association between the land ownership and various districts.

Fig. 3.10: Bi-plot between Land Ownership and Districts



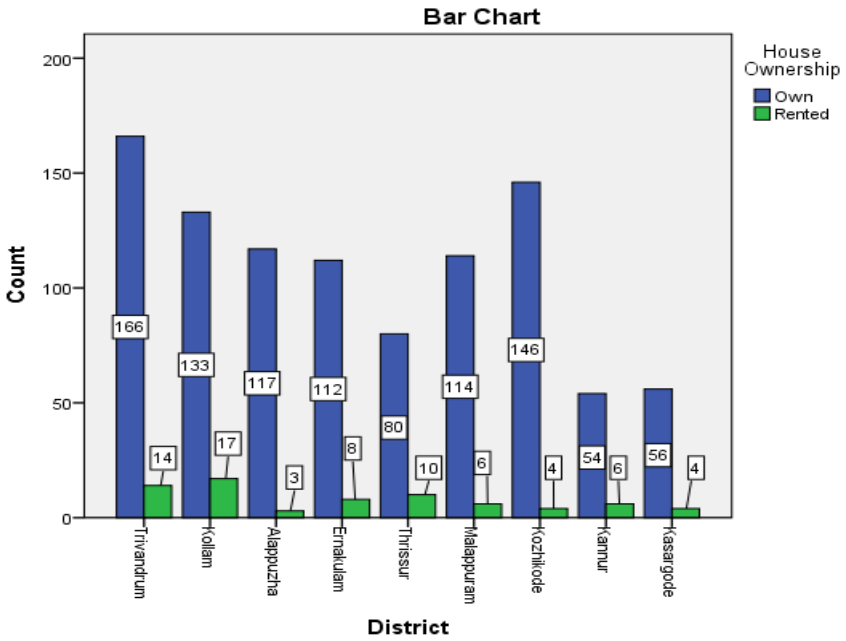
Source: Primary Data

In the above Bi-plot, upto 5 cents, the respondents from Trivandrum, Ernakulam and Kozhikode were the most. From 5 to 10 cents, Thrissur, Malappuram and Kollam districts dominated and after that the land ownership distribution was somewhat similar everywhere.

3.14. Housing and Sanitation Facilities

The data shows that 93.14 per cent of the respondents have their own house and the remaining are staying in rented houses. The percentage of homeless fisherfolk is higher in Kollam district (11.33 per cent) followed by Thrissur district (11.11 per cent) (See **Appendix 13**). The position of Alappuzha district is better in this respect; 97.5 per cent of the respondents have their own houses.

Fig. 3.11: Bar Chart between House Ownership and Districts



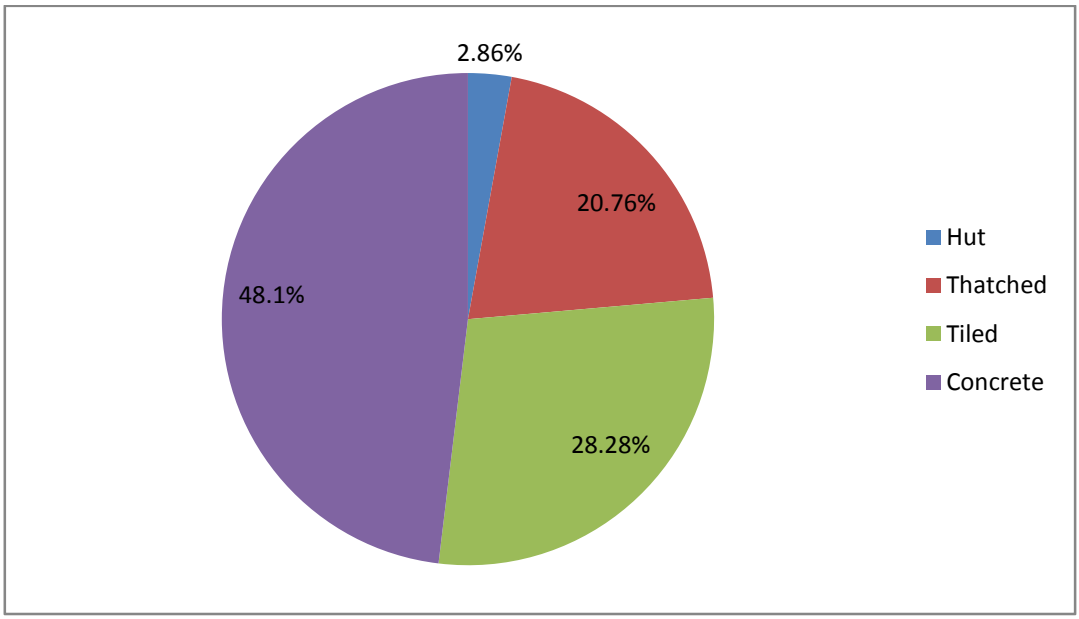
Source: Primary Data

From the above bar graph, (Figure 3.11) it is evident that majority of the respondents owned their houses and had adequate sanitation facilities. In Kollam and Kozhikode, most of the houses (166 and 146 respondents respectively) were owned by the respondents. Sameway, again in Trivandrum and Kollam the number of rented houses among the respondents are the most. All along the coastal districts, the graph shows that there is very high difference between the number of respondents who own and who rents the houses.

3.15. Type of Roof

The classification of the residential houses of the respondents based on the type of roofing is depicted in fig.3.12. As it is clear that 48 per cent of the fisherfolk covered under the study are residing in concrete buildings; 28.28 per cent in tiled houses. It is to be noted that 2.86 per cent are residing in huts.

Fig. 3.12: Distribution of Houses According to Roofing Pattern



Source: Primary Data

It is found that 70 per cent of the fisher-folk in Trivandrum district reside in concrete houses while this percentage is only 15.33 in Kozhikode district (See **Appendix 14**). In the coastal area of Kozhikode district, 64.67 per cent of the fisher-folk's houses are with tiled roof. It is also to be highlighted, here, that 41.67 per cent of the fisher-folk live in Thatched houses and another 5 per cent in huts in the case of Kannur district. In the coastal area of Thrissur district, 37.78 per cent of the fisher-folk have only thatched houses.

Table 3.21: *Correspondence Table between Roof Types and Districts*

District	Roof Type				
	Hut	Thatched	Tiled	Concrete	Active Margin
Trivandrum	5	22	27	126	180
Kollam	6	52	8	84	150
Alappuzha	6	23	27	64	120
Ernakulam	1	11	58	50	120
Thrissur	0	34	16	40	90
Malappuram	4	11	37	68	120
Kozhikode	1	29	97	23	150
Kannur	3	25	5	27	60
Kasargode	4	11	22	23	60
Active Margin	30	218	297	505	1050

Source: Primary Data

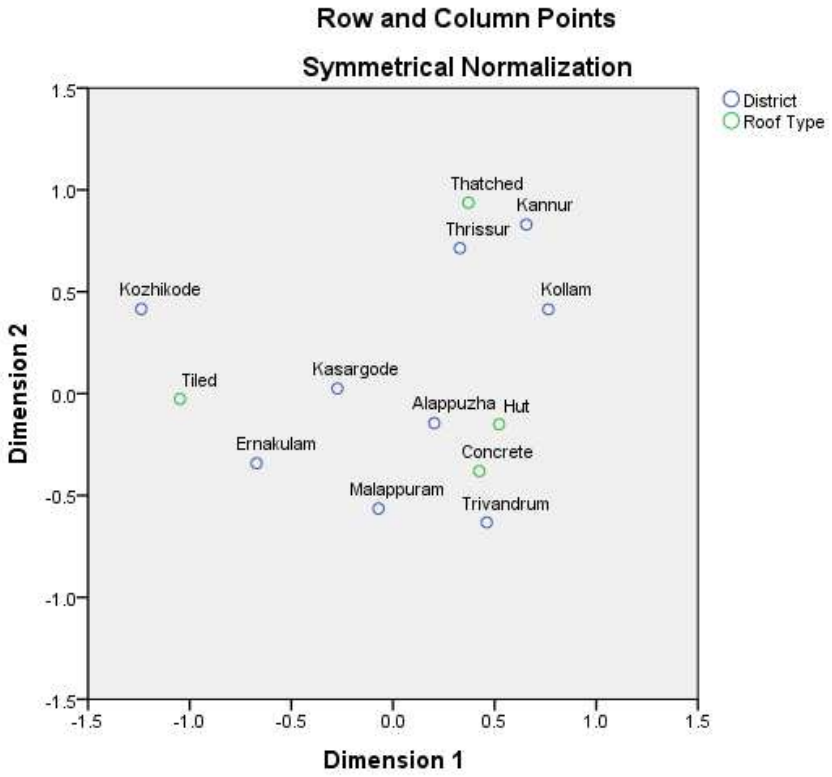
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.434	.188			.719	.719	.028	-.024
2	.253	.064			.244	.962	.030	
3	.099	.010			.038	1.000		
Total		.262	275.056	.000[a]	1.000	1.000		

a. 24 degrees of freedom

Statistical analysis showed highly significant ($p \cdot 0.01$) relationship between the level roof type and districts covered under the study. (Chi-square = 275.056, and $p<0.05$). Thus, it is evident from the above that the level of roofing type and districts are related.

Fig. 3.13: Bi-plot between Roof Type and Districts



Source: Primary Data

From the bi- plot graph 3.13, it is evident that majority of the respondents use concrete or tiled roofing across the districts selected. Here, concrete roofing is dominant in Trivandrum, Kollam, Alappuzha and Malappuram. Tiled roofing is found more in Ernakulam, Kozhikode and Kasargode. Thatched and hut roofings are found less considerably, however, thatched roofing is found more in Kollam, Thrissur and Kannur more than the other districts.

3.16. Plinth Area of Houses

The households covered under the study were categorised into three groups, viz., houses with plinth area upto 500 sq.ft., 500 to 1000 sq.ft. and above 1000 sq.ft. Accordingly, 60 per cent of the houses were found falling under the first category, 33 per cent under the second category and the remaining 7 per cent under the third category (See **Appendix 15**).

Table 3.22: *Correspondence Table between Plinth Area and Districts*

District	Plinth Area			
	Up to 500	500 – 1000	Above 1000	Active Margin
Trivandrum	96	80	3	179
Kollam	62	72	16	150
Alappuzha	94	23	3	120
Ernakulam	107	13	0	120
Thrissur	38	26	26	90
Malappuram	66	50	4	120
Kozhikode	79	54	17	150
Kannur	52	6	2	60
Kasargode	36	23	1	60
Active Margin	630	347	72	1049

Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.357	.127			.672	.672	.028	.330
2	.249	.062			.328	1.000	.033	
Total		.189	198.728	.000[a]	1.000	1.000		

a. 16 degrees of freedom

In the correspondence test analysis, it was found that a majority of the respondents belonged to the category of holding a plinth area less than 500 sq ft. The Chi-square test shows 198.728 statistic value. Here, $p<0.05$, so we can conclude that there is very significant relation between the plinth area and districts.

3.17. Type of Flooring

Mostly the fisherfolk houses were found using cement flooring. It was found that 68.76 per cent of the houses surveyed have cement flooring, 18.95 per cent have used floor tiles and in 9.15 per cent houses, ceramic tiles or marbles were used. Only 3.14 per cent of the houses were found having mud flooring (See **Appendix 16**).

Table 3.23: *Correspondence Table between Flooring and Districts*

District	Flooring						
	Mud	Cement	Mosaic	Tiled	Marble	Granite	Active Margin
Trivandrum	3	109	12	53	2	1	180
Kollam	1	119	5	21	4	0	150
Alappuzha	1	90	3	26	0	0	120
Ernakulam	0	75	9	34	2	0	120
Thrissur	11	61	0	10	4	4	90
Malappuram	6	85	2	23	4	0	120
Kozhikode	3	87	27	29	4	0	150
Kannur	4	54	0	2	0	0	60
Kasargode	4	42	1	1	12	0	60
Active Margin	33	722	59	199	32	5	1050

Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.341	.116			.489	.489	.031	.349
2	.238	.057			.239	.728	.039	
3	.202	.041			.172	.901		
4	.141	.020			.084	.985		
5	.061	.004			.015	1.000		
Total		.237	249.163	.000[a]	1.000	1.000		

a. 40 degrees of freedom

Here, the statistical analysis shows a Chi-square value of 249.163 and $p<0.05$. the proportion of inertia is accounted by 5dimensions, making a totality. There is very high significant association between the type of flooring and district wise distribution.

3.18. Electrification

The data relating to electrification of houses in coastal areas shows that 95.71 per cent of the houses are electrified. District-wise figures show that 11.67 per cent of the houses in the coastal area of Kannur district, 8.67 per cent in Kozhikode, 7.78 per cent in Thrissur, 4.17 per cent in Malappuram, 3.33 per cent in Ernakulam, 3.33 per cent in Kasargod, 2.5 per cent in Alappuzha, 1.67 per cent in Trivandrum and 0.67 per cent in Kollam districts are not electrified (See **Appendix 17**). Low voltage and voltage fluctuations are the common problems faced by the inhabitants of the coastal area. Establishment of transformers along with line extension/ conversion is required.

Table 3.24: *District and Electrification Crosstabulation*

District Count	Electrification		Total
	Yes	No	
Trivandrum	177	3	180
Kollam	149	1	150
Alappuzha	117	3	120
Ernakulam	116	4	120
Thrissur	83	7	90
Malappuram	115	5	120
Kozhikode	137	13	150
Kannur	53	7	60
Kasargode	58	2	60
Total	1005	45	1050

Source: Primary Data

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	26.797[a]	8	.001
Likelihood Ratio	25.913	8	.001
Linear-by-Linear Association	15.394	1	.000
N of Valid Cases	1050		

a. 3 cells (16.7per cent) have expected count less than 5. The minimum expected count is 2.57.

Here, the Chi-square test is done, for which the obtained statistic is 26.79 and df= 8. Here, $p<0.05$ and so we can conclude there is highly significant association between the electricity facility availability and the district wise distribution. In all the districts, majority of the respondents had availed the electricity facility. Out of 1050 respondents, only 45 of them did not had electricity facilities in their houses.

3.19. Source of Drinking Water

Timely availability of safe drinking water is a serious concern of the coastal fisher-folk in Kerala. The data relating to the sources of drinking water shows that 41.62 per cent of the respondents covered under the present study depend on public tap for collecting drinking water. As given in Table. 3.25, 24.76 per cent do collect from potable water sources, 13.24 per cent from the wells.

Table 3.25: *Distribution Based on Source of Drinking Water*

Source of Drinking Water	Nos.	Percentage
Pond	19	1.81
Well	139	13.24
Potable Water	260	24.76
Public Tap	437	41.62
Purchased Water	69	6.57
Borewell	126	12.00
Total	**1050**	**100**

Source: Primary Data

The percentage share of households collecting drinking water from sources like ponds and potable water is 26.57. Moreover, 6.57 per cent of the households buy drinking water. These sources, of course, increase the concern about the health conditions of the fisherfolk in the coastal area of the state. Besides this, the money spent for the purchase of drinking water also adds to the living cost of the people in this area. The district-wise figures are given in **Appendix 18.**

As reported in the FGDs, most of the drinking water projects commissioned for coastal area is not functioning well. In some places, capacity of pumping station and overhead tank is seen as not compatible with respect to quantity of water demanded by the project area. In some cases, old pipe lines aren't in a position to withstand higher water pressure. Lack of servicing the motor pumps is also a major reason for the failure of the project. According to the fisherfolk, the Jalanidhi project is a failure in many places due to the condition that the operation and maintenance cost has to be met by the user community.

Table 3.26: *Correspondence Table between Drinking Water and Districts*

District	Drinking water						
	Pond	Well	Portable Water	Public Tap	Purchased Water	Borewell	Active Margin
Trivandrum	2	15	43	88	3	29	180
Kollam	1	1	53	84	10	1	150
Alappuzha	3	31	2	40	15	29	120
Ernakulam	2	4	8	92	14	0	120
Thrissur	0	4	15	61	0	10	90
Malappuram	2	57	21	14	9	17	120
Kozhikode	3	12	109	8	1	17	150
Kannur	4	1	3	31	13	8	60
Kasargode	2	14	6	19	4	15	60
Active Margin	19	139	260	437	69	126	1050

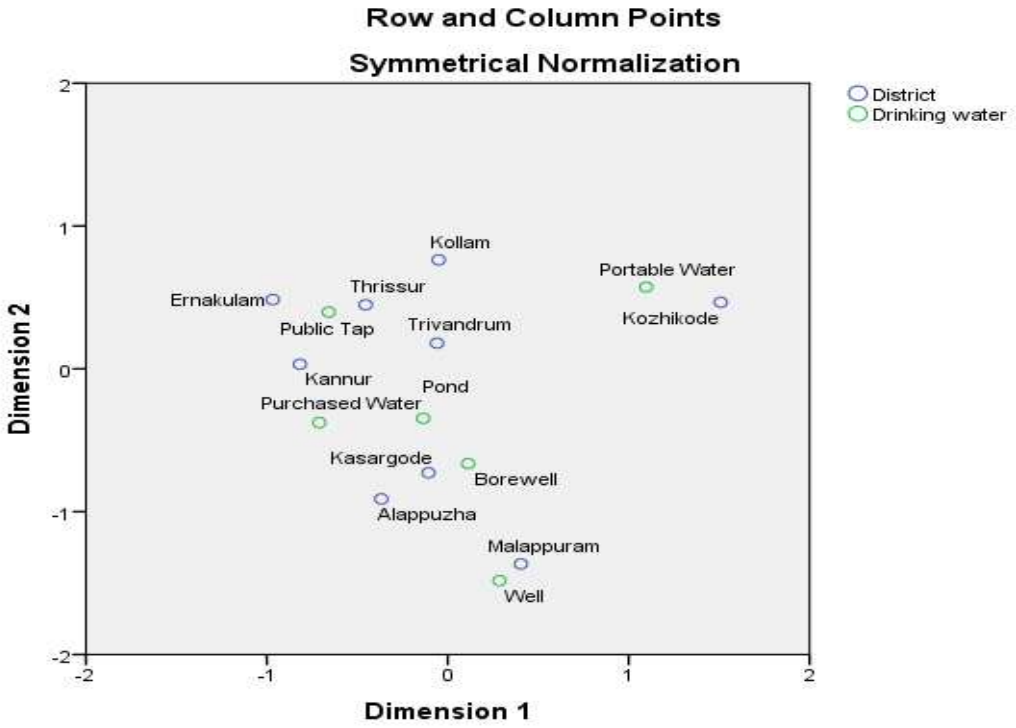
Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.524	.274			.452	.452	.024	.104
2	.502	.252			.415	.868	.028	
3	.206	.042			.070	.937		
4	.192	.037			.060	.998		
5	.037	.001			.002	1.000		
Total		.607	636.957	.000[a]	1.000	1.000		

In the above correspondence test analysis between the drinking water facility available and the districts, it was found that there is a significant association between them. The Chi-square statistic is 636.957 and $p<0.05$.

Fig. 3.14: Bi-plot between Availability of Drinking Water and Districts



Source: Primary Data

A majority of them (41.62 per cent, mostly in Trivandrum) used public tab, while 24.76 percent (mostly in Kozhikode) used potable water. 139 respondents had well, and 126 had borewell facilities. Only a very few depends on pond as a source of drinking water.

3.20. Fuel Used for Cooking

The most common fuel used by the fisherfolk houses for cooking is LPG. It was found that 36.19 per cent of the respondent households use LPG ; 26.76 per cent use a combination of firewood and LPG; 16.1 per cent use firewood; 10.38 per cent use the combination of firewood, LPG and electricity for the purpose of cooking. The remaining households use Kerosene and firewood (See **Appendix 19**).

Table 3.27: *Correspondence Table between Fuel Types and Districts*

District	Fuel						
	Firewood	Gas	Firewood & Kerosene	Firewood & Gas	Kerosene & Gas	Firewood, Gas & Kerosene	Active Margin
Trivandrum	14	107	2	1	48	8	180
Kollam	1	34	3	72	4	36	150
Alappuzha	10	18	6	63	5	18	120
Ernakulam	7	46	16	25	1	25	120
Thrissur	35	45	4	3	0	3	90
Malappuram	36	39	8	27	3	7	120
Kozhikode	35	46	1	66	1	1	150
Kannur	8	33	5	6	1	7	60
Kasargode	23	12	2	18	1	4	60
Active Margin	169	380	47	281	64	109	1050

Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.536	.287			.521	.521	.024	.205
2	.404	.163			.296	.817	.025	
3	.281	.079			.143	.960		
4	.113	.013			.023	.983		
5	.096	.009			.017	1.000		
Total		.552	579.193	.000[a]	1.000	1.000		

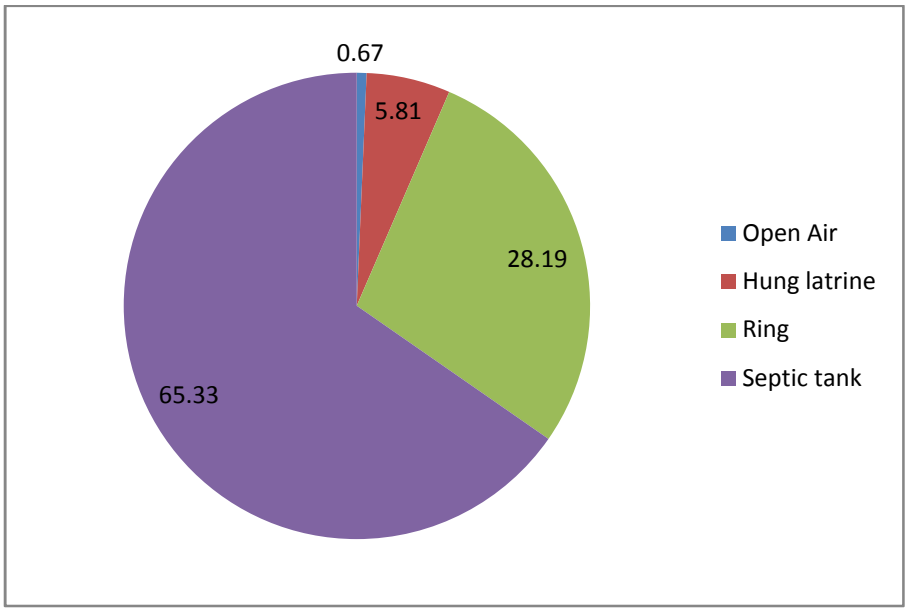
a. 40 degrees of freedom

For the statistical analysis done between the availability of fuel and districts, it was found that there is a highly significant association between them. The Chi-square statistic is 579.193 and $p<0.05$ here. There are 5 dimensions which are accounted for in the proportion of inertia, providing information about the district wise distribution.

3.21. Lavatory Facilities

The type of lavatory used is an indicator of the hygienic condition existing in the residential house. Data relating to the type of lavatory available in the respondents' residential houses show that 65.33 per cent of the houses covered under the study have hygienic type of lavatories.

Fig. 3.15: Distribution of Houses According to Type of Lavatory



Source: Primary data

From fig. 3.15, it is clear that 34.67 per cent of the houses do not have hygienic type of lavatories. The condition of 6.48 per cent of the houses is very poor as far as the lavatory facility is concerned. District-wise data shows (See **Appendix 20**) that lavatory facilities are very poor in the marine fishing villages of Kannur district. Here, only 26.67 per cent houses have lavatory with septic tanks. In the case of Alappuzha(50 per cent) and Kollam (56.67 per cent) also the position is not good. It is found that 78.33 per cent of houses in the fishing villages of Kasargod, 78 per cent in Kozhikode, 76.67 per cent in Ernakulam,72.22 per cent in Trivandrum have lavatory with septic tanks.

These figure indicate that there is an urgent need to improve the hygienic conditions in the marine fishery villages of Kerala. The data relating to the sources of drinking water too support this argument.

The participants of the FGDs highlighted the need to have proper drainage facilities in all the fishing villages in Kerala. Proper drainages are essential in maintaining the hygiene and sanitary conditions in the fishing villages. They also prevent water logging during monsoons. Absence of proper drainage system can

result in aggravating the ill-effects of water logging such as spreading of diseases. In Kerala, there are about 80-90 fishing villages which lack proper drainage facilities. Total sanitation program is essential for the entire fishing villages of the State to keep the fishing villages under good sanitary and hygienic conditions.

Table 3.28: *Correspondence Table between Lavatory Types and Districts*

District	Lavatory				
	Open Air	Hung Latrine	Ring	Septic Tank	Active Margin
Trivandrum	7	33	10	130	180
Kollam	0	1	64	85	150
Alappuzha	0	3	57	60	120
Ernakulam	0	2	26	92	120
Thrissur	0	1	31	58	90
Malappuram	0	9	30	81	120
Kozhikode	0	1	32	117	150
Kannur	0	11	33	16	60
Kasargode	0	0	13	47	60
Active Margin	7	61	296	686	1050

Source: Primary Data

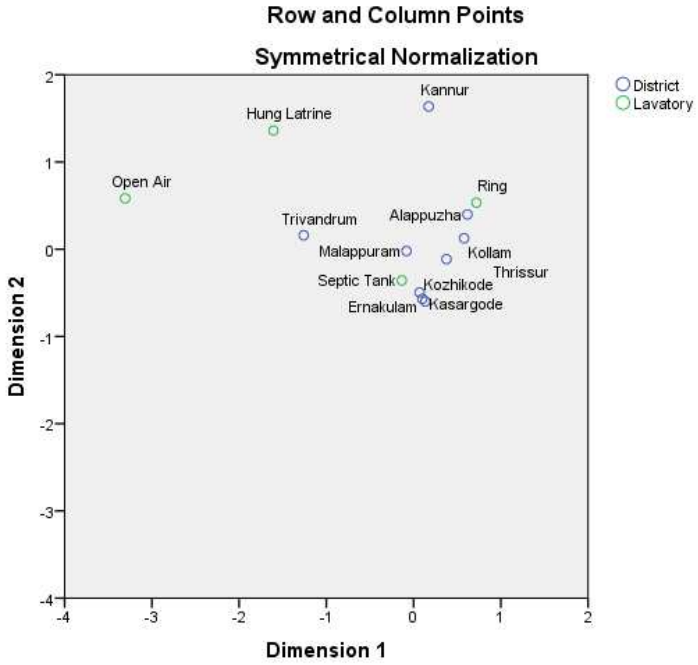
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation
								2
1	.381	.145			.645	.645	.028	-.061
2	.274	.075			.333	.979	.030	
3	.070	.005			.021	1.000		
Total		.225	236.298	.000[a]	1.000	1.000		

a. 24 degrees of freedom

In the above analysis, the Chi-square statistic is 236.298 and $p<0.05$ making it possible for a highly significant association between the type of lavatory distributed in the districts.

Fig 3.16: Bi-plot between Lavatory type and Districts



Source: Primary Data

The above Bi-plot graph (Figure 3.16) shows that open air system is not at all practised except in a very few areas. Trivandrum, Malappuram and Kollam are the districts with most of the respondents availing to septic tank facilities. Ring latrine and hung latrines are also somewhat equally distributed across the districts.

3.22. Expenditure on Liquor, Smoking and Gambling

Consumption of liquor is a serious social evil that has spread among the people of Kerala. The consequences are very high among the low income class of people. This habit, ultimately, affects the peaceful life of the families and the society, living standards of the people, education of the children, and the character of the children. The data reveal that 43 per cent of the fisherfolk consume liquor regularly (See **Appendix 21**). However, it is noted that expenditure on gambling

and smoking is comparatively lesser. It was found that only 1.81 per cent of the respondents spent money for gambling and in the case of smoking, it is 8.48 per cent. The habit of using intoxicative other than liquor exists among 16.57 per cent of the fisher folk in Kerala. This mainly represents chewing of pan. For the calculation of this percentage, only the number of respondents (ie., 1050) has been considered; the total number of family members is not considered.

Liquor consumption is found very high among the fisherfolk in Kollam (82.67 per cent) and Trivandrum (79.44 per cent) districts. The habits of consuming liquor, smoking and gambling was found nil among the fisher folk of Malappuram district, whereas 16.67 per cent of them use intoxicative like pan. In Trivandrum district, monthly expenditure for liquor is more than Rs.1000 in the case of 53.3 per cent of the respondents.

A very important observation made from the data collected is that only 8.48 per cent of the 1050 respondents covered under the study have the habit of smoking. But, this habit was found more among the fisherfolk in Alappuzha (35 per cent) and Kannur (21.67 per cent) districts respectively. The habit of smoking was found lesser among the fisherfolk in Thrissur, Malappuram and Kozhikode districts.

3.23. Fishing Category of the Respondents

The respondents are classified into three groups viz., Traditional, Acquired and Migrant fishermen. As shown in **Appendix 22**, 93.81 per cent of the respondents are traditional fishermen. Traditionally, they are engaged in fishing and they use mostly traditional crafts and gears for fishing. It is found that 3.14 per cent fall under the category of acquired and 3.05 per cent under the category of migrant.

Table 3.29: *Correspondence Table between Fishing Category and Districts*

District	Fishing Category			
	Traditional	Acquired	Migrant	Active Margin
Trivandrum	176	1	3	180
Kollam	145	5	0	150
Alappuzha	115	4	1	120
Ernakulam	104	7	9	120
Thrissur	90	0	0	90
Malappuram	111	4	5	120
Kozhikode	144	4	2	150
Kannur	54	4	2	60
Kasargode	46	4	10	60
Active Margin	985	33	32	1050

Source: Primary Data

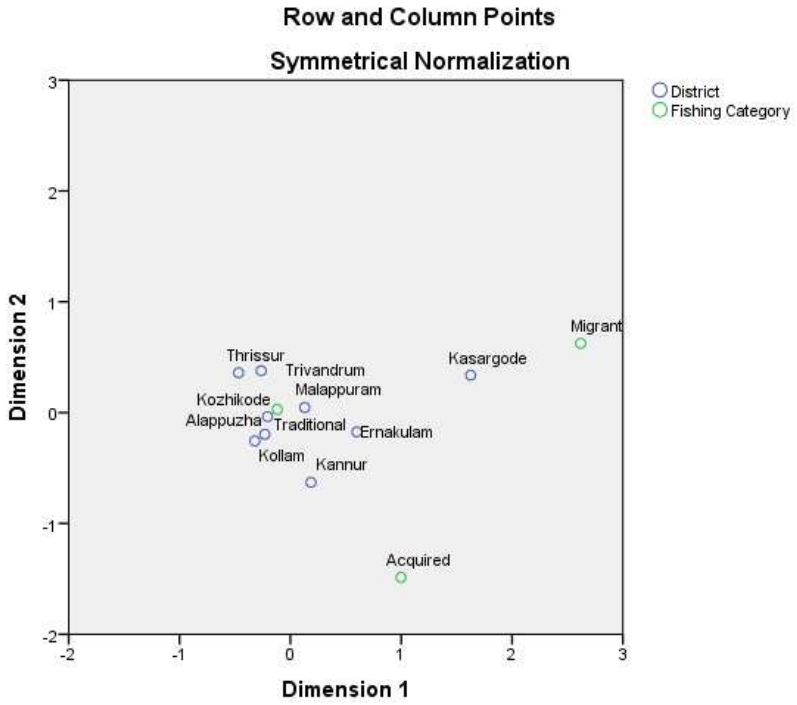
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.253	.064			.905	.905	.044	.064
2	.082	.007			.095	1.000	.030	
Total		.071	74.546	.000[a]	1.000	1.000		

a. 16 degrees of freedom

Considering the fishing category of the respondents across the districts, the Chi-square vale is 74.546 and $p<0.05$. so, there is a highly significant association between the category of fisher folk and the district wise distribution.

Fig. 3.17: Bi-plot between Fishing Category and Districts



Source: Primary Data

The majority of the respondents belonged to traditional fisher folk category, with a majority of them from Kozhikode, Trivandrum, Kollam, Alappuzha, Ernakulam and Malappuram. Acquired fisher folk belonged mainly to Ernakulam and Migrant fisher folk had amajority in Kasaragod.

3.24. Type of Participation in Fishing

The data relating to the type of participation in fishing indicates that 55.43 per cent of the fisherfolk are working as a member of a team (see Appendix 23). It was found that 13.05 per cent represent fishermen are going to the sea alone. During the survey and in the FGDs, the respondents explained that, whenever they go for fishing in a team of 20 to 40 members, so many advantages are there. At the same time, if there is no catch, the owner has to bear heavy loss. In the case of lone fishermen, the catch will be very limited and the fisherman, usually, does not move

far from the shore. The data also indicate that 31.52 per cent of the respondents do not go for fishing at all. They are engaged in other activities only.

The data shows that, lonely fishermen are more in Kasargod district (30 per cent) followed by Alappuzha district (25.83 per cent). Lonely fishing is very less in Kollam district (4.67 per cent) (see **Appendix 23**).

Table 3.30: *Correspondence Table between Participation Type and Districts*

District	Participation			
	Partner	Lonely	Not Applicable	Active Margin
Trivandrum	110	9	61	180
Kollam	89	7	54	150
Alappuzha	58	31	31	120
Ernakulam	62	18	40	120
Thrissur	50	14	26	90
Malappuram	73	16	31	120
Kozhikode	88	13	49	150
Kannur	30	11	19	60
Kasargode	22	18	20	60
Active Margin	582	137	331	1050

Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.234	.055			.930	.930	.032	-.052
2	.064	.004			.070	1.000	.030	
Total		.059	61.632	.000[a]	1.000	1.000		

a. 16 degrees of freedom

The above analysis shows that Chi-square test value is 61.632 and $p<0.05$, making it possible for a significant association between the type of participation if fisherfolk and the districts. Here, 2 dimensions provide the information accounted for the districts.

3.25.Type of Fishing Vessel Used by the Respondents

The fishing vessels used by the respondents are categorised into mechanised fishing crafts, motorised crafts, valloms with OBMs, canoe and others. As shown in Table 3.31, only 6.48 per cent of the fishermen are working in mechanised crafts. During the survey, it was observed that they are working in such crafts as labourers whose wages are based on the catch only. It is also to be noted that 31.52 per cent of the respondents (or their husbands in the case of females) were not at all going to the sea for fishing (See **Appendix 24**).

Table 3.31: *Type of Fishing Vessel Used*

Sl. No.	Fishing Vessel	Nos.	Percentage
1.	Canoe	97	9.24
2.	Vallom (OMBs)	294	28.00
3.	Motorized craft(OBM)	211	20.10
4.	Mechanized craft	68	6.48
5.	Others	49	4.67
6.	Nil	331	31.52

Source: Primary data

As shown in Table 3.31, 28 per cent of the respondents are using vallom (country craft) and 13.91 per cent are using small crafts such as canoe, catamaram, thermocol boats, etc. These figures indicate that majority of the fishermen in Kerala represent traditional fishermen.

Table 3.32: *Correspondence Table between Fishing Vessel Types and Districts*

District	Fishing Vessel						
	Canoe	Vallam	Motorized	Mechanized Craft	Others	Nil	Active Margin
Trivandrum	14	63	41	0	1	61	180
Kollam	4	40	22	26	4	54	150
Alappuzha	14	23	30	4	18	31	120
Ernakulam	14	10	36	17	3	40	120
Thrissur	13	46	4	0	1	26	90
Malappuram	14	41	20	9	5	31	120
Kozhikode	11	34	41	12	3	49	150
Kannur	8	19	11	0	3	19	60
Kasargode	5	18	6	0	11	20	60
Active Margin	97	294	211	68	49	331	1050

Source: Primary Data

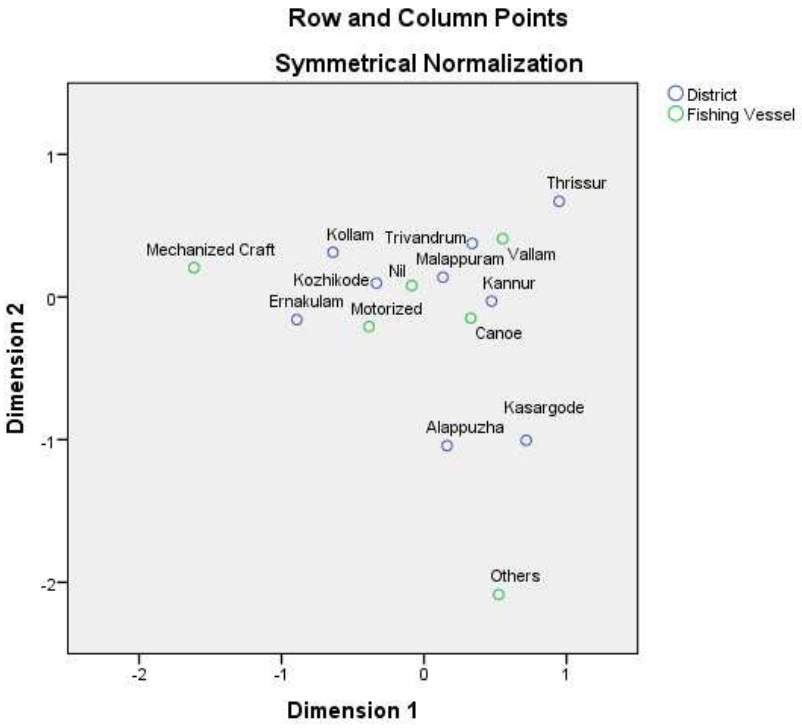
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.309	.096			.451	.451	.025	.099
2	.265	.070			.332	.783	.036	
3	.182	.033			.156	.939		
4	.103	.011			.050	.989		
5	.047	.002			.011	1.000		
Total		.212	222.369	.000[a]	1.000	1.000		

a. 40 degrees of freedom

In the case of type of fishing vessels used by the respondents across the districts, the Chi-square statistic is obtained as 222.369 and $p<0.05$, making the relationship between the two factors highly significant.

Fig. 3.18: *Bi-plot between Fishing Vessels and Districts*



Source: Primary Data

The above bi-plot graph (Figure 3.18) shows that vallam or motorised fishing boats are used by the majority of respondents. In this regard for vallam, Trivandrum, Kollam ,Alappuzha, Thrissur, Mappuram and Kozhikode have the majority of users. For motorised fishing vessels, Trivandrum, Alappuzha, Ernakulam and Kozhikode have majority of users. A vast majority of 331 respondents do not use any vessels on their own they are either the fishing labourers or theyare not engaged in active fishing.

3.26. Fishing Gears Used

Gillnet is found to be the commonly used gear by the fishermen in the coastal districts of Kerala. It was found that 45.14 per cent of the respondents use gillnet for fishing in the marine sector (See **Appendix 25**). It was also found that 31.52 per cent of the respondents do not use any gear as they are not directly engaged in marine fishing. Approximately, 9 per cent of them use hooks and lines, while the number of respondents who were using purse seine and trawl net was very less (7.71 per cent and 6.57 per cent respectively)

Purse seine and trawl net were found more in use among the fishermen from Kollam, Kozhikode and Ernakulam districts.

Table 3.33: *Correspondence Table between Fishing Gears and Districts*

District	Fishing Gears					
	Hook & Lines	Gill Net	Purse Seine	Trawl	Not Applicable	Active Margin
Trivandrum	14	105	0	0	61	180
Kollam	1	25	34	36	54	150
Alappuzha	24	62	3	0	31	120
Ernakulam	6	53	12	9	40	120
Thrissur	11	53	0	0	26	90
Malappuram	14	59	9	7	31	120
Kozhikode	8	53	23	17	49	150
Kannur	8	33	0	0	19	60
Kasargode	9	31	0	0	20	60
Active Margin	95	474	81	69	331	1050

Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.501	.251			.926	.926	.025	.036
2	.128	.016			.060	.986	.035	
3	.051	.003			.009	.995		
4	.035	.001			.005	1.000		
Total		.271	284.470	.000[a]	1.000	1.000		

a. 32 degrees of freedom

The statistical analysis shows that there is a significant association between the type of fishing gears used and the district wise distribution. Here, Chi-square test value is 284.470 and $p<0.05$. There are 4 dimensions, which are accounted for the district wise information.

3.27. Fishing Days Per Week

It was found that 36.19 per cent of the respondents are not going to the sea for fishing as they are engaged in other occupations. As it is clear from Table 3.34, only 10 per cent of the fishermen are engaged in fishing for six days in a week. Most of the fishermen are going for fishing only for two to four days in a week. The participants of the FGDs explained that nearly five years back, the fishermen usually go to sea six days in a week but due to the non- availability of fish, now they are not going for fishing regularly.

Table 3.34: *Number of Fishing Days Per Week*

Number of days going for fishing	Percentage of Respondents
One Day	1.52
Two Days	14.48
Three Days	13.90
Four Days	14.10
Five Days	9.81
Six Days	10.00
Seven Days	0.00
Nil	36.19

Source: Primary data

The districtwise details are given in **Appendix 26**. A comparison of the data given in Appendix 24 and 26 shows that there is a considerable decrease in the number of fishermen who are actively engaged in fishing throughout the year. As per Appendix 24, 32.52 per cent of the respondents are not directly engaged in fishing. However, this percentage is 36.19 as shown in Table 3.34. This is due to the reason that some fishermen who were engaged in fishing earlier, has stopped going to the sea recently due to the non- profitable venture.

Table 3.35: *Correspondence Table between No.of days/ Week and Districts*

District	No. of days/week								
	1	2	3	4	5	6	7	8	Active Margin
Trivandrum	8	25	20	31	14	13	0	69	180
Kollam	2	12	17	21	17	8	0	43	120
Alappuzha	3	15	16	19	14	9	0	44	120
Ernakulam	1	11	20	23	14	8	0	43	120
Thrissur	1	10	19	15	7	3	0	35	90
Malappuram	0	21	14	11	14	22	0	38	120
Kozhikode	0	34	19	9	12	24	0	52	150
Kannur	0	14	10	5	2	8	0	21	60
Kasargode	0	9	10	7	7	7	0	20	60
Active Margin	15	151	145	141	101	102	0	365	1020

Source: Primary Data

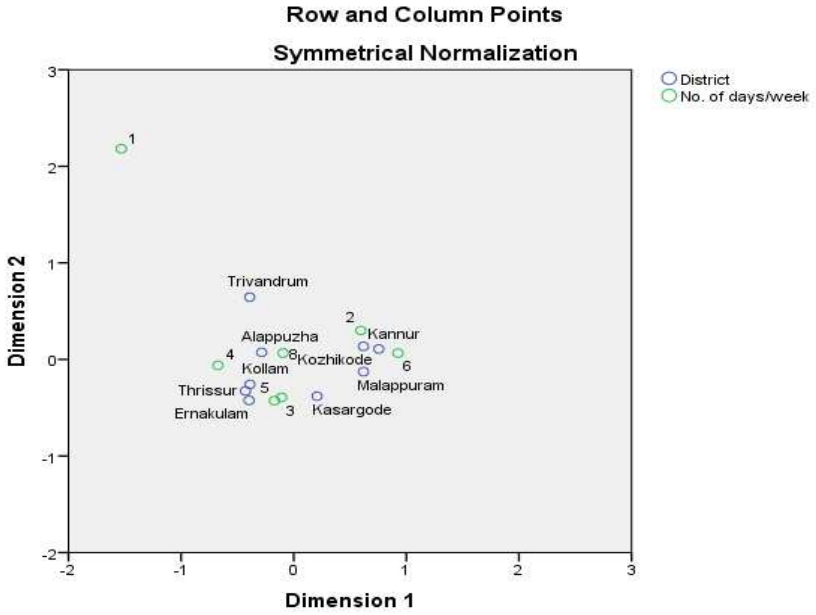
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.243	.059			.683	.683	.029	.040
2	.126	.016			.183	.865	.035	
3	.102	.010			.119	.984		
4	.032	.001			.012	.996		
5	.016	.000			.003	.999		
6	.009	.000			.001	1.000		
Total		.087	88.275	.004[a]	1.000	1.000		

a. 56 degrees of freedom

The statistical analysis between the number of days spend on work per week and the districts, shows that there is a highly significant relation between them. The chi-square statistic is 88.275 and p<0.0.5.

Fig. 3.19: Bi-plot between Number of Working days/ Week and Districts



Source: Primary Data

Here, it can be observed that majority of the respondents do not have work on the most of the days. This is the major problem in Trivandrum, Kozhikode, Alappzha, Kollam and Ernakulam. None of the respondents goes to fishing all the days of the week. Most of them goes for 2, 3 or 4 days in the sea. Trivandrum, Kozhikode, Ernakulam, Thrissur, Malappuram, Kollam and Alappuzha are the major districts in this regard.

3.28. Fishing Experience of the Respondents

Data pertaining to the period of experience in fishing indicate that 41.24 per cent of the respondents have an experience of more than 20 years in marine fishing. As explained in **Appendix 27**, 24.19 per cent have an experience of 10 to 20 years and 9.14 per cent have experience of up to 10 years (See appendix 27). The remaining 25.43 per cent do not have any experience in marine fishing. While

calculating the fishing experience, the experience of the head of the family or the main earning member was considered.

Table 3.36: *Correspondence Table between Experience and Districts*

District	Experience				
	Up to 10	10 to 20	20 & Above	Not Applicable	Active Margin
Trivandrum	33	64	33	50	180
Kollam	9	43	61	37	150
Alappuzha	4	34	60	22	120
Ernakulam	14	33	41	32	120
Thrissur	6	23	39	22	90
Malappuram	19	21	51	29	120
Kozhikode	4	25	80	41	150
Kannur	3	5	35	17	60
Kasargode	4	6	33	17	60
Active Margin	96	254	433	267	1050

Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.289	.084			.795	.795	.028	-.090
2	.135	.018			.174	.969	.028	
3	.057	.003			.031	1.000		
Total		.105	110.349	.000[a]	1.000	1.000		

a. 24 degrees of freedom

The statistical analysis shows that Chi-square test statistic is 110.349 and $p<0.05$. So there is a highly significant relationship between the fishing experience and district wise distribution. The majority of them have more than 20years

experience (active margin of 433 respondents and an active margin of 254 for more than 10years experience) and 14 percent had only upto 10years of experience.

3.29. Fish Finding Device Used by the Respondents

It was found that fish finding devices are not popular among the fisherfolk of Kerala. Echo sounder was found used by only 5.81 per cent of the respondents. Nearly 31 per cent of the respondents use GPS during fishing; 63 per cent do not use any such devices (see **Appendix 28**). It is observed that echo sounder is used by the mechanised crafts; it was also reported by the respondents that the mechanised crafts use GPS too.

Table 3.37: *Correspondence Table between Fishing Devices and Districts*

District	Device			
	GPS	Echo Sounder	Not Used	Active Margin
Trivandrum	68	3	109	180
Kollam	53	26	71	150
Alappuzha	37	3	80	120
Ernakulam	46	10	64	120
Thrissur	25	0	65	90
Malappuram	31	4	85	120
Kozhikode	46	4	100	150
Kannur	14	0	46	60
Kasargode	12	0	48	60
Active Margin	332	50	668	1050

Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.284	.081			.892	.892	.035	.164
2	.099	.010			.108	1.000	.030	
Total		.090	95.025	.000[a]	1.000	1.000		

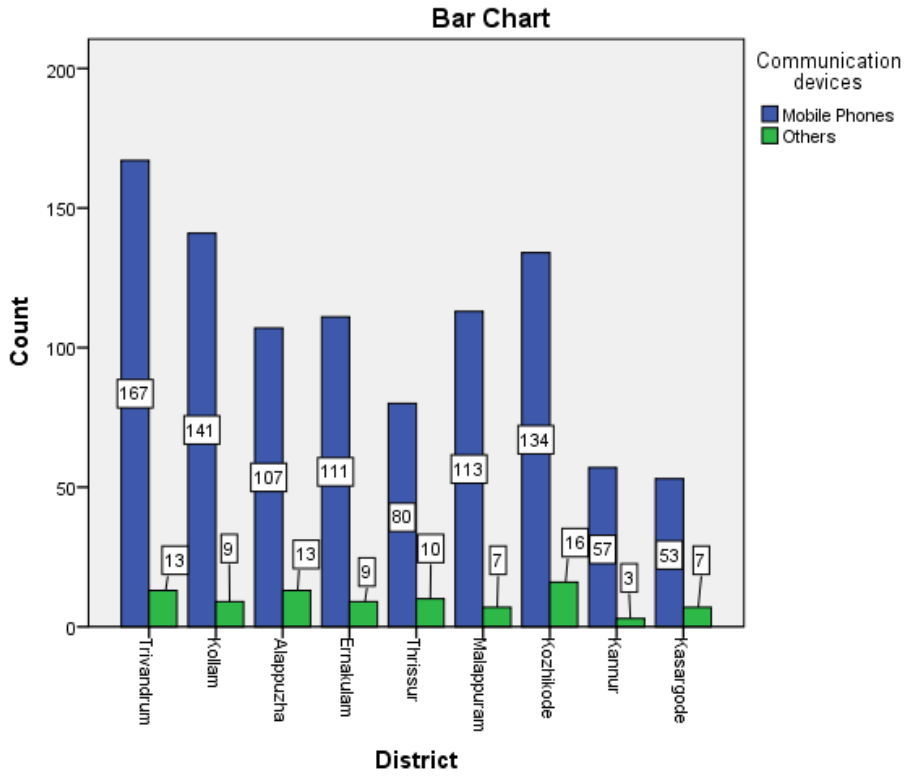
a. 16 degrees of freedom

The above test statistic shows that there is a highly significant relationship between the fishing devices and the district wise distribution. (Chi-square value is 95.025 and $p<0.05$). a majority of them do not use any fishing devices, while GPS is used by 332 respondents, who mainly belongs to Trivandrum, Kozhikode, Ernakulam, Alappuzha and Kollam. Echo sounder is most commonly used in Kollam and Ernakulam.

3.30. Communication Device used by the Respondents

The study found that 91.71 per cent of the respondents use mobile phones; while the remaining use other means of communication (see **Appendix 29**). It was found that the mobile phones are very much used to know about the market position, particularly about the price, buyers and availability of fish in the market. The data in this respect reveal that, 39.33 per cent of the respondents use mobile phones mainly for sharing market information; while 25.24 per cent use it for sharing information about fish shoals in the sea (see **Appendix 30**).

Fig. 3.20: Bar chart between Communication Devices and Districts



Source: Primary Data

Figure 3.20 shows the utilisation of communication devices, mainly classified as those who use mobile phones and other modes of communication. Mobile phones are mainly used in Trivandrum, Kollam and Kozhikode and least used by the respondents in Kasargode. Kozhikode, Alappuzha, Trivandrum and Thrissur make use mainly other modes of communication.

3.31.Marketing Methods

The data relating to the marketing method used by the fisherfolk covered under the study reveal that 51.71 per cent of them are selling fishes through intermediaries. Only 13.33 per cent make direct sale and 3.43 per cent sell through cooperative societies (see **Appendix 31**).

Thus, it is clear that though there are 666 primary cooperative societies in the fisheries sector in Kerala, they have failed in protecting the interest of the members.

During the survey and also in the FGDs, the fishermen said that the Matsyafed- the Apex body of the cooperative societies- officers or the fishery cooperative society representatives do not help them in fetching a reasonable price for their catch.

Table 3.38: *Correspondence Table between Marketing Methods and Districts*

District	Marketing methods				
	Direct	Intermediaries	Co-operatives	Not Applicable	Active Margin
Trivandrum	18	97	4	61	180
Kollam	15	73	8	54	150
Alappuzha	23	62	4	31	120
Ernakulam	10	70	0	40	120
Thrissur	10	47	7	26	90
Malappuram	20	69	0	31	120
Kozhikode	25	66	10	49	150
Kannur	7	31	3	19	60
Kasargode	12	28	0	20	60
Active Margin	140	543	36	331	1050

Source: Primary Data

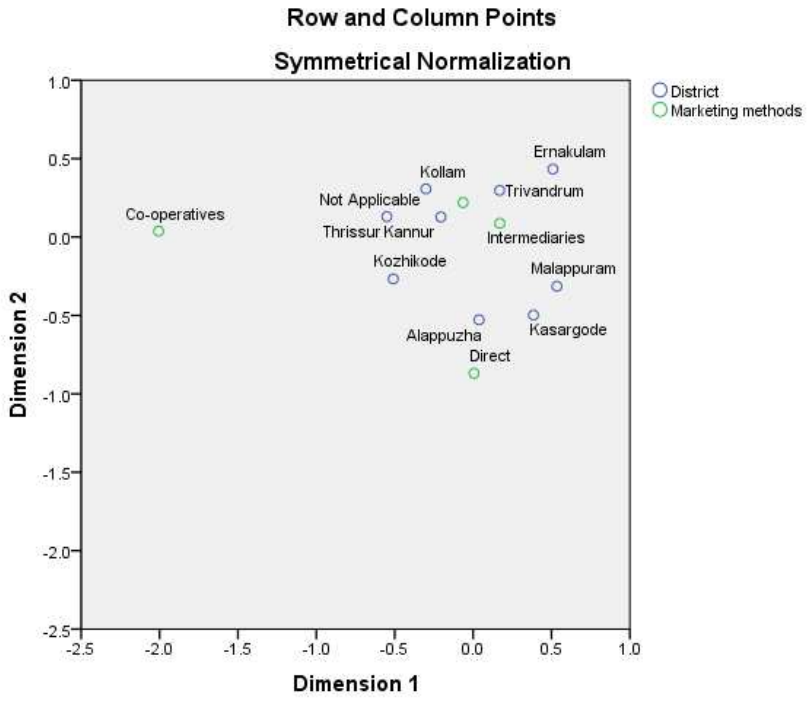
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.154	.024			.570	.570	.024	-.007
2	.120	.014			.344	.915	.031	
3	.060	.004			.085	1.000		
Total		.042	43.835	.008[a]	1.000	1.000		

a. 24 degrees of freedom

There is a significant association between the marketing methods adopted and the district wise distribution. Here, Chi-square statistic is 43.835 and $p<0.05$. most of them use intermediaries for marketing. This is followed by direct method and only a few avail the services of the co-operatives for the same.

Fig. 3.21: Bi-plot between Marketing Methods and Districts



Source: Primary Data

Here, under the direct marketing method, Kozhikode, Alappuzha and Malappuram have most of the respondents practising it. Trivandrum, Kollam and Ernakulam uses the intermediaries for marketing purposes, and cooperatives' services are availed considerably less (mostly by Kozhikode, Kollam and Thrissur). A vast majority of 331 respondents do not avail any marketing methods.

3.32. Average Quantity of Fish Catch

The data relating to the average quantity of fish catch per month is given in Table 3.39.

Table 3.39: *Average Quantity of Fish Catch per Month*

Name of District	Annual (Kgs)	Pre- Monsoon (Kgs)	Monsoon (Kgs)	Post –Monsoon (Kgs)
Trivandrum	180.36	29.52	82.51	68.34
Kollam	322.17	54.46	143.15	124.55
Alappuzha	214.20	30.04	98.95	85.21
Ernakulam	236.20	32.91	113.4	89.89
Thrissur	226.16	31.27	105.81	89.09
Malappuram	214.70	32.28	96.10	86.31
Kozhikode	277.93	39.51	127.36	111.07
Kannur	160.02	25.77	74.20	60.05
Kasargod	162.89	29.73	71.02	62.15
Kerala	**221.62**	**33.94**	**101.39**	**86.29**

Source: Primary Data

The monthly average fish catch per head is 221.62 KGs taking the State as a whole. The table shows that fish catch is very poor in Kannur and Kasargod districts. Per head fish catch is high in Kollam district where large number of mechanised fishing vessels is in operation. Here, it is to be noted that the average catch per head is very less in the case of fishermen who are going for fishing in non-motorised vessels. The average catch per month in their case is between 50 – 60 Kgs as reported during the study. Most of the fishermen who participated in the FGDs opined that a traditional fisherman who fully depends on fishing for his livelihood is not in a position to meet the daily minimum expenses. This has forced the youngsters to keep away from fishing related activities. They said that a fisherman who goes to the sea in the early morning is not earning an amount of Rs. 100 in most of the days during the pre monsoon period.

The district wise details are given in **Appendix 32**. The fish catch is more during the monsoon season; the state average catch per month is 101.39 Kgs. per head Catch per head during the pre- monsoon season was found to be 33.94 Kgs in the State as a whole. This indicates the low earnings of the active fishermen during the pre- monsoon period.

A recent Study by the CMFRI found that there is a decrease 14.3 per cent in the total fish catch in Kerala during the year 2014 as compared to the catch during 2013. The report has pointed out that landing of Sardine has reduced by 37 per cent, Carangids by 19 per cent, Groupers by 32 per cent, Anchovies by 30 per cent and Trichurus fish by 25 per cent.

3.33.Variety of Fishes Caught

Data relating to the variety of fishes caught were collected and analysed. The respondents were asked to name the variety of fishes they usually catch from the sea. The data so collected reveal that Sardine and Mackerel are the two most common varieties caught by them; 78.57 per cent of the fishermen catch sardine and 63.43 per cent catch Mackerel. As exhibited in Table 3.40, Prawn, Squid, Tuna, Carangids, Ribon fish, Pomfret and Seer fish are the other varieties caught by them.

Table 3.40: *Variety of Fishes Caught by the Respondents*

Species	Percentage
Sardine	78.57
Mackerel	63.43
Prawn	28.67
Squid	13.81
Tuna	13.05
Carangids	12.67
Ribbon fish	10.1
Pomfret	7.14
Seer Fish	8.1

Source: Primary Data

The district-wise details are given in **Appendix 33**. It was found that Mackerel and Sardine are the common varieties mostly caught by the fishermen from Kasargod, Thrissur and Ernakulam. Sardine is found common in all the coastal districts.

Table 3.41: *Correspondence Table between Varieties of Fishes Caught and Districts*

District	Variety FishesCaught									
	Mackeral	Nemiptorous	Pomfret	Ribbon Fish	Sardine	Seer Fish	Shrimp	Tuna	Squid	Active Margin
Trivandrum	74	13	7	12	74	16	34	43	25	298
Kollam	81	54	8	47	130	9	52	31	6	418
Alappuzha	86	10	8	14	90	11	65	16	16	316
Ernakulam	88	8	7	14	102	20	33	15	30	317
Thrissur	65	7	16	2	88	6	27	9	8	228
Malappuram	85	12	18	4	105	5	46	2	21	298
Kozhikode	88	16	4	3	126	14	33	10	6	300
Kannur	41	9	6	1	52	1	9	11	29	159
Kasargode	60	4	1	9	58	3	2	8	4	149
Active Margin	668	133	75	106	825	85	301	145	145	2483

Source: Primary Data

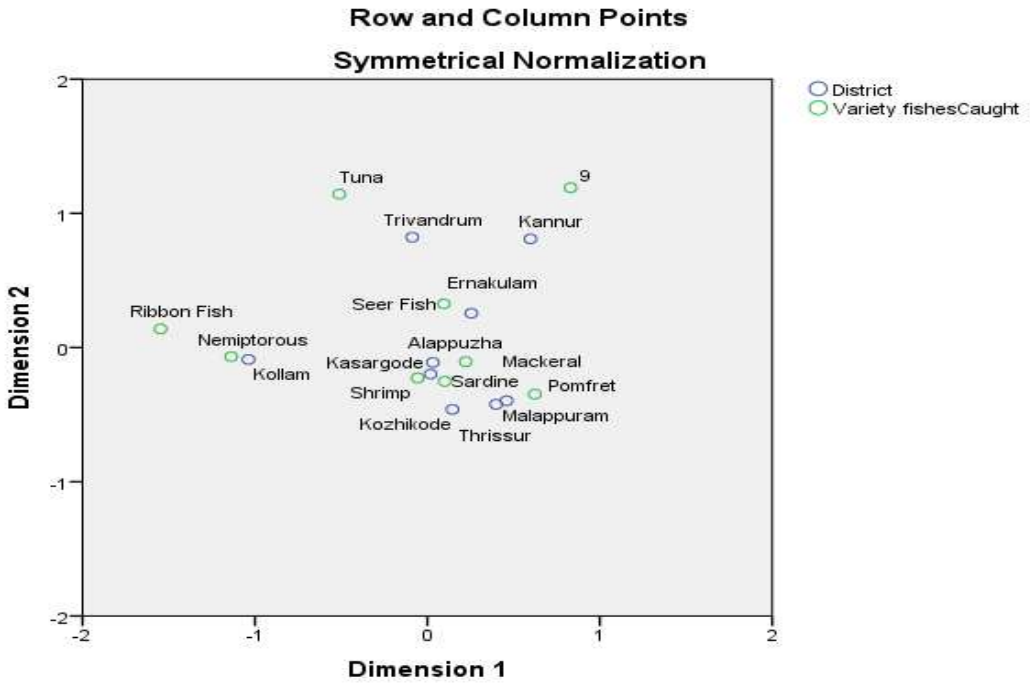
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.256	.066			.402	.402	.022	.001
2	.198	.039			.240	.642	.022	
3	.147	.022			.133	.775		
4	.137	.019			.116	.891		
5	.092	.008			.052	.943		
6	.076	.006			.036	.979		
7	.057	.003			.020	.999		
8	.010	.000			.001	1.000		
Total		.163	404.510	.000[a]	1.000	1.000		

a. 64 degrees of freedom

The Chi-square test value gives 404.510 and $p<0.05$. So, there is highly significant association between the variety of fishes caught and district wise distribution.

Fig. 3.22: Bi-plotbetween Fish Varieties Caught and Districts



Source: Primary Data

Mackarel, Shrimp, Sardine and Tuna are the most commonly avariable fish species. Mackarel is caught mainly in Kollam, Alappuzha, Ernakulam and Kozhikode. Sardine is caught mainly in Kollam, Ernakulam, Malappuram and Kozhikode. Shrimp is caught mainly in Kollam, Alappuzha and Malappuram , whereas Tuna levels caught is high in Trivandrum and Kollam. Other fish varieties caught by the respondents mostly are pomfret, seer fish, ribbon fish, nemiptorous, squid, etc.

3.34. Prime Season of Fish Catch

In the opinion of 70.1 per cent of the respondents, monsoon is the prime season of marine fishing in Kerala. Only 19.62 per cent claimed it is the post monsoon period; 6.67 per cent did not make any opinion in this regard. (see **Appendix 34**). However, the participants of FGDs reported that, recently, during monsoon, due to the flow of water from south to north direction, the volume of fish catch decreases considerably.

Table 3.42: *Correspondence Table of Prime Season Distribution in Districts*

District	Prime season				
	Pre Monsoon	Monsoon	Post Monsoon	Not Responded	Active Margin
Trivandrum	2	118	45	15	180
Kollam	2	107	33	8	150
Alappuzha	12	85	9	14	120
Ernakulam	14	78	22	6	120
Thrissur	1	85	1	3	90
Malappuram	1	52	59	8	120
Kozhikode	2	107	33	8	150
Kannur	4	52	2	2	60
Kasargode	0	52	2	6	60
Active Margin	38	736	206	70	1050

Source: Primary Data

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.347	.120			.687	.687	.028	.052
2	.212	.045			.257	.945	.033	
3	.099	.010			.055	1.000		
Total		.175	183.901	.000[a]	1.000	1.000		

a. 24 degrees of freedom

The statistical analysis shows that there is a highly significant association between the prime seasons of marine fishing and the district wise distribution. The Chi-square statistic is 183.901 and $p<0.05$. most of the respondents, especially from Trivandrum, Kollam and Kozhikode have observed monsoon as the prime fishing season. Whereas, the respondents from Malappuram and Trivadrum have observed post monsoon as the prime fishing season. Only 38 respondents amounting to 3.62 per cent have observed pre monsoon periods as the prime season.

3.35. Infrastructure Facilities in the Fishing Villages Covered under the Study

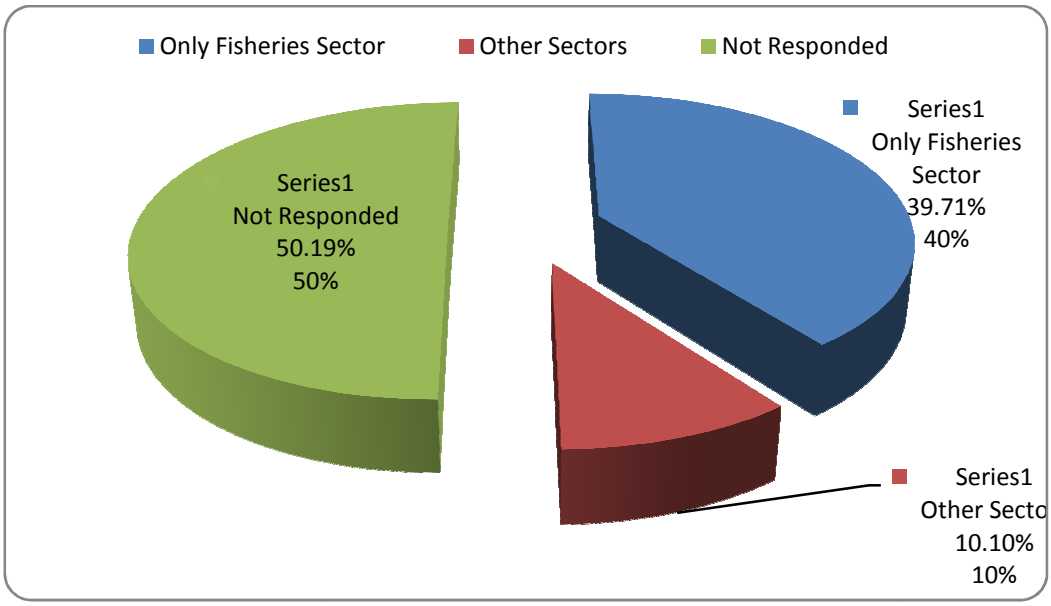
Data relating to the infrastructure facilities available in each fishing village covered under the study were collected. Facilities such as landing centre, ice plant, fish marketing cooperatives, market place, cold storage, freezing plant, source of potable water, all weather roads, railway station, telephone booths, freight trucks, post office, commercial banks, office of Matsyafed, office of fisheries department, police station, hospital, primary school, high school, college, technical institutions, library/ reading room and community hall were included. It was found that these facilities are available within 3-4 KMs in almost all the fishing villages. In few villages, railway station , freezing plants, cold storage, college and post office are available only at a distance of more than 5 KMs (**See Appendix 39-43**).

In the fishing villages of Trivandrum district, infrastructural facilities except, college, technical institute, railway station, hospital, community hall and library are available within 5 KMs in all the fishing villages. In the fishing villages of Kollam district, the position is satisfactory except in Cheriazheekkal and Maruthoorkulangara in which case people have to move beyond 5 KMs for the basic facilities. Infrastructural facilities in the fishing villages of Alappuzha district are not much better. Landing centre, freezing plant, college, technical institute, police station and hospital are located at a distance of more than 5 KMs in all the villages. In the case of Cherai and Chellanam fishing villages of Ernakulam, infrastructural facilities are generally poor. The position of the fishing villages of Thrissur district is also not good as the facilities are concerned. Infrastructural facilities in Kadalundinagar and Parappanangadi in Malappuram are found poor. Similarly, the facilities available in Thopayil, Puthiyangadi and Puthiyappa are to be improved. The infrastructural facilities available in the fishing villages of Kannur and Kasargod are satisfactory except in the case of Palisseri.

3.36. Approach towards an Alternative Source of Income

Opinions of the respondents regarding their attitude towards alternative employment were collected. It was found (fig.3.23) that only 39.71 per cent of the respondents wish to continue in the fisheries sector; 10.1 per cent wish to seek employment in other sectors and the remaining 50.19 per cent did not respond to this question. This indicates that majority of the members in the fisherfolk do not consider fishing and related activities as a strong source of earnings. This is due to the reducing fish catch and the resultant hardships in their livelihood. This problem was stressed in the FGDs conducted during the study.

Fig. 3.23: Approach Towards Alternative Source of Income

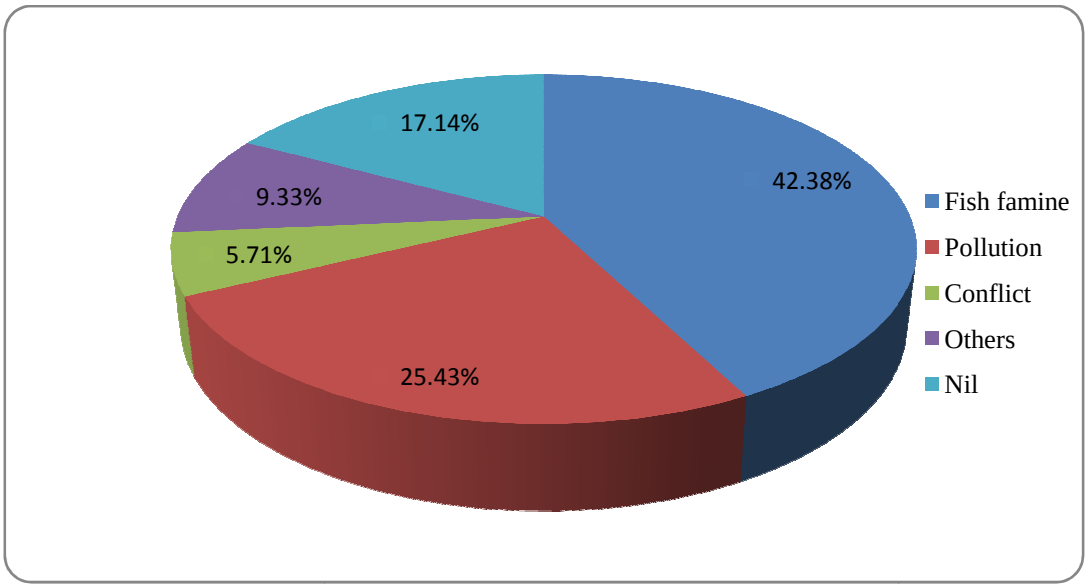


Source: Primary data

3.37.Problems in the Marine Fisheries Sector of Kerala

Observations of the respondents relating to the problems existing in the marine fishery sector of Kerala are shown in fig.3.24. Fish famine is pointed out as the most important problem faced by the marine fisherfolk in the State. This problem was the top most item raised during all the FGDs. The traditional fishermen having long years' fishing experience explained that the impact of climate change is evident in the form of change in the flow of ocean current, water colour, coastal erosion, roughness of the sea, non availability of certain species and change in the depth of water where mackerel is now available. As shown in fig. 3.40, 42.38 per cent opined that fish famine was the most important problem and water pollution (25.43 per cent) was another important issue highlighted. The district-wise details are given in **Appendix 38.**

Fig. 3.24: Problems in the Fisheries Sector of Kerala



Source: Primary Data

During the study, the respondents expressed the need for the government intervention through providing regular concessions in the form of free ration during dry season, welfare schemes, alternate employment opportunities and also more sanitaion facilities. The respondents complained that many a time time, they find it very difficult to get compensation for the loss of their fishing gears and other equipments.

Table 3.43: *Correspondence Table between Various Problems in Marine Fisheries and Districts*

District	Problems in Mar.Fis.					
	Fish Famine	Pollution	Conflict	Others	Nil	Active Margin
Trivandrum	79	47	5	19	30	180
Kollam	65	42	4	17	22	150
Alappuzha	59	25	12	5	19	120
Ernakulam	45	32	9	14	20	120
Thrissur	57	23	6	3	1	90
Malappuram	75	5	1	9	30	120
Kozhikode	24	63	23	11	29	150
Kannur	4	28	0	4	24	60
Kasargode	37	2	0	16	5	60
Active Margin	445	267	60	98	180	1050

Source: Primary Data

Summary

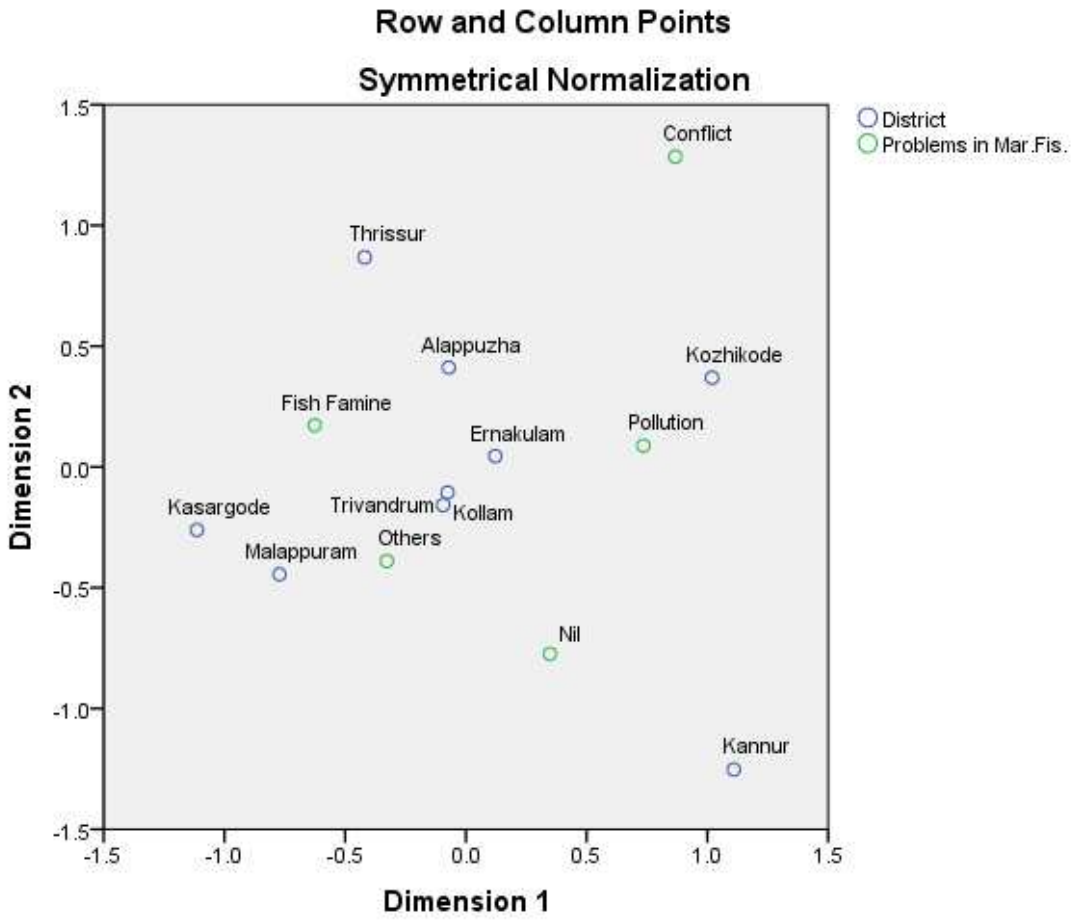
Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.377	.142			.604	.604	.025	-.086
2	.226	.051			.216	.821	.026	
3	.164	.027			.115	.935		
4	.123	.015			.065	1.000		
Total		.236	247.320	.000[a]	1.000	1.000		

a. 32 degrees of freedom

The Chi-square statistic is 247.320 and $p<0.02$. this implies that the association between the problems in marine fisheries and their district wise

distribution is highly significant. There are 4 dimensions, which are accounted for providing information regarding the districts.

Fig 3.25: *Bi-plot between Problems in Marine Fisheries Sector and Districts*



Source: Primary Data

Fish famine as observed by 445 respondents, is mainly occuring in Trivadrum, Malappuram and Kollam. Pollution affects Trivandrum and Kozhikode the most, while Kozhikode and Alappuzha are at risks of conflicts. Trivandrum, ernakulam, Kollam, Kozhikode and Kasargod are susceptible to various other issues that affects the marine fisheries. However, 180 respondents are of the view that no such problems are present in the sector. They are unaware or reluctant to share the information.

Socio-economic profiles of fisher folk in all the coastal districts have brought about interesting results. Urbanized disticts showing better socio-economic indicators than the other semi-urbanized/rural districts. Individual income seems to be the major determining factor for the household income of the marine fisher folk. This chapter gives a kaleidoscopic view of socio-economic matrix and living standards of the fishing community. A further analysis with respect to climate change related factors is attempted in Chapter 4.

Chapter 4

VULNERABILITY AND ECOLOGICAL PRESSURES ON FISHING COMMUNITIES DUE TO CLIMATE CHANGE

In this chapter awareness of climate change related factors on marine fisher-folk of Kerala and their vulnerability towards these factors has been assessed based on the sample study. Important factors indicating the climate change on the fisher folks were collected, analysed and conclusions are drawn.

The tools used in the study are correspondence analysis, chi-square test, bi-plot graph and clustered bar chart .Correspondence analysis is being carried out between districts of Kerala and the attributes associated.

4.1. Vulnerability Concept

Vulnerability can be defined as the extent to which a system is susceptible or exposed to a distress situation. Here, vulnerability relates to the extent to which the harmful impacts of climate change affects the system. It deals with the system's sensitivity and its adaptive capacity (IPCC,,2001). The concept encompasses the main components like exposure, sensitivity and adaptive capacity (Vivekanandan. E. & Jayashankar.J., 2008).

Vulnerability = f (Exposure, sensitivity, adaptive capacity)

Here, sensitivity is the degree to which the system is affected, either adversely or beneficially by a climate change stimulus (Fussel & Klein, 2006).

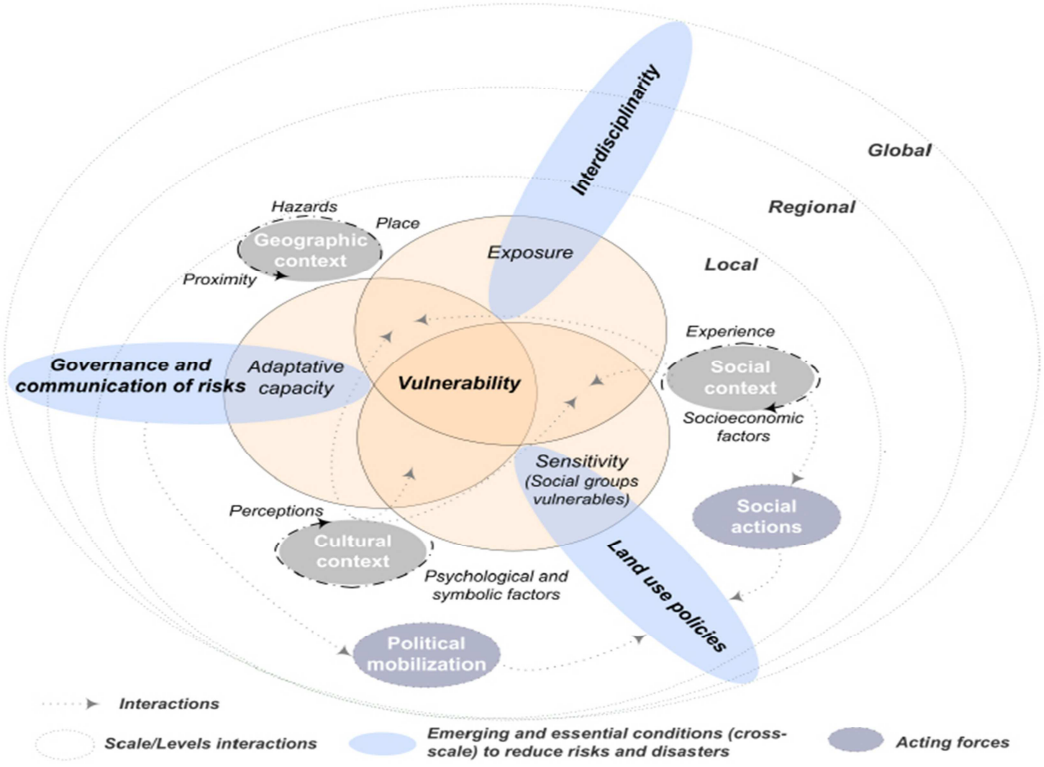
The vulnerability makes the system susceptible to the adverse impacts of climate change, which affects the biological, geophysical, social, Economic and environmental aspects of the system. According to IPCC, as a result the term

'vulnerability' can mean" the vulnerable system itself, e.g., low-lying islands or coastal cities; the impact to this system, e.g., flooding of coastal cities and agricultural lands or forced migration; or the mechanism causing these impacts, e.g., disintegration of the West Antarctic ice sheet" (IPCC, 2007).

The vulnerability of a system is associated with many risks, uncertainties and adverse impacts which can affect the system. Coastal region is a climate sensitive system, which is susceptible to various risks and uncertainties regarding climate change as well as the fishing activities of the fisher-folk, which is dependent on the sea and climate. Thus, the ocean can act as both a boon as well as a bane for the coastal population. However, despite the odds, the fisheries sector worldwide have flourished over the years, due to policy frameworks, welfare programs, coastal zone management, disaster management techniques and mechanisation. But, the sector is still backward than the general population, due to the vicious cycle of poverty they are trapped in from the beginning.

The vulnerability approach can be divided into two types. The first one including the measurement of the major vulnerability related indicators, in view of aspects like food security and disaster management. The second type is a broader concept, which deals with the analyses and formulation of vulnerability profiles of situations and systems, development of spatial maps of vulnerability or broader comparisons. Despite the difference in the kind of approaches, both have recognised the vulnerability concept as a relative aspect, which is depending mainly on the indicators constituting or leading to it. The IPCC defines the vulnerability concept as a measure of the possible magnitude of the stressful conditions affecting a system, which can be attributed by some causal shocks of external origin

Fig. 4.1: Factors Related to Vulnerability of a System



Source: Prepared by the Iwama and authors

Source: Allan Yu Iwama, Mateus Batistella, Lúcia da Costa Ferreira, Diogenes Salas Alves, Leila da Costa Ferreira (2006).

The vulnerability analysis, apart from dealing with the exposure, sensitivity and adaptive capacity of the system concerned, also looks into the causative factors of the climate change impacts. For instance, we can look into the interconnected aspects that increase the exposure of the system to the climate change impacts, the inefficient land use policies and their poor implementation that affects the sensitivity of the local population, and the lack of proper governance measures as well poor communication which deals with the reduced adaptive capacity. Apart from these, there are various acting forces which influence these three components of vulnerability. The geographical forces, which include the location, potential hazards related to the native geographical features, place, etc. affects the adaptive capacity as well as exposure of the system. Experience and socio-economic factors constitute the social forces, affecting the sensitivity of the system. Political mobilization and the nature of the political set up along with the policy measures adopted are other

driving forces, which determine both the sensitivity and the adaptive capacity of the system. These factors affect the local circle of the system. However, they can have influences in regional or global levels as well, especially in the events of prominent climatic fluctuations.

4.2. Coastal Vulnerability

The coastal vulnerability relates to the vulnerability of the coastal environment as well its local population towards the harmful impacts of climate change. The potential impacts of climate change on marine fisheries include sea level rise, natural hazards like storm surges and cyclones, rise in sea surface temperature, damage of marine and coastal ecosystems, resource depletion, variability in catch and the resultant economic loss (Vivekanandan, 2006). Several parameters that represent the vulnerability level of the fishing community, like the social, economic, physical, technical, geographical and participatory aspects, are to be identified and studied upon. For the immeasurable indicators, variables are assigned, models are formulated and are transformed into the suitable index and are analysed.

4.2.1. Various Ecological Problems Affecting the Coastal Zone:

The coastal zones are affected by various impacts of climate change. It includes sea level rise, sea surface temperature, and uncertainty in upwelling, storm surges, and coastal erosion, among others.

Sea level rise has increased approximately by 12-22cm globally by the last century and this has various disadvantages in the local ecosystem as well as the island coasts in the long run. Coastal erosion is another issue which affects the dwellings of the fisher folk as well. The coastal erosion, loss of land and related problems can be studied in a long time framework to analyse the potential causative factors and the trends of the process. A study of coastal slope and surface waves, tides and upwelling activities also helps in tracking the geological changes in the region. The wave action can influence the sedimentation process along the region. Salt water intrusion is also a problem; however, it is a result of industrialization and

excess pressure on aqua-cultural activities. Similarly, the natural hazards like storms, cyclones and atmospheric pressure induced tropical cyclones like the recent Okhi, and Kerala floods 2018 all are various manifestations of climate change impacts. Cyclones can also cause coastal inundation, which in turn hampers the livelihood of the fisher folk. A suitable way to study and analyse such changes in coastal geography is that of geomorphological techniques. This includes remote sensing, field surveys, etc. Apart from all these, coastal region is affected by human pressure from urbanisation, illegal construction, fishing pressure and resultant resource depletion, poor waste management, high population density, tourism and industrialisation. These make the coastal region uninhabitable to various organisms and flora and fauna.

4.2.2. Methods of Studying Coastal Vulnerability

The major methods of studying coastal vulnerability are index based methods, GIS based methods, indicator-based methods and methods based on dynamic computer models. The first one was formulated by Gorintz in 1990, which is based on sea level rise and the related parameters like geomorphology, shoreline change rates, coastal slope, sea level rise rate, mean significant wave height, mean tidal range. These features are rather common to the coastal regions, and CVI (Coastal Vulnerability Index) helps in coastal management and planning of policy frameworks. Later, composite and multi scale Vulnerability Indices were introduced. In indicator based approach, natural calamities were considered as variables that determines the potential vulnerability level of a susceptible system. It covers the adaptive capacity of the system as well as the various dimensions of the susceptibility of the system. The GIS based decision support system and methods on computer models are usually the community vulnerability assessment tools. Here, various decision support systems are introduced. It is an effective method in coastal zone management and disaster management. They analyse the potential risks in the region , which can be classified based on the studied of the type of models used, which may in turn be sector models or integrated assessment models, which can be used to analyse a particular parameter or do integrated studies (Sudharani,

Satyanarayana, Bhaskaran, 2015). The vulnerability indices were also constructed using parameter, attribute, resilient indicator and score (PARS) methodology, a conceptual framework developed for assessing the climate change vulnerability of coastal livelihoods..

4.2.3. Human Vulnerability

The vulnerability of a system is expressed by exposure, sensitivity and adaptive capacity of the system. However, the fisher folk in coastal region are affected both directly and indirectly, in terms of natural hazards or resource depletion, as well as indirectly as low income, poor standard of living or education and also poverty. Similarly, loss of property by tidal action, coastal flooding, etc., all indicate their sensitivity to the adverse impacts as well as their low adaptive capacity.

So vulnerability considers the individuals and their possessions as well. This can be material or value based, like property, physical or social infrastructure, values of culture, traditions or personal choices. Cultural or traditional aspects can be related to values or places of worship, like in most regions, sea being the source of their income, are worshipped as a deity in one form or other. It also encompasses the economic stability concept, which is essential for the community to be in the path of progress.

The property and physical possessions are more vulnerable and the climate change impacts have great effects on them depending on the vulnerability variations. Similarly, demographics also plays a major role here while determining human vulnerability. The young, disabled and the aged population are more vulnerable than others. Similarly, there are better off groups and very poor groups who have differing vulnerability levels, depending on the social infrastructure available to them. It can be on the basis of education, health facilities, gender (fisherwomen are more vulnerable than men, because the former earns much lower than the latter irrespective of comparable contributions) or financial strength. Marginalised sections within the fishing communities are more vulnerable than the others.

Similarly, education gives the fisher folk chances to opt other modes of livelihood, during adverse situations. So uneducated are more vulnerable, because they will have no other option, but to continue fishing, despite all the uncertainties and risks associated with the occupation.

However, the assessment of vulnerability is also influenced by the size of the population and the sample considered. The frequency of occurrence of natural hazards and the trends in climate change parameters like sea level rise, storm surges, sea surface temperature, heavy rainfall, high tides, cyclones, etc., also influences it.

In this regard, the building up of resilience and adaptive capacity are two major steps to resolve the issue. This helps in tackling the problems, by adapting to the circumstances, reducing the potential effects of the impacts and also by utilising the opportunities that are beneficial to the system.

4.3. Adaptation and Mitigation:

Exposure, sensitivity and adaptation are the key factors that can be related to the vulnerability of a system.

- **Exposure :**

The exposure of a system briefly refers to the degree to which the system is exposed to the climate impacts. The presence of people or occurrence of environmental factors and resources, existence of economic or cultural aspects in the impact prone localities adds to the chances of exposure.

For example, in assessing the vulnerability of a coastal community, along with the existing socio- economic and livelihood aspects of the fisher folk, the prevalent ecosystems as well as the indigenous resource varieties are taken into consideration. Therefore, by stressing the need for interdisciplinary to address the vulnerability issue, both the climate related parameters like the rainfall level, precipitation level, frequency of occurrence of natural hazards, sea level rise, etc., as well as the non-climatic parameters like the socio-economic, cultural, infrastructural or political setups are to be given due emphasis. Similarly, the key industrial sectors

of the area and the livelihood sources must b also considered, along with the other vulnerability boosting factors poverty or indebtedness.

- **Sensitivity:**

Sensitivity of a system refers to the degree up to which the system is affected by the adverse situation. The impacts can be from shocks or stimulants, which may prove to be beneficial or adverse to the system. In the case of climate change impacts that affect the fisher folk livelihood, they are affected by the potentially harmful impacts which can be direct like the change in temperature, heavy rainfall, flooding, coastal erosion, sea level rise, etc. or indirect like health hazards, resource depletion and resultant low catch by the fishermen, poverty and indebtedness.

So, under the sensitivity analysis, both the climatic and non- climatic factors must be analysed. Also the factors that exert higher pressure on the system making it more vulnerable and sensitive to the adverse impacts are to be found out. In this regard, exposure profiling and sensitivity projects are done under various studies.

- **Adaptive Capacity:**

It refers to the adaptive ability of the system to deal with the adverse impacts of climate change. It helps in moderating and coping up with the potential hazards as well as make use of the potentially beneficial aspects. It can be related to the capacity of the fisher folk community to address and tackle the crises caused by the climate change impacts. It deals with maintaining, minimising loss and to maximising the gain in welfare (Brenkert & Melone, 2005). The major adaptive capacity indicators can be institutional, regulatory, disaster management aspects, infrastructural facilities, and the efficiency of the system.

4.3.1. Occupation and Vulnerability

The occupation type and financial security are major socio-economic aspects that relates to the vulnerability. Someone who has multiple means of income are less vulnerable compared to someone with only a single choice of income. Therefore,

occupational multiplicity of alternate modes of livelihood helps in reducing the vulnerability level. In the case of fisheries sector, the fisher men are more vulnerable, because due to lack of adequate education and skill, they are unable to opt alternate mode of livelihood during adverse times of low catch, natural hazards, etc. Similarly, the risk and uncertainty associated with the occupation as well as the willingness on the part of the members to take risk or to averse it also determines the vulnerability level.

The traditional fishermen, with inefficient crafts and gears, are forced to go out into deeper waters due to poverty, lack of alternate income sources and also competition due to mechanisation, resource depletion and higher population density. So here, the traditional and artisanal fishermen are forced to face the uncertainties in their occupation, which enhances their susceptibility adverse circumstances.

The occupation is, however, only a part of the wider socio-economic condition of the individual. The interaction to others in the households, family and broader social network also matters. The changes out of choice and necessity are different, and these must be considered while analysing the occupational link with vulnerability. Often, it is the lack of choice that forces the traditional fishermen to choose fishing as the occupation, despite already high disguised unemployment in the sector (Hilary Lohmann, 2015).

4.3.2. Planning for adaptive measures:

The response planning and taking further adaptive measures are the major part of the vulnerability mitigation process. First of all the harmful impacts of climate changes must be listed and prioritised in the order of level of influences. For this the multidisciplinary approach is very important, by making use of all data resources and taking opinions and consultation from all the stakeholders like the traditional and mechanised fishermen, traders, exporters, policy makers, planners and the like.

Therefore, the responsive planning can be done by analysing the identified economic impacts, social, political and environmental impacts. Structural

interventions and the institutional or financial measures can help in enhancing their development. Similarly, adaptation programs and capacity building measures like awareness programs, skill development training, etc., can be implemented.

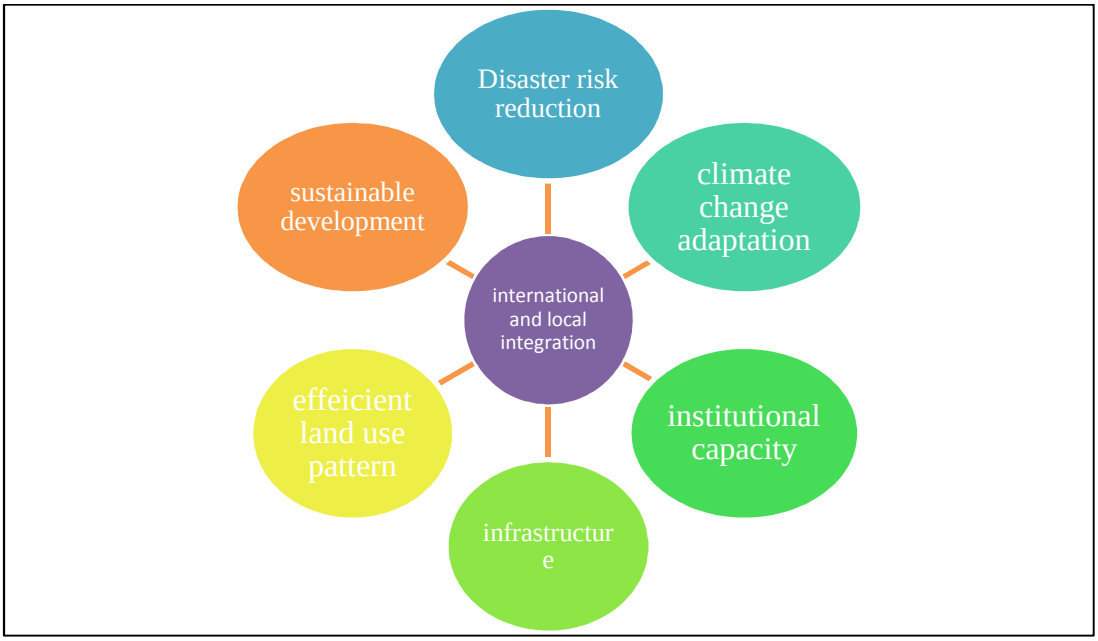
The monitoring and evaluation aspects deals with tackling the uncertainties related to the vulnerability aspects and the impacts. So, required modifications can be carried out on the existing policy measures. The sustainable development of the system must be given the utmost importance.

4.3.3. Climate Change Adaptation and Disaster Risk Reduction

In the present scenario, what is more suitable is incorporating the adaptive capacity enhancement measures with the policy agenda, instead of considering it as a separate goal to satisfy. This can be done at various levels of organisation, like national, state, regional as well as local organisations.

For this, the active participation of all the concerned stakeholders must be ensured, with contribution from international agencies, national, local NGOs and the local communities. This must be done in view of administrative efficiency and improved coordination among the various stakeholders.

Fig. 4.2: Framework for Disaster Management Plans



Source: nidm. gov. report, 2014.

Figure 4.2 presents a framework for climate change adaptation and disaster risk reduction integration. The interdisciplinary and flexible frameworks helps in creating strategic guidance to build resilience methods to deal with the impacts of climate change.

4.4. Disaster Management and Mitigation Measures

The government of India has introduced various disaster management plans to tackle the impacts of climate change in forms of natural hazards like cyclones, floods or tsunamis. The state governments are given the responsibility in this regard, at carrying out DMPs in various levels. It can be carried out by means of Hazard Risk Vulnerability Capacity (HRVC) Analysis, however, these are often inefficient in predicting the trend of occurrence of climate fluctuations or chances of natural hazards to occur. Mitigation Plan is another type of measure, which deals with the various short, medium or long term steps or solutions that can be adopted to tackle or prevent various climate change impacts. However, these measures which are mainly to be carried out before disaster, as preventive ones, are often not highlighted.

The mitigation plans must include the required modification in planning, change in economic, social and infrastructural set up already prevalent in the system, as well as the rehabilitation measures to be carried out after the disaster. The disaster management must encompass the protective measures for all aspects of the society, like biological, ecological balance, social and cultural aspects, infrastructural and livelihood aspects, economic stability as well as the management and capacity building aspects of the community. However, a majority of the plans in this regard are of emergency preparedness types. The policies and plans must advocate the tolerance and resilience aspects and efficient and strategic frameworks are to be built accordingly (nidm.gov. Report, 2014).

As per the GCF (Green Climate Fund) Concept Note, 2016, the Indian coastline is one of the most vulnerable regions affected by global climate change. This is evident from the increasing frequency of the occurrence of cyclone and

weather fluctuations in the coastal regions. Added to these, pollution from the rising urbanisation and high population density exerts higher pressure on these areas, leading to degradation of the native ecological balance. The resultant resource depletion and health issues affect the local communities residing there. Storm surges, cyclone, floods, coastal erosion are all part of this.

To protect the coastal regions, National Action Plan on Climate Change establishes various projects and missions. These aim at sustainable development, protection and conservation of coastal resources and also energy conservation. In this regard, National Coastal Mission was established to provide policy framework, which focuses on environmental preservation and community based protection measures. Vulnerability mapping, sustainable development by enhancing the resilience of the local communities and adoption of mitigation plans are part of this. It gives significance to measures like Green India Mission which stresses on reducing deforestation and promoting the restore of forest resources, the National Mission for Sustainable Agriculture and the National Mission on Strategic Knowledge for Climate Change.

The NAPCC also stresses on several measures like the developing of air-ocean circulating modelling system, high resolution ocean atmosphere variability studies, high resolution storm surge model, promoting salinity tolerant crop cultivars, providing awareness to the local communities, mangrove restoration and protection and also improved weather forecasting systems; which aims at dealing with the impacts of climate changes in coastal regions. Apart from this, the country is working towards lowering its carbon emissions.

4.4.1. Cases of Natural Hazards that Have Affected the Coast:

The Indian Ocean suffers from the impacts of climate change, and the waters are highly sensitive to such variations in atmospheric pressure, underwater earthquake, temperature fluctuations and the like. For instance, in 2006, the huge tsunami waves thrashed the Indian coast comprising Tamil Nadu, Kerala, Pondicherry, Andhra Pradesh and Andaman & Nicobar Islands. With 187 affected

villages, 180 lives lost, and a vast number of houses and property destroyed, the Kerala coastal region suffered much. The major proportion of the victims was from the fishing communities. Post disaster, in spite of various government initiated rehabilitation and welfare programs, the sector took a long time to regain its vitality. The worst affected were the traditional and artisanal fishermen. The non-motorised or mechanised gears were damaged the most. This along with the disappearance of a number of fish species coupled with lower demand of many species and resultant low prices, made the lives of the fishermen further worse. The disaster management plans and post disaster measures were carried out intensively by many organisations, NGOs, local groups and government, which have helped those (Sathiadhas & Sangeetha, 2005). However, the vulnerability or susceptibility of fishing communities to such natural hazards has remained high.

Many studies show that the Kerala coast is sensitive to climate change impacts. With low backshore elevation, some of the areas like Neendakara have possibilities of aggravating tsunami inundation. However, in some areas like Cochin Harbour, due to the various natural canals and channels present there, the chances for the level of run-up height of tsunami or the amplification of waves are relatively low when compared to many other areas. The rise in sea level, coastal erosion, and variation in sea surface temperature are all reasons for the various natural hazards that can occur like storm surges, tsunami, cyclones or coastal floods.

Similarly, the cyclone Okhi is another result of climate change. The global warming causes increased frequency of occurrence of such natural calamities. Tropical cyclones like Okhi due to atmospheric depressions are due to such imbalance in climate system. The rise in sea surface temperature can in turn increase the harming potential of such cyclones. With the present pace of global climate change and global warming, the chances are really high for such natural calamities to occur more frequently than that of in earlier times. Therefore, adequate measures must be adopted to increase resilience and adaptive capacity of the vulnerable groups, especially the coastal fisher folk, by enhancing their adaptive capacity through skill development and capacity building programs.

4.5. Resilience Aspect

Human activities have influenced the coastal environment, by changing the resistance and the resilience capacity, which leads to natural imbalances in the system. Defining briefly, resilience is the ability to recover from the adverse circumstances, especially bearing of great significance in the climate change economics, specifically regarding the vulnerability and livelihood of the coastal communities. Fisheries sector is one of such highly vulnerable communities as per the SAPCC observations. The climate variations can create various disruptions and obstacles in the marine ecosystem, fish stock, harvesting, marketing, agriculture, marketing and trade. But the lower adaptive capacity pushes the community back to further poverty. Especially, the coastal districts like Alappuzha are more vulnerable owing to the splendid diversity of ecological resources present there.

Despite the repeated warnings and protective regulations regarding the sea level rise, desertification, and decline in fisheries resources, still the lack in effective capacity building is an issue. Government has taken several steps at addressing the climate change impacts, like the State Action Plan on Climate Change (SAPCC), Climate Resilient Kerala Policies, other studies by UN and SAARC, Thanal, etc have all been only partially successful in tackling the various issues.

What can be emphasised in this situation is the capacity building of the fisher folk and also the raising of the adaptive capacity. The multidisciplinary approach is the most necessary, starting from the primary level fisher folk, by providing awareness to every stakeholder regarding the risks of depletion of resources and reduction of the fish species variability. In this regard, the emphasis must be given to interdisciplinary studies in this regard. The necessary steps must be aimed at starting from the primary level, informing all stakeholders about the risks of resource depletion and extinction or disappearance of fish stocks due to climate variability, promoting multi-disciplinary holistic approach, open sea cage farming and pen culture in coastal water bodies, including and encouraging public participation reducing gender disparities, monitoring the fisheries systems and also enhancing the

adaptive capacity of fisher folk, especially the traditional fisher folk ; and taking up sustainable measure for capacity building is necessary in this regard.

4.6. Assessment of Vulnerability to Climate Change Impacts, by Fisher folk Communities in Ernakulam district of Kerala- A Case Study

Climate change being the buzzing word of the hour, have gained a lot of attention from all over the world, from all stakeholders, administrators, politicians, environmentalists, scientists, scholars and even the technocrats. For centuries, atmospheric carbon dioxide had never been above about 300 parts per million. However, the current level being 400 ppm, owing to the escalation in integration of technology in almost every aspects of human life. i.e., the harsh impact of the industrial development and the resultant fast urbanisation of the world. Global warming, being the rise in the average temperature of the Earth's surface and its atmosphere, is the most closely related aspect of climate change, being both its cause and result. The greenhouse gases, emission, aerosols and soot, solar activity all being the causes of it. The outcomes of this phenomenon being sea level rise, sudden and extreme weather fluctuations, climate changes, ecological imbalance, and other long and abrupt impacts. All of these, being the repercussions of one another, often creating imbalance in the vulnerable ecology and even human lives, like inundation from sea level rise disturbing the infrastructure and human settlements.

Fishing communities being the most vulnerable in this category, faces a lot of harmful backwash effects of the same. Fisheries, being the important contributor to food security and livelihoods are responsible for providing essential nutrition for 3 billion people and about 50% of animal protein for people in the poor countries. The fishing sector in third world countries are more vulnerable when compared to that of developed nations who have better tools and means to exploit the resources. The climate change can have the impact on changes in various aspects affecting the fishing activities, namely, the availability, stability, accessibility and utilization. India, being a peninsular country, and fishing, being a major industry of the coastal

states which employs over 14 million people, the fishing communities here, are undeniably susceptible to aftereffects of climate variations. Riding on a robust demand for its frozen shrimp and frozen fish in international markets, India exported 11,34,948 MT of seafood worth an all-time high of US$ 5.78 billion (Rs 37, 870.90 crore) in 2016-17 as against 9,45,892 tons and 4.69 billion dollars a year earlier, with USA and South East Asia continuing to be the major importers while the demand from the European Union (EU) grew substantially during the period.(MPEDA 2017)

The vulnerability of fishing community towards the climate change, being a subject of great concern all over the world, takes the form of social, economic and even geographical problems. “A coastal area profile presents a variety of information required for effective decision-making and planning, including environmental and socio-economic information and the analysis of problems and opportunities for sustainable coastal development” (FAO). Fishing has been considered as a primary livelihood option since time immemorial, for the occupants of the coastal belt in India, stretching along 8129 km.

Fisheries sector play an important role in the economic activity of the nation, through its contribution to national income, foreign exchange, food and employment. About 12.49 lakh fisher-folk operate using diverse types of craft-gear combinations with regional and seasonal variations all along the Indian coastline. The secondary sector provides employment to more than 15 lakh people and another two lakh people is employed in the tertiary sector. It is estimated that fishery and allied activities provide livelihood security to about 30 million people (Sathiadhas et al, 2007). The density of population is very high all along the coastline as compared to the midlands and the highlands (Asia Development Bank, 2003). Kerala was made a leading producer and consumer of fish, due to the presence of a very rich marine wealth with a large variety of fish and a highly skilled population of (Aerthayil, 2000). Kerala, being an important exporter of marine products and host of various fishing communities is also facing a crunch due to both uncontrolled

fishing activity, the resultant over exploitation of resources, environmental pollution as well as the effects of climate change.

4.6.1. Vulnerability Aspects and Framework.

The conditions, situations and indicators related to the vulnerability framework and concepts takes the following aspects and dimensions, including geographical, social, environmental, technical, sectoral, equity related, policy related, gender specific, and so on.

Along the coastal areas, coastal erosion and the measures taken to control it have together led to the loss of several beaches. The barrier beaches & backwater islands of Kerala are very sensitive environmentally, socially and economically as a large population depends on the system. The communities in most of such island systems are ecosystem people who depend on the natural island system for their survival. Degradation of resources, uncertain employment and earnings, limited livelihood assets and subsistence almost entirely from fishing impacts these community's livelihood options. Rao et al., (2005) and, Beck and Nesmith (2001) argue that there is a need to give greater attention to the role of Common Property Resources (CPR) in poor people's livelihoods. Non-motorised boats with low mobility for comparatively poor fishermen also add to the problem of catch fluctuations.The sole dependence of people on marine fishery for their livelihood itself is a major challenge. The stock of resources is reported as depleting and the resulting conflict prevails between the traditional fishermen and the capitalists. The policy connected with deep sea fishing is allegedly making distress to fishermen. Most of the fishermen are severely indebted, addicted to alcohol & drugs, under educated and lacking skills for alternate employment. It helps occasionally in mushrooming of the illegal activities and attracts more and more unemployed youth. Darkened expectation in life, illiteracy, lack of awareness & counselling support, rising influence of alcohol and drugs, rise in communalism and criminal tendencies, etc. are some of the reasons for such social issues. On a whole, backwardness becomes the hallmark of fisherman. This vicious circle of poverty needs to be broken so that a virtuous circle of prosperity is set in motion by 2030. (John Joseph,

2015). Consequently schooling on one hand result in putting the out of their traditional occupation and also the dropout rate is higher in fisher folk. (John Kurien, 1981).So, the people have limited alternative skills other than the traditional fishing activities.

"Increased incidence of extreme events such as storms, floods and drought will affect the safety and efficiency of fishing operations, flow of rivers, area covered by wetlands and water availability and will have severe impacts on fisheries. Sea level rise will have effects on the coastal profile and livelihoods of communities. The potential outcome for fisheries may be decrease in production and value of fisheries, and decline in the economic returns from fishing operations". (E. Vivekanandan). Inter-governmental Panel on Climate Change 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).

It is the open-access or common property nature of the sea that attracts large numbers of poor people to find their livelihoods there, and they are badly affected when the terms of access to the resource change. Open access allows the entry of bigger players into the sector, which come to dominate or even monopolize access to resources – often with the facilitation of the state – and marginalize traditional stakeholders. Development efforts have given rise to a hierarchy based on economic criteria in the villages. The diffusion of new technologies has benefited a few people, with the large majority becoming wage earners and several others becoming redundant. Changes in marketing patterns brought about a change in sharing patterns, transforming fishing crew from shareholders to employees, although they still retain a share in the catches (Venkateshsalagrama).

About the societal issue faced by the fishing communities due to climatic change, the primary challenge to the fisheries and aquaculture sector will be to ensure food supply, enhance nutritional security, improve livelihood and economic output, and ensure ecosystem safety. These objectives call for addressing the concerns arising out of climate change, and evolve adaptive mechanisms and implement action across all stakeholders at national, regional and international

levels (Allison et al., 2004; Handisyde et al., 2005; Leary et al., 2006; World Fish Center, 2006; FAO, 2008). In response to shifting fish population and species, the sector may have to respond with the right types of craft and gear combinations, on-board processing equipments etc. Governments should consider establishing Weather Watch Groups and decision support systems on a regional basis. Allocating research funds to analyze the impacts and establishing institutional mechanisms to enable the sector are also important.(E.Vivekanandan). For instance, Coastal Regulation Zone notification is perceived as being partially effective, trawl ban is considered to be effective.

Trade policy tools like tariffs, subsidies and standards, can also affect the fishers. Likewise, a major problem of competition with more powerful forces, coupled with the community based governance systems and the absence of institutional mechanism among the fishers, can be addressed by promoting cohesion within the fishing communities, imparting awareness about new laws and schemes that which restrict or promote the fishing activities and to encourage capacity building. On a different note, adaptive capacity can be increased through equal distribution of resources. It is related to the resource conservation and participation in management, which are in turn linked to the aspect of technology of harvesting, certain historical rights and even certain value premises. Within each zone of Kerala coastline, geography, fishery resources, infrastructural and mechanical facilities and market access are relatively same. Thus, the fishing community can have greater involvement in the development and conservative management of fishery resources with the united efforts of active fishermen, social workers, social and physical scientists and voluntary associations concerned with socio-economic and ecological issues. However, artisanal fishermen are more affected, leading to poverty. Open and regulated access to new technologies can be emphasised (Pavithran.A.P, Sachin.et.al. 2018).

On the gender perspective, the fisherwomen in Kerala play an important role in the fisheries sector in terms of their involvement in fishery related activities viz., fish vending, fish drying, prawn peeling, sorting, grading, fish packing, and net

making. However, they are more vulnerable than men in receiving the after effects of the impacts. The highest level of gender discrimination faced by all the respondents across the four different occupational groups were in handling, transporting and storing bulk quantities of fish resources. “Micro enterprises and SHGs linked to any financial institution in order to obtain credit facilities, like Rashtriya Mahila Kosh, NABARD, banks; can be assisted technically or financially by local self-government or NGOs, Grama Panchayat, Municipalities, Corporation, or resource departments. The flagship programmes of SAF, and the Theeramythri mainly aims at the social and economic emancipation through encouraging employment. This can act as a great relief for BPL fisherwomen, who does jobs like vending and trading of fish, apart from household support, as it helps to achieve a financial stability; and non SHG members, can organise occupational ones to start micro enterprises. In Kerala, 80% of the incomes generating groups were formed by the women beneficiaries. Similarly, Mahatma Gandhi National Rural Employment Guarantee Act was implemented, with over 91% beneficiaries as women in Kerala. Regarding political empowerment, after the implementation of Panchayati Raj in early 90s and the decentralisation of power in the local self-government department bringing a reservation for women first up to 33% and then to 50%, women empowerment has increased on a great sense. But, violence and sexual harassment against fisherwomen are on an increasing trend. Still they face several social and economic barriers. So gender specific strategies are to be initiated and implemented, like establishment of self-help groups, etc., thereby creating additional livelihood opportunities for them. With education, awareness, active participation and employment generation by implementing inter-disciplinary models through SHGs and welfare schemes, they can drive the development process in a faster pace. So, it should be a strong focus on involving and empowering women in particular because income earned by this group is more likely to benefit the entire household. Gender sensitive research helps in attaining the inclusive growth through finite strategies of development, so the sustainable goals can be met for uplifting the vulnerable groups in the context of aspects like climate change and development”.(Pavithran. A.P, Sachinet.al 2017).

So, altogether, for the betterment of the condition of the fishing communities, development of regional adaptation networks is a necessity. According Sunil Santha, "formal adaptation strategies are highly techno-centric, costly, and do not take into account the vulnerabilities of the fishing community. Instead, they have contributed to ecological, livelihood, and knowledge uncertainties. The adaptation strategies of the fishing community are a response to these uncertainties." So, evidences are to be generated, gathered and documented. Linkages between scientific aspects, policies and practice should be strengthened. Establishment of the network between the members and identifying the location's priority needs helps in addressing the problems more systematically and efficiently.

Fishing community lives very close to the coast (and they are affected to)

- Cyclone, which hinders the fishing activity for a definite period of time, even affecting the marine lives also. The recent occurrence of the cyclone, Okhi along the Kerala coast is a relevant example of how the livelihoods of the fishing community were affected.
- Storm surges, which curbs the boats from going in the offshore areas, thus curbing the prospects of a better catch. Fishing is mainly dependent on seasons and a poor or delayed monsoon, which affects the indigenous and seasonal fishes and thereby, the seasonal harvests also.
- Floods, can hamper the livelihoods of the fishing community, affecting the poor infrastructure and fishing activities.
- Sea level rise, can cause the various outcomes of variation in currents and bottom pressure in the near shore regions, variation in tidal activities, changes in wave patterns, and so on.
- Coastal erosion, is reported to affect about 23% of the shoreline along the Indian mainland. (Vivekanandan,2011)
- Fish availability can change with respect to tabulations in the weather pattern and it manifests in the forms of changes in the migration and breeding

seasons of fish varieties , or even endangering some of the fish varieties eventually.

4.6.2. Materials and methods

Selection of coastal villages Coastal villages from Ernakulam District for the study were selected based on different parameters viz., socio-economic factors, number of families below poverty line, job migration, infant mortality, adult-child ratio, average family size, gender ratio, literacy rate, dependence on fishing activities, craft and gear inventories, participation in cooperatives and ancillary activities. The study was conducted for a period of one year from May to November 2015.

4.6.3. Socio-economic profile

The socio economic profile collected include ages of the fishers, educational standards of the fishers , experience in fishing(years) and distance of houses from coastline (m). The study on the age distribution of respondents revealed that the majority of them belonged to the mid age group of 36 to 55 years. This was followed by older age group, i.e.; people belonging to over 55 years and finally the young age group. The younger group being in minority can probably be attributed to change from traditional fishing to other means of livelihood

4.6.4. Vulnerability Assessment of the Fisher Households

Vulnerability studies are being conducted on an increasing basis, due to growing concerns and discussions regarding the various effects and implications of climate change as well as the socio-economic resources. So the various potential drivers that helps in adding the frame to the vulnerability study of fishing community were to be considered.

Vulnerability to climate change is defined by IPCC (20007:883) as “the degree to which a system is susceptible to, or unable to cope with, adverse effects of

climate change, indicating climate variability and extremes" and is a "function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity".

The vulnerability indices were constructed using parameter, attribute, resilient indicator and score (PARS) methodology, a conceptual framework developed for assessing the climate change vulnerability of coastal livelihoods. PARS provides prioritisation and ranking of different impacts as perceived by the fishers and the frame work allows adequate distribution between fishing related factors. The fishers were asked to rank between 1– 5 indicating the severity of the vulnerability: 5 indicates very high, 4 - high, 3 - medium, 2 - low and 1- negligible/marginal. Each and every parameter will lead to different attributes and the attributes will lead to different statements or resilient indicators which will be based on different scores. The rank based quotient technique was used to analyse the scores and the ranks were in such a way the most affected attribute will get the highest ranking. PARS methodology was analysed using rank based quotient (RBQ) formula of Sabarathnam (1988). Rank Based Quotient = $\sum_{i=1}(Fi)(n+1-i) \times \frac{100}{Nn}$ where, Fi = number of farmers reporting a particular problem under ith rank, n = number of problems identified and N = number of fishers. This methodology is very much useful to find out which parameter or which attribute of the parameter is the most vulnerable factor of the area in terms of climate change.

Table 4.1: *Rank-wise Analysis of Various Vulnerability Parameters*

Parameters	Chellanam	Rank	Cheriyakadavu	Rank	Kannamali	Rank	Composite data	Rank
Environmental	60.23	2	59.31	1	58.30	3	59.28	2
Fishery	62.45	1	58.43	2	61.30	1	60.72	1
Social	57.43	4	57.50	3	60.40	2	58.43	3
Economic	58.32	3	53.43	5	59.45	4	57.06	4
Development Drivers	52.45	5	56.45	4	58.40	5	55.76	5

Source: Primary data

PARS methodology was applied in an effort to understand the indicator factors of coastal vulnerability in the selected fishing villages of Ernakulam district and scale up the impacts, adaptations and mitigation plans of coastal livelihoods to the district level. The application of PARS methodology in this study helped to assess impact of climate change on the five different parameters considered**.**

Among the three fishing villages studies, the analysis of environmental parameters showed that Chellanam was the most vulnerable area (60.23%) towards the climate change; followed by Cheriyakadavu (59.31%) and Kannamali (58.30%). While analysing fishery indicators also Chellanam was found to receive major part of the impact (62.45%), and Cheriyakadavu was the least affected with (58.43%) and Kannamali being 61.30% susceptible to the impact. When considering the third indicator, i.e., the social parameters, it was found that Kannamali faced 60.40% of impacts of the social indicators, and Cheriyakadavu and Chellanam remained somewhat similar with 57.50% and 57.43% respectively .The same pattern was seen upon analysing the impact of development drivers with Kannamali having 58.40% ,Cheriyakadavu with 56.45% and Chellanam having 52.45%. In the case of economic parameters, Kannamali had the most impact among the three fishing villages, with 59.45 %, followed by Chellanam (58.32%) and Cheriyakadavu (53.43).

Upon considering the composite data of all the three villages, it was found that the fishery indicators affected the villages the most with 60.72%. This was followed by environmental parameters (59.28%) and social parameters (58.43%).

The villages were affected by economic indicators by 57.06% and lastly by development drivers by 55.76%. Several selected aspects were considered upon selecting the various indicators which were clubbed together under various parameters.

The study in the selected fisher households in all the three villages indicated that climate change has mostly impacted fishery based on the fishers' perception on different attributes followed by other attributes. In Chellanam fishing village, fishery parameters (62.45%) had severe impacts, which were followed by environmental impacts (60.23%) and economic impacts (58.32%); whereas in Kannamali, fishery attributes had the greatest impact (61.30%), which were followed by social impacts (60.40%) and economic attributes (59.45%).

The data on the composite villages indicated that on a wider level also, fishery is the most impacted parameter, owing to the heavy felt effects of the climate change followed by the effects and impacts of environmental and social parameters. Here, development drivers is the least impacted parameters as perceived by the fishers.

4.6.5. Fishers' Perception on the Causal Factors of Change

An analysis was carried out to assess the fishers' response to what could possibly be the causal factors for climate change. The perception of the fishers towards the casual factors of climate change indicated that temperature, sea level rise, ocean currents, landslides, urbanisation, cyclones, industrialization, habitat destruction, pollution and wind can be considered as the causative agents of climate change.

The potential causes for the various impacts can be related to anthropogenic (pollution and overexploitation) and climatic factors (Kristin, 2013). Upon considering the views of the community level actors, both pollution and rising fishing pressure that leads to increased exploitation of the marine resources, are also considered as major stressors on fisheries resources. (Vivekanandan, 2011). The

fishers responded that temperature (85.9%) followed by pollution (75.2%) and sea level rise (63.1%) as the significant causal factors for climate change.

The study indicated that fishers' response to climate changes was in consonance with real time changes in the environment, with regard to temperature rise, rate of pollution, the change in wind pattern as well other ocean parameters. It was also noted that the long term effects of climate change weren't felt much among the fisher household. The fishers could only realize immediate issues such as loss in fishing days and erratic monsoon resultant which in turn leads to economic losses. Relatively poor technology, infrastructure, economic factors of cost and revenue, barriers and laws, along with the equity issues related to the accessibility , poor linkages and gender related social and economic barriers adds up the crisis. This can be effectively addressed through sustainable management and ensuring equitable resource distribution, capacity building, promoting adaptive capacity, spreading awareness on various laws and schemes, establishment of institutions, taking measures to protect the environment and by emphasizing the gender sensitive strategies.

4.7. Ecological Pressures on Fishermen Community due to Climate Change

Observations and opinions from the respondents about the ecological pressures on fishermen community due to climate change and its impact on the fisher-folk of Kerala were collected with the help of some statements and questions.

The opinion collected from the respondents regarding climate change indicates that 73.14 per cent of them have noted many factors relating to the climate change. They have reported that changes in the level of temperature, availability of rainfall, change in the sea water colour, availability of fishes, non -availability of certain species, change in the direction of flow of sea water, etc. are noted by them. Experience shared by the fishermen who participated in the FGDs brought to light that certain species are not at all available for the last few years.

4.7.1. Costal Upwelling

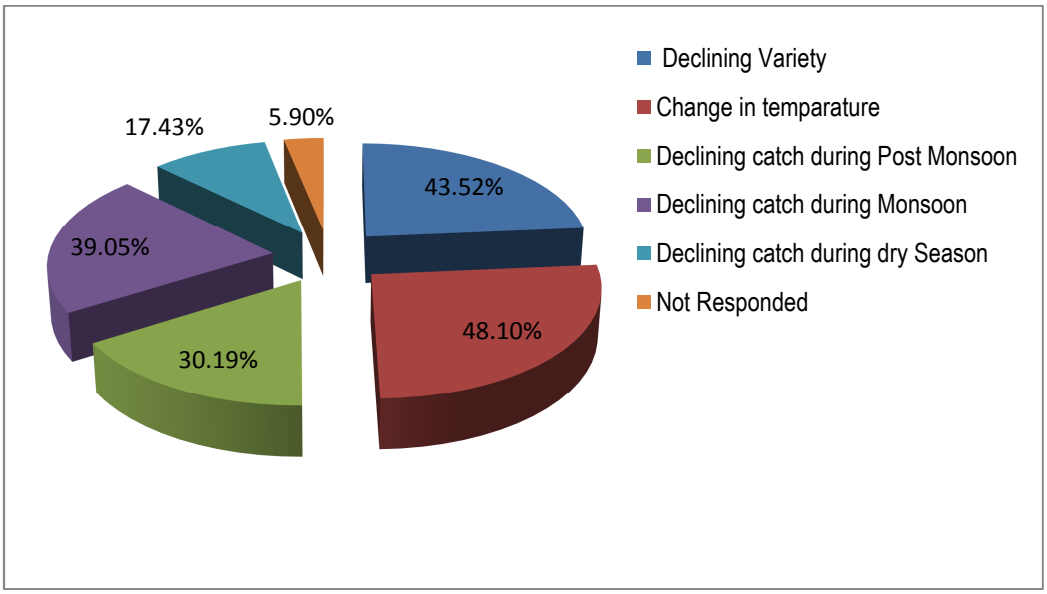
Coastal upwelling is the upward movement of water along the coast. Water that rises to the surface as a result of upwelling is typically cooler and is rich in nutrients. These nutrients "fertilize" surface waters, meaning that these surface waters often have high biological productivity. Therefore, good fishing grounds typically are found where upwelling is common. The Malabar upwelling zone along the Kerala coast (south-west coast of India) is one of the important upwelling systems of the world (Bakun et al., 1998) and contributes about 20 per cent to the marine fish catch of India. This phenomenon was well studied and reported by Johannessen, O.M, et al. in 1981. They found that coastal upwelling is a repetitive phenomenon in the Kerala coast during the south- west monsoon period. According to them, a north flowing coastal current from November to December through January – February is associated with the influx of low salinity water from the south.

However, the data collected from the fisher-folk relating to this phenomenon indicates that only 20.61 per cent of the respondents have noticed it. Coastal upwelling was mostly observed by the fisher-folk of Kannur (35 per cent) and Kasaragod (32.78 per cent). It is also reported that upwelling was observed during the monsoon season. But, the participants of the FGDs at Sakhthikulangara in Kollam and Pollethei in Alappuzha reported that during earlier years the flow of water from south to north direction was regular in every monsoon period, but recently there is a change in this flow. The absence of this northward flow has resulted in to a large scale decrease in the availability of fish. Nearly 80 per cent of the fisher-folk are not aware of this phenomenon.

4.7.2. Indicators of Seasonal Variation

Opinion of the respondents regarding the indicators of seasonal variations were collected and categorised. These indicators are declining variety, changing temperature, non-availability of fish during post monsoon, declining catch during monsoon and declining catch during dry season.

Fig. 4.3: Indicators of Seasonal Variation According to the Respondents



Source:Compiled from primary data

Fig.4.3 shows that change in temperature is the indicator noted by most (48.1 per cent) of the fisher-folk. Similarly, declining catch during dry season (43.52 per cent), during monsoon (39.05 per cent) and during post monsoon (30.19 per cent) are the major indicators of climate change as observed by the fisher-folk. The district-wise details are given in **Appendix 35.**

4.7.3. Influence of Climate Change

Observations, of the fisher-folk, relating to the influence of climate change in the fisheries sector were collected. The data pertaining to this shows that change in water level, disappearance of traditional species, change in water temperature, change in water colour, etc. are the clear evidences for the changes in the climate and its influence on the fisheries sector.

Table 4.2: *Influence of Climate Change as Observed by the Respondents*

Indicators	Respondents Observed	
	Number	Percentage
Change in Species Landed	491	46.76
Occurrence of New Species	144	13.71
Disappearance of Traditional Species	704	67.05
Change in Roaring Sea	481	45.81
Change in Water level	571	54.38
Change in Water colour	551	52.48
Change in Water Temperature	505	48.10

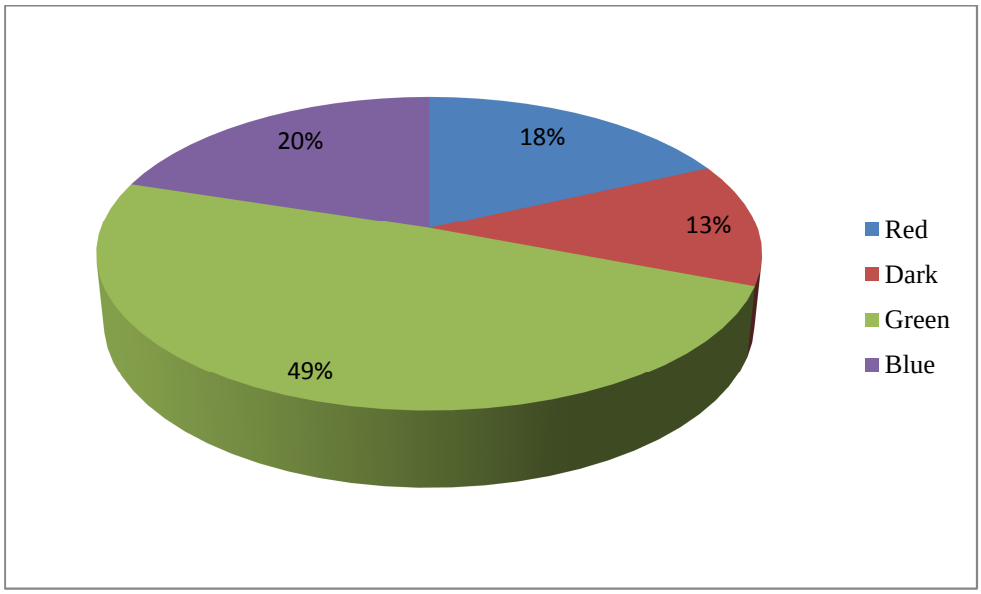
Source: Primary data

As shown in Table 4.2, majority of the fishermen have observed the changes taking in different factors. Nearly 67 per cent of the respondents have observed the non- availability of traditional species; 54.38 per cent noted the change in water level; 52.48 per cent noted change in water colour and 48.1 per cent note change in water temperature (they specified that water temperature has been increasing over the years). Of course, the observations shared by the respondents confirm the influence of climate change in the fisheries sector.

4.7.4. Water colour during May-August

The respondent fisher-folk reported different water colours at various parts of the Kerala coast during May – August, covering the monsoon season. The colour as reported by them is shown in fig.4.4.

Fig. 4.4: Water Colour during May-August as Reported by the Respondents



Source: Primary data

As shown in fig.4.4, 49 per cent of the respondents reported green colour during the period; 20 per cent blue colour; 18 per cent red colour and the remaining 13 per cent reported dark colour. Green colour was reported by fisherfolk of Ernakulam, Thrissur, Malappuram, Kozhikode, Kannur and Kasargod. Dark colour was reported mainly by the fisherfolk of Trivandrum district; While Red colour was reported by the fisherfolk of Kollam and Alappuzha districts (See **Appendix 36**).

Table 4.3: Correspondence Table between water coloration and Districts

District	Water colour				
	Red	Dark	Green	Blue	Active Margin
Trivandrum	0	120	33	27	180
Kollam	106	4	27	13	150
Alappuzha	74	1	1	44	120
Ernakulam	4	0	90	26	120
Thrissur	0	0	77	13	90
Malappuram	0	1	85	34	120
Kozhikode	3	0	115	29	147
Kannur	3	8	38	11	60
Kasargode	0	0	49	11	60
Active Margin	190	134	515	208	1047

Source: Primary Data

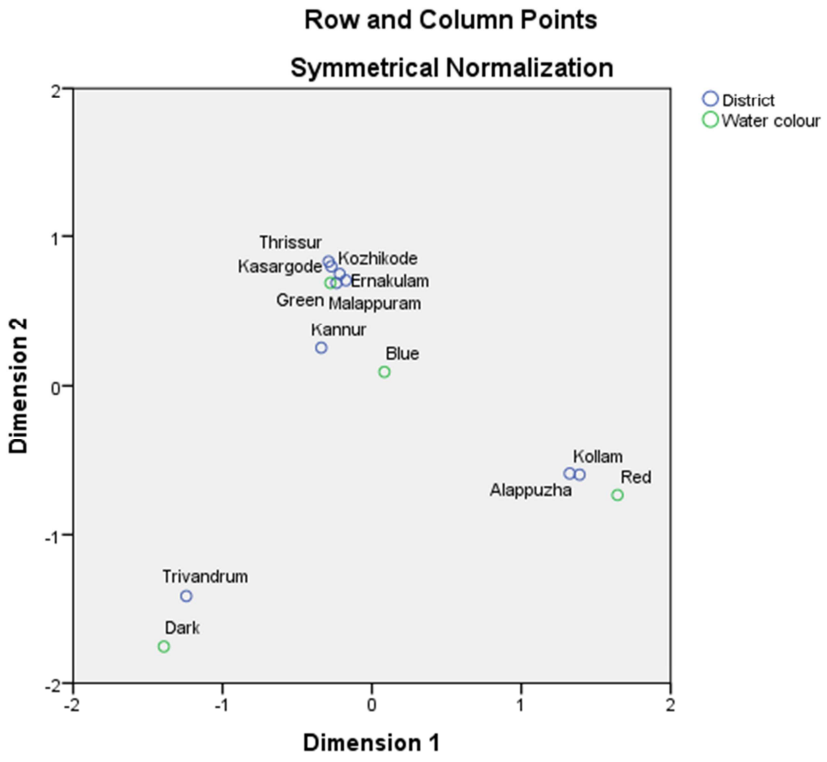
Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.778	.605			.517	.517	.018	.538
2	.725	.526			.450	.967	.021	
3	.197	.039			.033	1.000		
Total		1.170	1225.120	.000[a]	1.000	1.000		

a. 24 degrees of freedom

The Chi-square test value between coastal upwelling and district wise distribution gives 1225.120 and $p<0.05$, making the association between the two highly significant.

Fig 4.5: Bi-plot between Changes in the Water Colour and the Districts



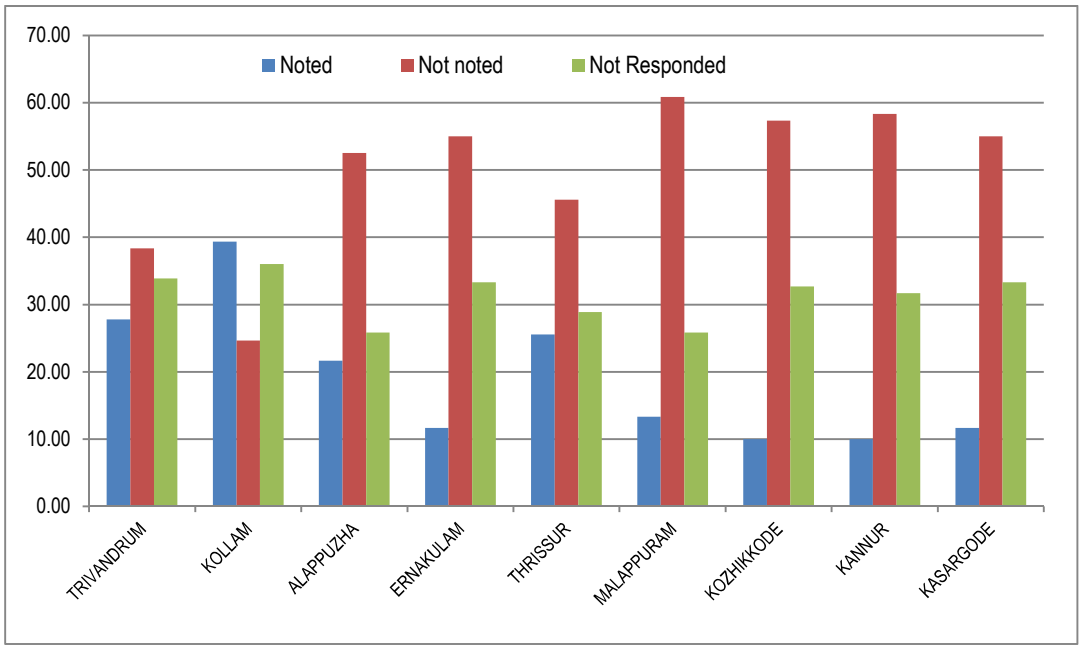
Source: Primary Data

The above bi-plot graph (4.5) shows that red colouration in tides is predominantly observed in Kollam and Alappuzha. While dark tides are observed in Trivandrum, a green colouration of sea water is observed in Kozhikode, Ernakulam, Malappuram and Thrissur. Blue tides are mainly observed in Alappuzha and Malappuram. The distribution of observation of blue sea water colouration is somewhat similar in all the districts.

4.7.5. Presence of Algal Bloom

The water colour during the monsoon season is to be linked with the presence of algal bloom. Fig.4.6 shows the percentage of respondents who have noted the presence of algal bloom in different parts of the coastal waters of Kerala.

Fig. 4.6: Observation of the Respondents about the Presence of Algal Bloom



Source: Primary data

The data shows that majority of the fisher folk are not aware of the algal bloom or phytoplankton (See **Appendix 37**). It was found that nearly 29 per cent of the respondents have noted the presence of algal bloom during monsoon season; while 15.96 per cent have noted its presence during the post monsoon season. Regarding the type of algal bloom and its influence on the fishery resources scientific study is required to make any interpretation.

4.7.6. Sea-Surface Salinity

Opinion of the respondents about the relationship between level of salinity and availability of fish was collected.

Table 4.4: *Relationship between Level of Salinity and Availability of Fish*

Opinion on Availability of Fish	Level of Salinity	
	High	Low
	Per cent	Per cent
Increases	6.86	15.05
Decreases	20.10	4.10
No change	12.37	11.80
Not aware	60.67	69.05

Source: Primary data

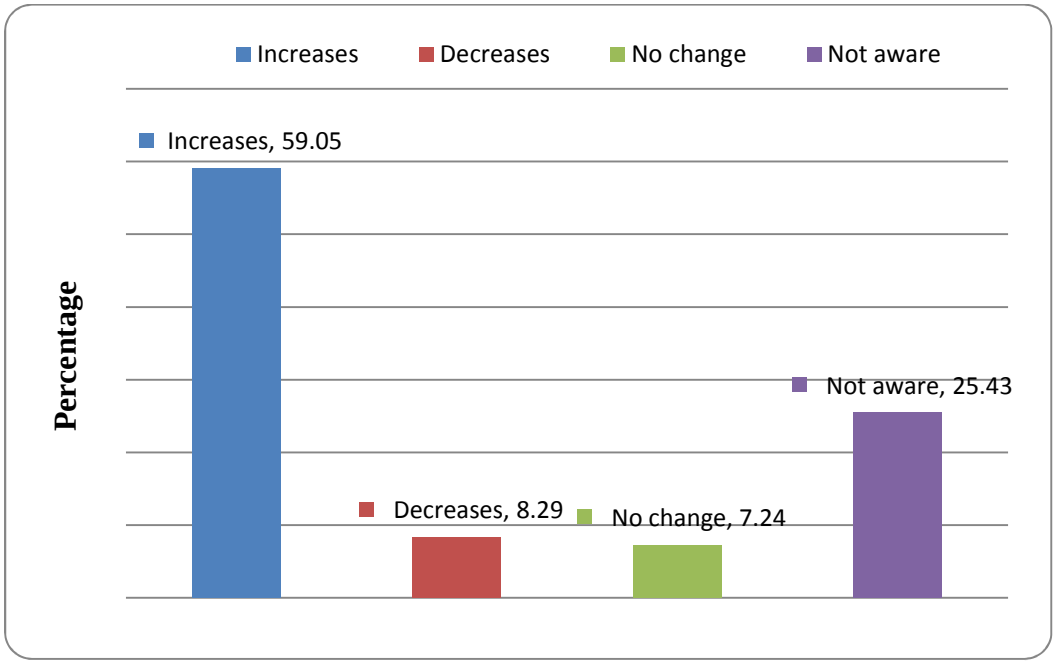
It is clear from Table 4.4, that most of the fisher-folk are not aware of the relationship between the sea water salinity and the availability of fish. When 20.1 per cent opined that fish availability decreases as a result of an increase in the water salinity, 6.86 per cent made a reverse opinion. Similarly 15.05 per cent of the respondents believe that availability of fish increases when salinity decreases. Perhaps, it may be due to fact that during the summer season, as a result of evaporation of water, level of salinity increases. At the same time, during summer season, fish availability will also be less because of intensive catch. Here also a final conclusion can't be made simply on the basis of opinion from the respondents.

4.7.7. Level of Sea Surface Temperature

Increasing sea surface temperature is a serious concern before the mankind today. When water heats up, it expands. Thus, the most readily apparent consequence of higher sea temperature is a rapid rise in sea level. Sea level rise causes inundation of coastal habitats for humans as well as plants and animals, shoreline erosion, and more powerful storm surges that can devastate low-lying areas.

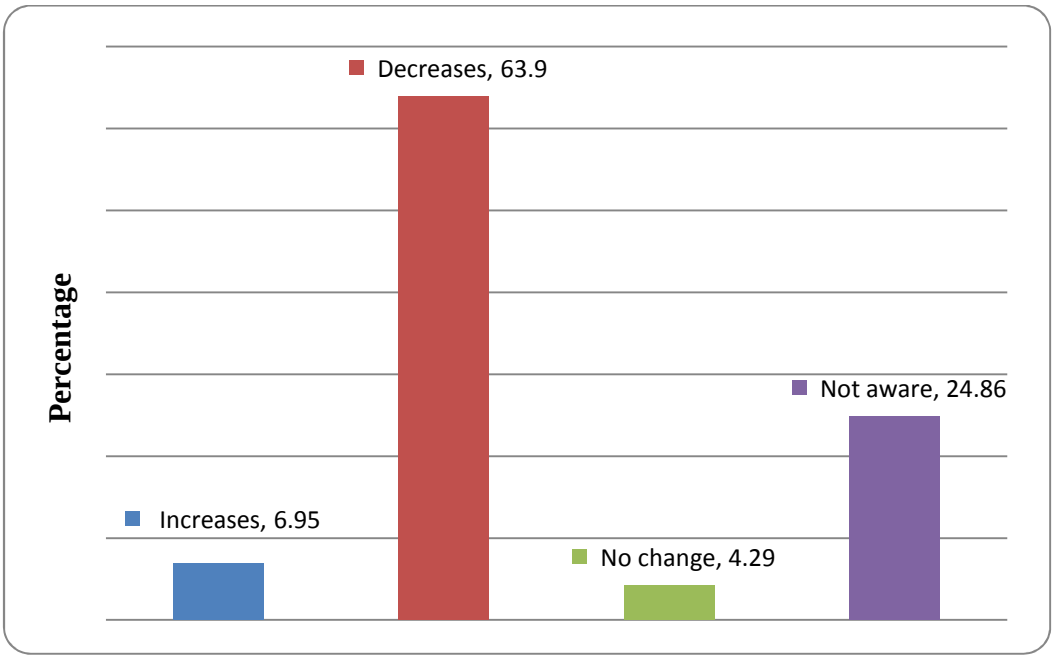
The observations on the sea surface temperature were collected from the respondents and analysed. It shows that 59.05 per cent of the respondents opined that fish availability increases when the sea surface temperature is low (see fig.4.7.). Similarly 63.9 per cent of the respondents believe that the availability of fish decreases as a result of an increase in the sea surface temperature (see fig. 4.8).

Fig. 4.7: Availability of Fish when SST is Low



Source Primary Data

Fig. 4.8: Availability of Fish when SST is High



Souce: Primary Data

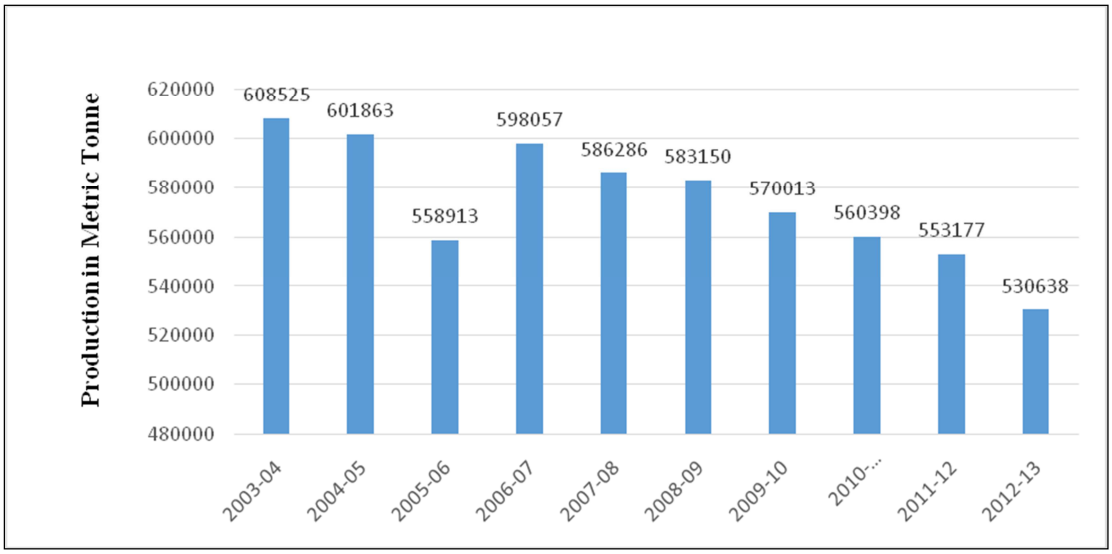
The increasing sea surface temperature and the rise in sea level were important concerns raised by the participants of the FGDs at different places. They explained that in many places, especially in Pollethei, Alappuzha, and Kanjhangad the private lands were eroded up to 50 meters within a period of five years. While explaining their experience, they said that they can feel the water temperature simply by touching and can predict the chances of getting fish. The participants also confirmed that sardine has moved to other places and those available in the Kerala coast, have gone to further deep waters.

According to Venkatesh, one possible impact of rising sea-surface temperature being felt by the fishers might relate to the changing fish composition in their catches. The small-scale gillnet fishers of Andhra Pradesh have reported that the depth of the surface gillnets, which was four fathoms in the 1980s, has now gone up to nine fathoms; the fishers contend that the pelagic species have descended to the lower layers from the surface due to variation in surface-water temperature (Salagrama, Venkatesh, 2012). The findings of the study by Vivekanandan et al. (Vivekanandan,E, 2009) are most relevant here. The study concluded with the

remarks that oil sardine fishery did not exist before 1976 in the northern latitudes and along the east coast as the resource was not available. With warming of sea surface, the oil sardine is able to find temperature of its preference especially in the northern latitudes and eastern longitudes, thereby extending the distributional boundaries and establishing fisheries in larger coastal areas. It is expected that the distribution may extend further to Gujarat and West Bengal coasts in forthcoming time assuming that other fishery related physical and biological parameters will not vary considerably. However, if the sea surface temperature in the southern latitudes increases beyond the physiological optimum of the fish, it is possible that the population may be driven away from the southern latitudes, which will reduce the catches along the south-west and south-east coasts in the future.

Perhaps, the data relating to marine fish landings during the last few years also support that climate change may have influenced fish landings in Kerala. The trend in marine fish landings during the period from 2003-04 to 2012-13 is given in fig.4.9.

Fig. 4.9: Fish Production in Kerala

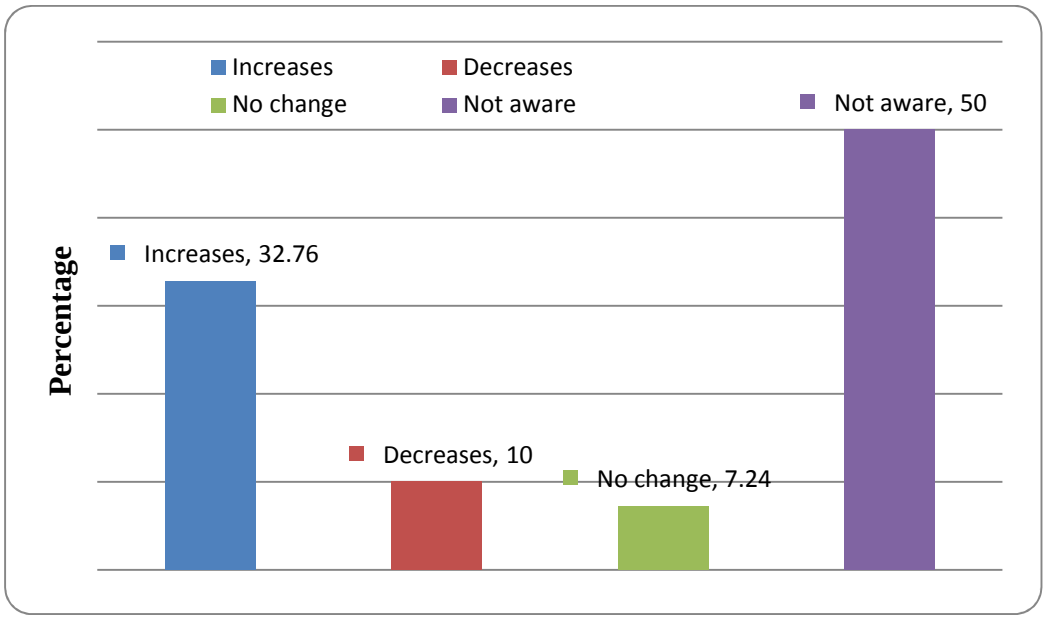


Source: Department of Fisheries, Govt of Kerala, Facts and Figures 2012 & Kerala Economic Review, 2014.

4.7.8. Humidity and Availability of Fish

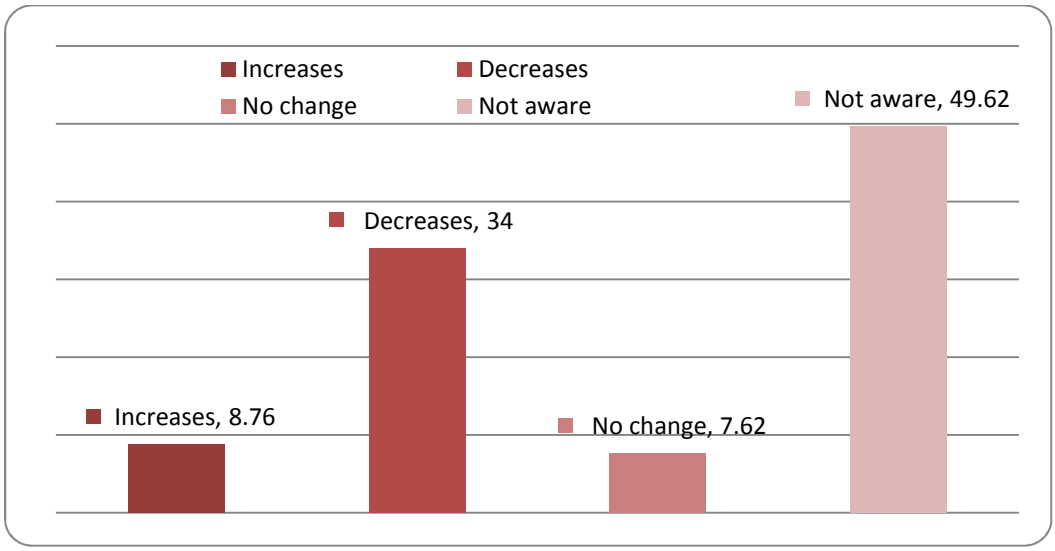
The relationship between humidity and availability of fish was tested using the chi-square test. It shows a positive correlation between the two. The opinions collected from the respondents are shown in fig.4.10.

Fig. 4.10: Availability of Fish when Humidity is High



Source: primary data

Fig. 4.11: Availability of Fish when Humidity is Low



Source: primary data

Table 4.5: *Humidity and Availability of Fish- Case Processing Summary*

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
AVFISH1 * HUMIDITY	2100	94.7per cent	118	5.3per cent	2218	100.0per cent

AVFISH1 * HUMIDITY Cross tabulation

Count

		Humidity		Total
		1	2	
AVFISH1	1	344	92	436
	2	105	357	462
	3	76	80	156
	4	525	521	1046
Total		1050	1050	2100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	283.224[a]	3	.000
Likelihood Ratio	300.450	3	.000
Linear-by-Linear Association	19.136	1	.000
N of Valid Cases	2100		

a. 0 cells (0.0per cent) have expected count less than 5. The minimum expected count is 78.00.

Symmetric Measures

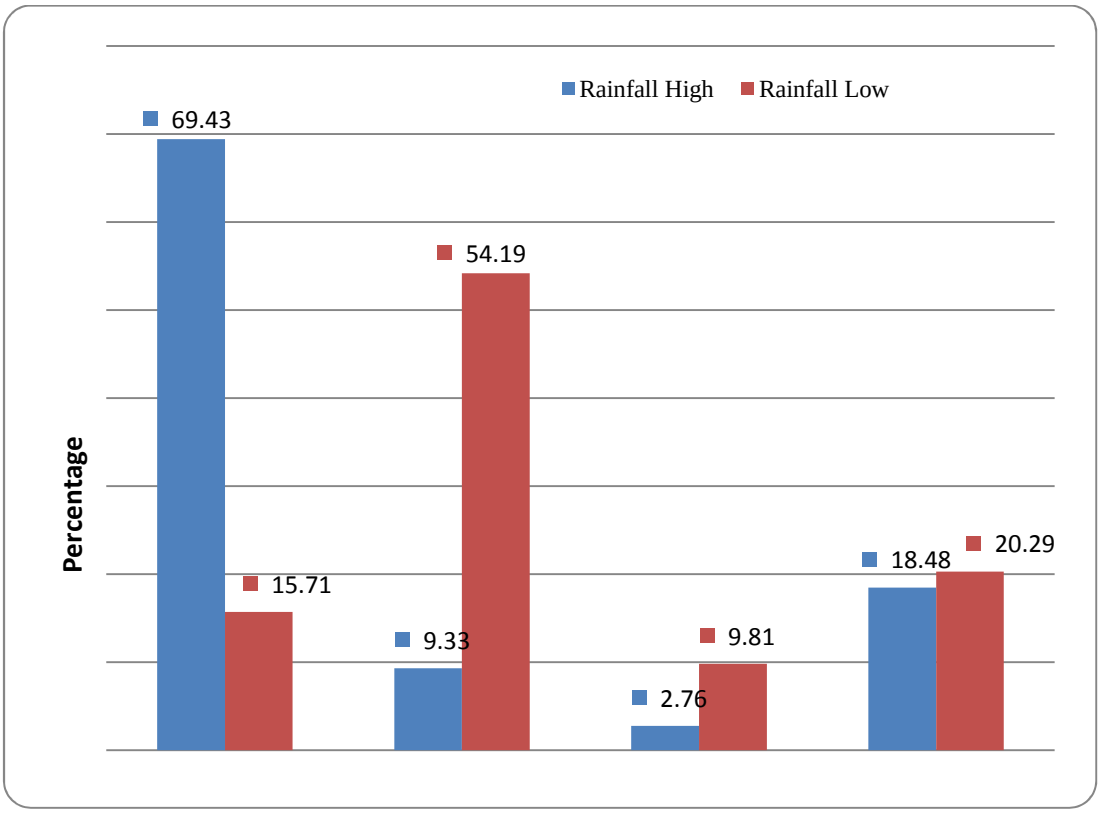
		Value	Approx. Sig.
Nominal by Nominal	Contingency Coefficient	.345	.000
N of Valid Cases		2100	

Interpretation: Humidity and availability of Fish are significantly correlated (chi-square = 283.224, df = 3, coefficient of contingency = 0.345, P< 0.01). Availability of fish is found to increase as humidity increases. Significant decline in fish availability is noted for lower levels of humidity.

4.7.9. Impact of Rainfall on Fish Availability

The data collected from the respondents reveal that the availability of fish increases as a result of an increase in rainfall and vice- versa. As shown in fig.4.12, 69.43 per cent of the respondents opined that fish catch increases when rainfall increases. The chi-square test also supports this argument. The respondents also have pointed out that if there happens a sudden rainfall when the temperature is high, availability of fish increases.

Fig. 4.12: Relationship between Level of Rainfall and Availability of Fish



Source: Primary data

Table 4.6: *Rainfall and Availability of Fish- Case Processing Summary*

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
AVFISH * RAINFALL	2100	100.0per cent	0	0.0per cent	2100	100.0per cent

AVFISH * RAINFALL Cross-tabulation

Count

		RAINFALL		Total
		1	2	
AVFISH	1	729	165	894
	2	98	569	667
	3	29	103	132
	4	194	213	407
Total		1050	1050	2100

Crosstabs

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	730.779[a]	3	.000
Likelihood Ratio	797.049	3	.000
Linear-by-Linear Association	172.185	1	.000
N of Valid Cases	2100		

a. 0 cells (0.0per cent) have expected count less than 5. The minimum expected count is 66.00.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Contingency Coefficient	.508	.000
N of Valid Cases		2100	

Interpretation: Level of rainfall and availability of Fish are significantly correlated (chi-square = 730.779, df = 3, coefficient of contingency = 0.508, P< 0.01).

Availability of fish is found to increase as rainfall increases. Significant decline in fish availability is noted for lower levels of rainfall.

Thus, the most important factors influencing the availability of fish in the sea show that fish availability is closely related to the changes in these factors. Increase in temperature, decline in the volume of fish catch, changing colour of the sea water, increase in the sea level, changes in humidity , etc. are well noted by the fisher-folk in the State.

4.7.10. Precautionary Measures Initiated by the Fisher-folk

Opinions were collected from the respondents relating to the precautionary measures initiated by them to prevent dangers of monsoon, flood, storms, drought, coastal erosion and salinity. Only 18 per cent (189) of the respondents marked their opinion for this question. The general opinion provided by them indicates that no effective measures are initiated individually, but the government and Grama Panchayats spent funds for the above purpose. The participants of FGDs also have pointed out that in certain areas works were undertaken to prevent flood and coastal erosion by building bunds and planting of trees under the Mahatma Gandhi National Rural Employment Guarantee scheme. Sea walls are also built using government funds along the Kerala coast.

Thus, the above analyses shows that there are well experienced fishermen who clearly observe the changes in the climate conditions and its impact on the availability of fish. However, organised effort is lacking in the coastal villages of

Kerala for the practice of responsible fishing and also to ensure a sustainable system of fishing

4.8. Sustainability of Fisheries Sector:

The fisheries sector, having much developed from its earlier primitive state, has come a long way by becoming a dominant primary sector. However, in developing countries, the fisheries sector still faces the curses of ecological degradation and over exploitation for marine resources. This leads to resource depletion and resultant adverse impacts of environment as well as the livelihood of fishermen. The beaurocratic hurdles and corruption occurring in the administration and management of fisheries sector are the major reasons for this. The higher population density of coastal areas, unbalanced development of different types of fishermen, resultant competition among the various types of fisher folk, and the constant depletion of resources along with climate change aspects and pollution all brews the dark fortune for the fisher folk. The limited financial gains, with high competition for declined resources make it unbearable for poor traditional fisher men to compete with the mechanised fisher folk. They are also affected by indebtedness, health problems and issues of poverty. Suffering from poor standard of living when compared to the general population, the fisher folk find it nearly impossible to shift their occupation and choose alternate means of income. This is because of the lack of education and poor skills. The sector is affecting from disguised unemployment up to a larger extent. In addition to this, the complex fishing systems makes it difficult for the authorities to implement the welfare schemes properly, and it cannot be ensured always that the recipients are the deserved ones. The lack of proper governance, poor co-operation on the part of various government departments, and lack of co-operation between the fisheries sectors and other sectors have all added to the problem. Therefore, what is to be adopted are the active strategies for public private partnership, stronger institutional credit facilities, measures for boosting gender equality, regulations like trawl ban, etc., for the fisher folk, conservation measures for native ecosystems, emphasis on indigenous technical knowledge and also ensuring that the new developments are

adopted with support and co-operation from the local fishing communities (Ranjini, 2011). The sustainable development agenda must be given top priority in framing all fisheries policies, leaving no scope for leakages, thereby ensuring human and natural development.

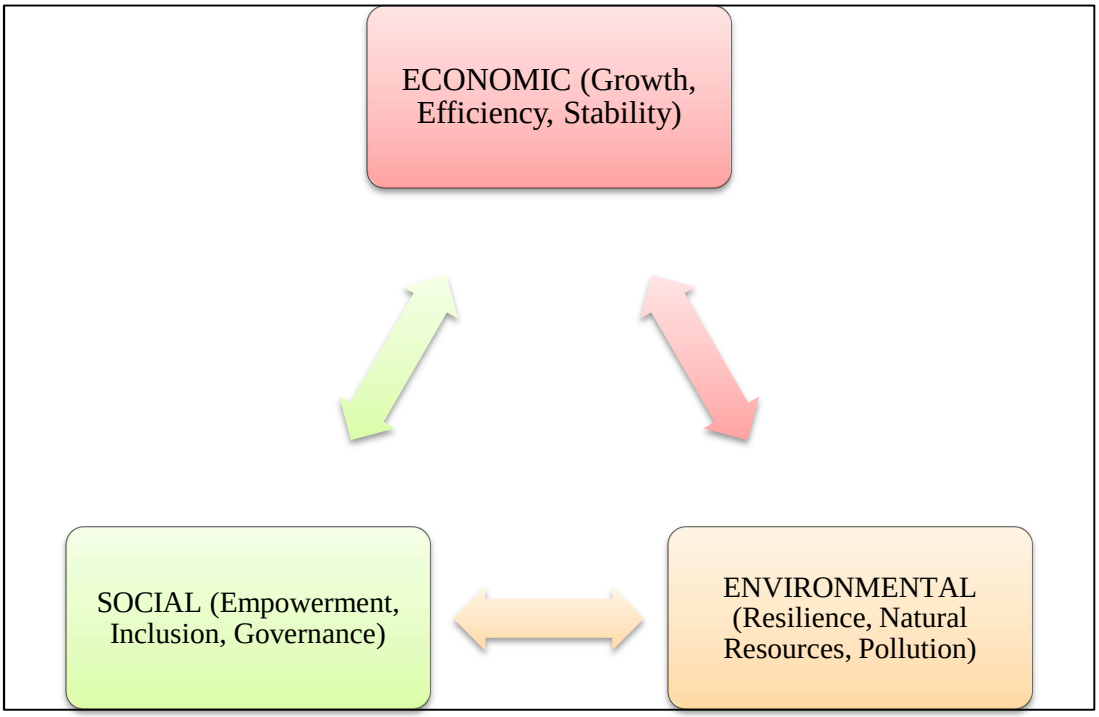
In Kerala, the traditional fishermen suffer a lot from heavy competition from mechanised fisher folk. The trade- off between economic profit and resource sustainability is a major aspect. The mechanisation in fisheries was both a boon and a bane. Because, when mechanised fishermen received higher profits, the traditional fishermen using traditional gears and vessels had to face a lot of pressure from the heavy competition. The fisher men unions were formed during 1970-80s, with initial objective as social service societies. Religion based federations were also started among them like the Kerala Latin Catholic Fishermen Federation or the All Kerala Dheevara Sabha, etc. Later all these were brought together and the Kerala Independent Fishworkers Federation was formed, which is an apolitical trade union, affiliated to National Fishworkers Forum. With such collective measures on the part of the fishermen, along with the later created political party trade unions, they succeeded up to a greater extent in improving the welfare of the artisanal fishermen. With this, the mechanised and motorised fisher folk also formed collective unions, forming powerful lobbies. The mechanisation of indigenous crafts became a method for resilience. Similarly the establishment of All India Fishers and Fisheries Workers' Federation in 2001 aimed at enhancing worker peasant alliance (Ranjini, 2011). All these have improved the socio-economic conditions of the fisher folk, and with the aid of government through welfare programmes, they are on the path of progress.

4.9. Sustainomics:

The sustainable development is a wide concept with various interconnected aspects related to it. The complexity of the concept makes it difficult to study. The term 'sustainomics' was put forward by Munasinghe (1994) as a trans-disciplinary, balanced, comprehensive, integrative, heuristic and practical meta-framework, which is needed to make the development more sustainable. It perceives sustainable

development as an ideal and unique goal of welfare. However, making development more sustainable if rather feasible and practical to the economy, that is, mainly by avoiding unsustainable activities. The standard of living and quality of life can be enhanced with minim and efficient use of resources, and considering the future generations. The productive assets must be used efficiently, like the material and social capital as well as the natural resources. According to Munasinghe (1992), sustainomics envisages to address the climate change issue and sustainable development in a a feasible and practical manner, by emphasising the sustainability triangle, consisting of economic, social and environmental aspects.

Fig. 4.13: Sustainability Triangle Elements



Source: Based on Munasinghe (1992, 1994).

The three major elements of sustainability triangle is based on the existing aspects of poverty, equity, sustainability and co-evolution. These are affected by inter-generational equity and also the basic needs, livelihoods, incidence of impacts, values and cultural aspects of the system. According to him, internalizing of externalities is to be stressed and an optimality- durability approach must be followed. Multi-criteria models, action impact matrices, integrated assessment

models and multi sector models, all must be incorporated in order to arrive at a development level or path that is sustainable. This is facilitated by interdisciplinary approach.

4.10. Requirement of an Inter-disciplinary Approach:

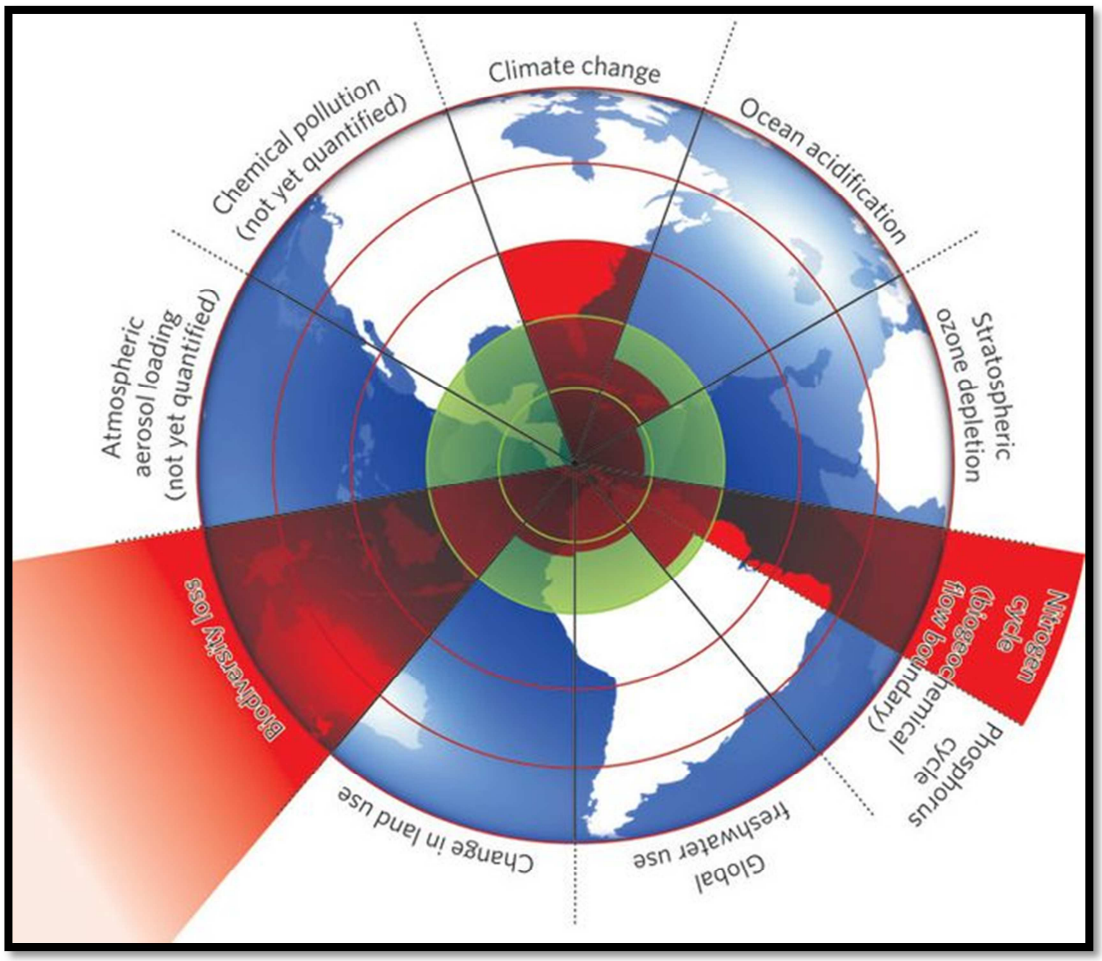
The Earth having been gone through multiple cycles of evolution through the thousands of centuries, have undergone various major environmental shifts and changes, altering the state of environment completely sometimes. In the modern age, with Industrial Revolution, the degradation of presently existing ecological system have started. This is caused by harmful emissions, discharge of effluents, resultant global warming and the catastrophic global climate change.

The concept of planetary boundaries (Johan Rockstrom, 2009), was put forward in this regard, defining the operating space in relation to the planet's system and biophysical components. The various earth processes are often sensitive to the pollution and resultant climate change, affecting bio diversity and also human livelihood rather seriously.

The non-linear relations can change as a result of the breaking of the natural threshold capacity of the biophysical cycle to tolerate the harmful influences of human activities.

The major earth processes that determines the planetary boundaries include climate change, stratospheric ozone depletion, ocean acidification, global freshwater use, rate of biodiversity loss, interference with the nitrogen and phosphorus cycles, change in land use, chemical pollution, and atmospheric aerosol level.

Fig. 4.14: Components relating to the Planetary Boundary



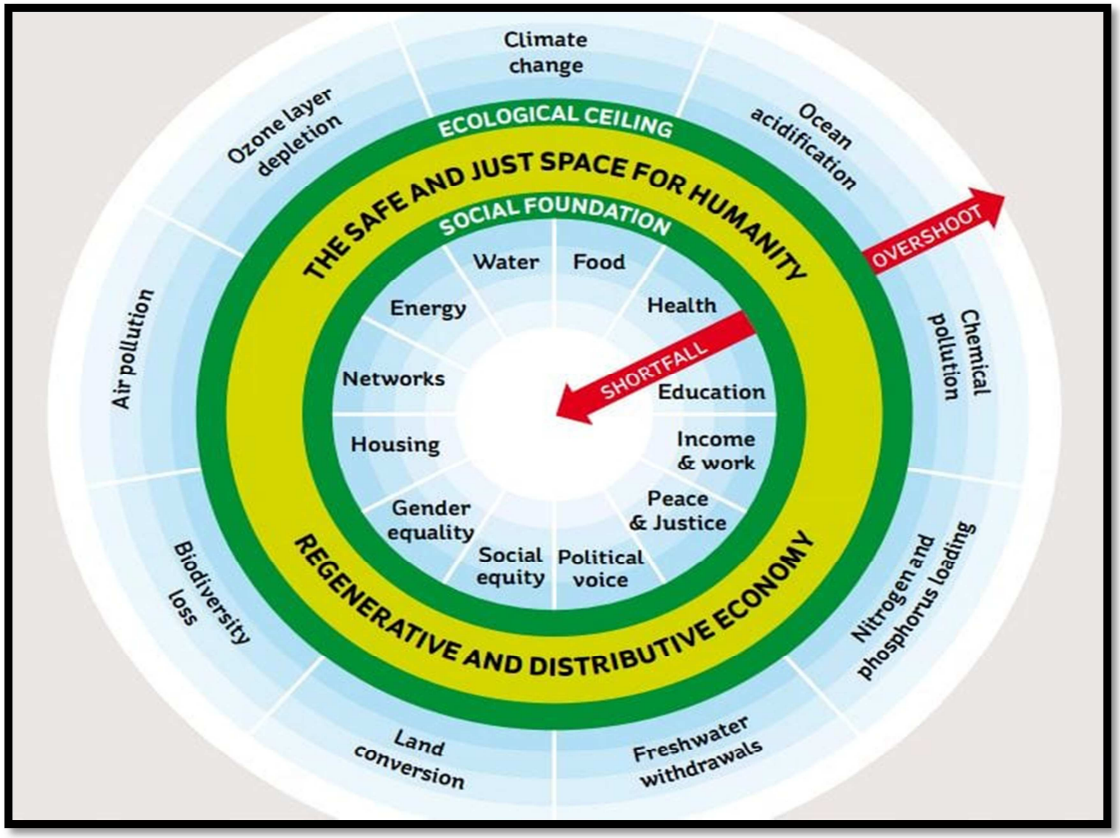
Source: Johan Rockström, Nature International Journal of Science, 2009.

The above figure 4.14.depicts the aspects related to the planetary boundary. Three out of nine processes are already marked red, and are affected harmfully, which can potentially lead to the imbalance of the global system. In this, climate change is of much significance, and the main two parameters affecting it are the increasing concentration of CO_2 in the atmosphere and also the radioactive forcing. With industrialisation, the planetary boundaries are being crossed, and the planet is open to the major risk of climate change. It is in this situation, that the most vulnerable groups like the fishing communities suffer from the potential hazards of climate change in the form of natural -calamities like tsunami, cyclones, storm surges, sea level rise, coastal floods, coastal erosion, sea surface temperature increase, and the like.

The fisher folk communities, being relatively developed than the tribal or other communities that depend on nature, are in fact suffering more because of the complexity of a number of socio-economic and ecological interlinking aspects that can exert pressure from their livelihood to health aspects. So, in this regard, already the government, NGOs, UN, other international agencies, local groups, etc. are coming together and implementing various programmes in collective nature. This brings about the need for an interdisciplinary approach in addressing such issues.

Even the need for development of relatively new fields of study, like the alternative economics or the innovative concepts of bio-economics, climate change economics or environmental economics arises in this scenario.

Fig. 4.15: Diagram depicting Sustainable Space with respect to various Socio-economic and Environmental Factors



Source: Kate Raworth, 2017.

Figure 4.15 depicts the two essential boundaries of a sustainable living space. The innermost space is of poverty, because it is even below the inner ring representing the housing, sanitation, education, health, governance, energy aspects. These constitute the major necessities sufficient for living. The outer ring comprising of harmful aspects affecting the nature, like pollution, ozone layer depletion, extinction of species, climate change, bio-diversity loss, land conversion, freshwater withdrawal, etc., forms the outer boundary. Crossing this boundary indicates that the earth's threshold capacity is affected. However, the area between the two rings provides a sustainable and safe space for livelihood (Raworth ,2017).

Therefore, there is an increased need to diverge from the existing individualistic economics and to promote the interdisciplinary approach. The integration of all economic, social, political and cultural aspects, along with the energy of the earth system, while considering the ecological balance and environmental stability, through sustainable development measures, must be envisaged. The long term goals must be strengthened instead of short term goals. The coherent measures of sustainable growth can be incorporated with the strategic management plans. All the frameworks must be made after consultation with all the stakeholders of the system, starting from the primary level of local traditional fisher men in the case of fisheries sector.

This chapter analyses the awareness of climate change related factors on marine fisher folk of Kerala and their vulnerability towards these factors. A case study using PARS methodology was conducted in the three fishing villages of Ernakulam district to check the vulnerability level of the fisher folk and the results were drawn. The traditional fishermen are the most vulnerable of all the other fisher folk groups, owing to their poor living conditions and limited accessibility to resources. It was found that the long term effects of climate change weren't felt much among the fisher households, but many of them were aware of it. The fishers could only realize immediate issues such as loss in fishing days and erratic monsoon resultant which in turn leads to economic losses. A detailed analysis with respect to Coastal Zone Management principles, concepts, forces affecting coastal resources, and a case study is attempted in Chapter 5.

Chapter 5

COASTAL ZONE MANAGEMENT

CZM or Coastal Zone Management is a policy instrument which deals and tackles the issues of environmental and socio-economic nature, which affects the coastal zone, especially from low tide line to the landward side, by making use of ecologically sustainable measures. It encompasses a multitude of functions like the protection, preservation and conservation of the costal population, coastal areas, marine resources, including the sea bed and the area from low tide line to landward side. The careful land allocation and use plan of resources constitutes the main aim of Coastal Zone Management. For this, the information regarding the state's bio physical coastal resources and potential utilisation capabilities of the same, along with the existing socio-economic condition of the local communities must be taken into consideration. This chapter analyses the Coastal Zone Management and its impact on society citing a case study.

5.1. Principles of ICZM

Despite ICZM being a rather recent concept, which is still gaining popularity and developing and exploring new aspects in its policy formulation, execution and management, there are some general principles which are somewhat universal in nature. The two principles are as follows:

- **The Integration Principle**: The main aim of the ICZM plans is to promote sustainable development of coastal regions. It envisages the adoption of new approaches and methods in management and development of coastal regions and marine resources, in all the levels, namely, global, national, regional and

sub-regional. These precautionary and anticipatory methods must be integrated in content and action as a driving factor of holistic nature of the development plans. The integration can be among various sectors, between the Central and State governments, between the land- water interface, among various disciplines or among different countries in the case of enclosed or semi-enclosed water bodies (Muthukrishnan.A, 2010).

- **The Precautionary Principle**: This was adopted by the Maastricht Treaty as a fundamental component of the Environmental Policy

5.2. Planning and Process of Developing ICZM Strategy

All around the world, ICZM strategies are adopted by different countries, and each nation will be facing its own set of coastal issues, and the environmental, political and economic set up of the countries will be differing. They will have to consider the funding needed, objectives of the ICZM which is to be satisfied, collaboration and holistic approach to be adopted, setting up of time limits for various stages and the steps of programme development.

In spite of various differences existing in the issues affecting coastal regions of various countries, the following stages are part of the ICZM programme planning and generation:

- **The stage of formulation of policy**: This involves the formulation of policy framework by incorporating all the objectives and goals to be satisfied under the ICZM programme. This is done with the aid of legislative action.

- **The stage of preliminary planning:** After the authorisation of the strategies to be adopted, this stage involves the considering and determination of various impacts of the ICZM policy and its feasibility. The effects of ICZM can have effects on the various stakeholders, marine resources, cultural and social activities, and the like. It can even influence the occupation, urbanisation in the region and foreign exchange earnings. The costs and

benefits are to be determined and studied prior to creating the outline strategy.

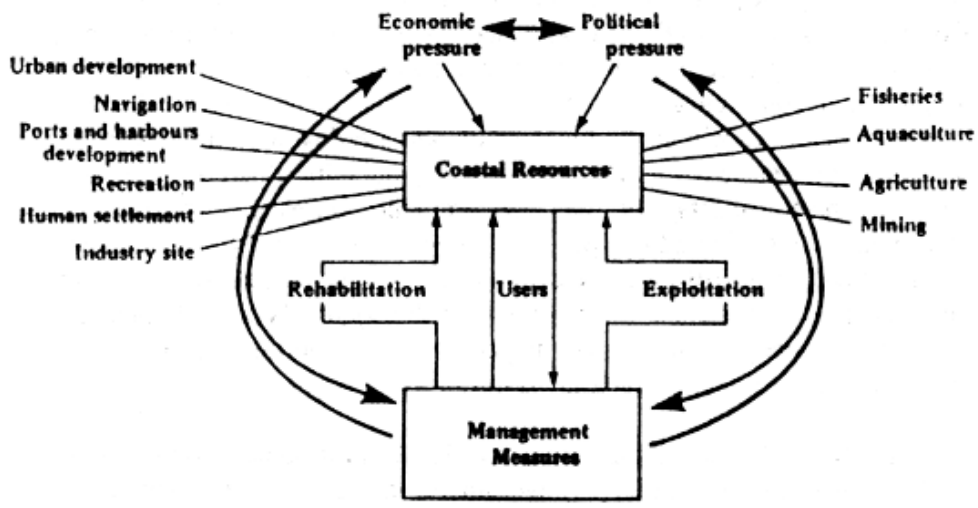
- **The stage of master plan**: Here, the programme is modified and developed by formulating the master plan for coastal conservation and management. Institutions are allowed with responsibilities.

- **The stage of implementation**: In the final stage, the budget is prepared and finalised and with legislative approval, the ICZM programme can be implemented

5.3. Forces affecting Coastal Resources

The coastal resources are affected by many economic and political factors, apart from social and cultural aspects already existing. Urbanisation, housing, recreational activities, construction of ports and harbours, tourism, navigation and industrialisation constitutes the major economic factors. The coastal region is mainly used by the people for activities like fisheries, aquaculture, agriculture and mining, which mainly aim at the exploitation of resources, rather than their preservation. So, management measures by ICZM policies are adopted, which regulates the excess exploitation of coastal resources (Chua, 1986).

Fig. 5.1: Forces Affecting Coastal Resources



Source: Chua,1986.

Under the ICZM policy however, certain habitats and reserves can be allowed restricted use, like the places of worship, etc. But the primary function remains to be of environmental protection and management, but the policy measures adopted by the government can also alter the general economic policy up to an extent. So a holistic approach incorporating all the related aspects is significant while considering the ICZM framework construction generally.

5.4 Global Context:

Considering an outline of the history of ICZM, it is evident that Europe and the USA were the pioneers in adopting ICZM policies, in order to protect their coastal and marine resources. Now a days, with the growing concern over climate change and global warming along with the ever rising demand for fisheries product and the resultant resource depletion, almost all the countries with coastal regions, are adopting ICZM plans. The US in this regard, adopted the US Coastal Zone Management Act, 1972. With the advent of 1980s, numerous developing and even less developed nations followed this path with financial assistance from international agencies or other nations. USAID/ICLARM programme in the ASEAN countries, UNEP's Mediterranean Action Plan, USAIDIURI plans implemented in Thailand, Sri Lanka, Ecuador, national plans of Brazil, Columbia, Argentine, etc. are in this regard. In 1992, UNCED in its newsletter had mentioned about 108 efforts and action plans adopted in 44 coastal sovereign and semi-sovereign states (Clark, 1992). According to Hildebrand (2002), in 2002, 700 ICZM efforts had been taken all around the world by various coastal countries. With the advent of technology, the need for adopting ICZM plans have increased especially owing to the problems of mechanisation of fisheries led resource depletion and urbanisation. The case of Canada which is surrounded by oceans in its three sides, namely, Atlantic, Arctic and Pacific, with the lengthiest coastal region and biggest continental shelf, is the most interesting in this regard.

5.5 Indian Context:

With a coastline of 7516 km and rich marine and coastal resources, the country have rich marine ecosystems and various ecological habitats like mangroves, lagoons, islands, marshes and swamps, which needs protection. It was in this regard, the Coastal Regulation Zone Notification of 1991 was introduced under the Environment (Protection) Act, 1986. In India, under the Sections 3(1) and 3(2) (v) of the Environment (Protection) Act, 1986, by the MOEF, which initiates actions to protect the wet and dry sides of the coastal zones. The regulations are known as Coastal Regulation Zone Notification, which are legal instruments, issued by MOEF in 1999, protecting the area from Low tide line to the landward side. This enabled the country to protect and conserve the ecologically sensitive coastal habitats by means of various policies and frameworks. However, owing to the need of sustainable development of tourism industry in the coastal regions, amendments were made after evaluating every issue affecting the environmental balance of the coastal region. Around 19 amendments have been made so far. However, these ICZM policies were mostly neglected by the state governments which led to the increased havoc during the 1999 Orissa cyclone as well as the 2004 tsunami. This is because; most of these ICZM policies have not been implemented and monitored properly (Menon & Sridhar, 2002). A lot of working committees have been set up in this regard by the MOEF. However, there are still many leakages prevailing in the system. With the higher coastal population density, industrial growth and the resultant pollution, tourism and property boom have led to the damage of the pristine coastal ecosystems. The Coastal Regulation Zone includes the coastal stretches of bays, estuaries and seas which are influenced by tidal action upto 500m from High Tide Line(HTL) and the land between the Low Tide Line (LTL) and the HTL. (Sankhua)

The coastal regions are further divided into :

- Coastal Management Zone-I: The areas that are environmentally significant and sensitive the most. These include mangroves, coral reefs, swamps, coastal forests, estuaries, lagoons, creeks and similar inland water bodies,

mud flats, marshes, habitats of importance to fauna and flora like seaweed beds, horseshoe crab habitats, turtle nestle areas, migratory birds nesting regions, etc.

- Coastal Management Zone –II: These are developed regions, where construction and operations are regulated. These include areas of ports and harbours, coastal corporations, tourist spots, mining sites, defence camps, special economic zones (SEZs), heritage sites and the like.

- These are under developed regions, where certain operations are allowed. These are those coastal regions apart from those under I, II and IV CMZs.

- Areas of islands and the like which are protected highly. These include the coastal regions of Lakshadweep and Andaman & Nicobar islands.

Similarly, the Biological Diversity Act, implemented in 1993, aims at protection and preservation of ecological resources to promote a sustainable and equitable usage of the same. Also, Ocean Regulation Zone, are recognised and have classified the coastal region into various categories, like that of near the main land and Andaman & Nicobar and Lakshadweep islands as well as the environmentally important and sensitive regions like coral reefs, marine habitats, wildlife reserves, etc ; the area developed for construction, industries and navigation; areas yet to be developed, etc. Considering the various issues of environment sustainability and conservation, the Government has introduced the National Environment Policy, 2005. The conservation of coastal areas and creating suitable policy framework along with the management and development of the institutional arrangements and to impart knowledge in this regard constitute the major objectives of the policy. The India Integrated Coastal Zone management Project was introduced in this regard with the assistance of World Bank. The objectives include capacity building as well as conservation of ecological and cultural aspects with view to reduce poverty and bring in economic growth and sustainable development. The integrated management of the coastal ecosystems and holistic approach promoted in this view helps the fisher folk in various levels from gaining an improved living standard to reduction of

susceptibility to climate change impacts. The capacity building initiative mainly includes, the National ICZM Capacity Building which aims at mapping, delineation and demarcation of the hazard lines along the mainland coast and in the Ecological Sensitive Areas (ESAs), capacity building of the Ministry of Environment, Forest and Climate Change, training and awareness initiatives, establishing and working of National Centre for Sustainable Coastal Zone Management.

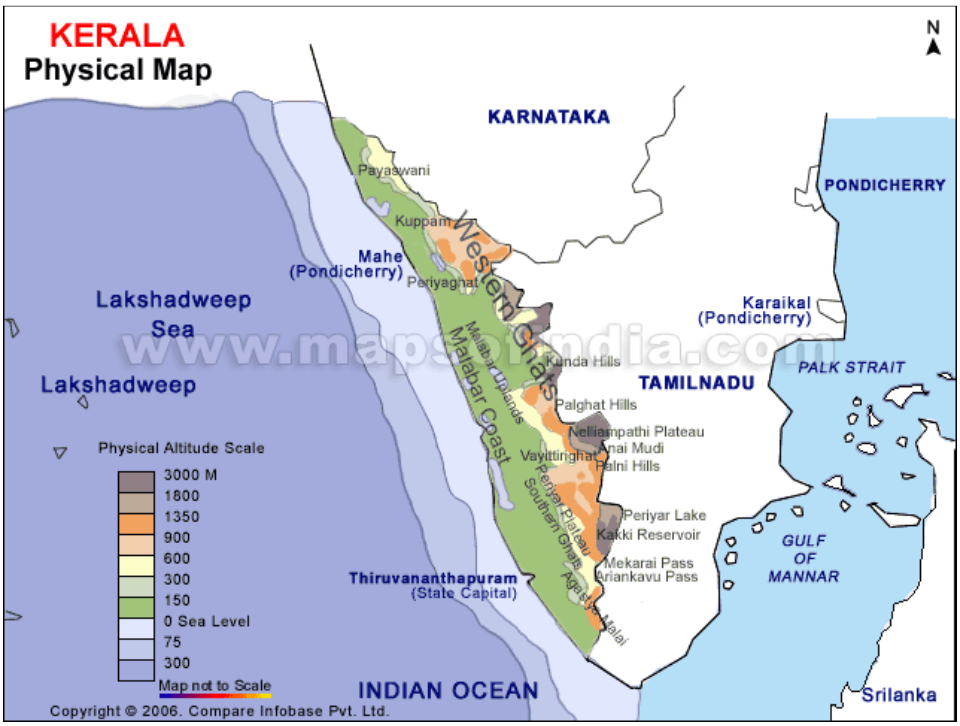
5.6. An Overview of the State and its Coastal Characteristics

A most significant area of any region, which is interlaced by the three major forces of nature, the ocean, the land and the air, is its coastal region. The area, which is increasingly affected by both the natural forces as well as the extensive human-nature interactions, remains a victim of increased resource depletion; in the form of intense fishing, excess fishing pressure, trawling, pollution etc. which are adding flame to the fire of already existing issues of climate change impacts and seasonal variations in catch.

5.6.1. Kerala Coast

Located at the south-western corner of India, this tip of the Indian peninsula offers 38863 sq km of total area and 590 km of coastline. Out of 14 districts, 9 are coastal ones and possess rich marine resources and splendid variety of ecosystems, like lagoons, mangroves, beaches and estuaries. Despite possessing positive trends in various socio economic indicators like 94% literacy rate, 75% life expectancy, better standard of living, higher per capita income, life expectancy, high sex ratio, educational qualification and the like, the condition of coastal fishing community is rather low compared to the general population. The state is also famous for its higher human development index, 2011.

Fig. 5.2: Physical Map of Kerala with Physical Altitude Level



Upon considering the physical features of the state, the Western Ghats with a rise of 100 m and above have considerable effects on the state's climate, land use and topography. With asymmetrical altitude distribution and the vast coastal line, around 55% of the state is below 100m contour (GOK,2015). Geologically, Kerala with a lot of Archaean crust, had possessed a much lower sea level in the past, evident from the evidences of seaward extensions and laterite cappings. There have been several sea level changes and formation and disappearance of lagoons and lakes, the variations in beach sediments. Altogether, there had been multiple marine regressions and transgressions.

With 41 rivers flowing westward and 3 eastward, the state is rich in natural drainage and helps in supporting a wide variety of ecosystems. In spite of smaller in length, these rivers fluctuate widely with seasonal differences, from monsoon to post monsoon. Similarly, a number of lakes, that are situated parallel to the coastline is another feature of the state, which have influences in the local ecosystem as well (GOK,2015). With more than 80% sand content, the soil lacks water holding capacity in coastal region.

5.6.2. Issues Affecting Coastal Region

Coastal region is prone to a lot of hazards and natural calamities, like the storm surges, high tides, cliff recession, soil erosion, heavy rainfall and cyclones. Many factors like topography, seasonal variations, climate change, off shore wave energy, soil and rock composition and the overall geomorphology of the location affects the occurrence of such hazards. Estuaries are part of the most vulnerable area in this regard. Apart from natural hazards, pollution and fishing led resource depletion are other issues in the coastal area, especially in the name of tourism and excessive fishing pressure. The ill effects of these are enhanced by pollution factor, population rise, high coastal population density of 2000 persons per km, irregular monsoon and the like.

Coastal erosion is a major issue, which is caused by changes and occurrence of mud banks, beach cusps, sand dunes and further by micro morphological features, along with waves, sea currents, wave breaking, sedimentation, mud bankformation, making it often seasonal or cyclical. Sea accretion also affects the beaches. However, these vary with seasons and irregularity of monsoon in Kerala is a major issue, even forming waves of heights of up to 2.6m. Apart from these, the coast is susceptible to the threats of cyclones and tsunami in the Indian Ocean. Sea level rise, which is a direct effect of global warming and resultant climate change, also affects the coastal sustainability. In Kochi, annual sea level rise was estimated to be of 2.1mm, during a100 year period.

Coming to the coastal ecosystems, mangroves, lagoons, mud banks are of significance which needs to be preserved under the CZM plan. Apart from these, beach dunes, barrier flats, alluvial plains, marshes and beach ridges are also present. The beach ridges say a lot about regressions and transgressions of the past.

Coming to the resources available, the major resource is fisheries and the state is a leading producer of marine fish production, contributing around 20% of the nation's total output. Monsoon related formation of mud banks in several parts of the Kerala coast, helps in increased fisheries output. With high density of

population, some also practice agricultural activities. The area is rich in minerals, important varieties of soils and fossil deposits. For instance, Chavara is famous for the mineral deposit. The tropical resources include various ecosystems like mangrove vegetation, swamps, open sea front, rocky beaches, lagoons and the like.

The islands situated in Kerala coasts are all highly populates, including the barrier islands, like Nendakara-Chavara-Panmana-Alappad, Arattupuzha-Thrikunnapuzha, Chellanam-Fort Kochi, Vypeen, Dharmadom, Ramanthali, Valiyaparamba (GOK, ICZM Kerala Concept Note, 2015).

With the mechanisation and the increasing fishing pressure, having made a revenue of Rs.1000 crores from the internal market and forex earnings of Rs.800 crores, contributes to nearly 24% of the national fisheries output. However, damages to the coastal ecosystems and species depletion, which is accelerated by fishing practices like trawling.

An important coastal ecosystem form is mud bank. These are small patches or areas of water, with high concentration of clay and sediment, appearing parallel to the coast at an average length of 2 to 5 kms. They are influenced by the monsoon and wave formation. They are rich in phytoplankton content and algae, which increases the presence of fishes in the area, especially sardines, prawns, silverbellies, and the like. These are favourable fishing spots for traditional fishermen contributing up to around 56% higher output than in other parts.

5.6.3. Socio-economic aspects: Coastal Zone

With high coastal population density and about 30% of the population of the state living in the coastal region, the studies on socio-economic aspects of fishing communities are of importance. Despite having around 250 large/ medium sized enterprises and about 5000 small scale units, the standard of living of the coastal communities are much lower when compare to the general population. The high population density and rising urbanisation in the name of tourism have, however, had a lot of harmful after effects on the coastal ecological balance, by means of pollution and degradation of marine resources. Despite many developments, the

fishing communities face the issues of backwardness, poverty, health issues, illiteracy and poor organisations. Often they are not aware of the various governmental schemes and programs that are aimed at their welfare.

The excess fishing activities and mechanisation paved way for depletion of marine resources. This is accompanied by the poor access to the fishing resources by the traditional fishermen, which makes them trapped in the vicious cycle of poverty. Also the supply chain and the changes in fishing methods make the traditional skills of poor fishermen less efficient. Also a lack of education and awareness makes them stick to the activity rather than opt alternate modes of livelihood. Similarly, as the fish traders have extended their reach, the traditional fish selling activities by fisherwomen are also becoming less common. This indirectly makes them more marginalised than the fishermen. Overall, the fisher folk are more vulnerable to the seasonality of climate and they find it extremely difficult in times of harsh weather.

Upon analysing the state's closed eco-system, we can very well find many threats, despite its glorious first position in HDI index for Indian states and high social orientation and development. The major threats in this regard itself are the property boom and the industrialisation drivers which together creates pollution and ecological damage. The climate change impacts like the rise in sea level, seasonal fluctuations, sea surface temperature rise and the resultant resource depletion, everything hampers the ecosystem balance. Even a few millimetre sea level rise can affect the livelihood of the densely populated coastal communities. Climate change induced heavy tides often destroys their houses and properties. However, there have been very little efforts on the part of the government to investigate into the matter of climate change caused havoc and to frame policies to protect the coastal population.

5.6.4. Rules & Laws in this regard and the Participating Institutions:

There have been various policies and rules aimed at environment protection and conservation. The Environment Protection Act of 1986 is a pilot Act in this regard, which aims at the protection and conservation of air, water and land

environment, and also its interrelationship existing with humans and other organisms and the related property. Similarly the Coastal Regulation Zone notification was introduced which restricted the construction of industries and operations in the coastal region, apart from regulation on wetland reclamation and clearance of mangroves. According to Government of Kerala concept note on ICZM (2015), other rules and laws concerning to coastal area protection includes, Wildlife (Protection) Act - 1972 Water (Prevention and Control of Pollution) Act – 1974 and Rules 1975; Territorial Water, Continental Shelf, Exclusive Economic Zone and other Marine Zones Act – 1976; Forest (Conservation Act) – 1980; Maritime Zone of India (Regulation and fishing by foreign vessels) Act – 1980; Air (Prevention and Control of Pollution) Act – 1981; Environmental (Protection) Act – 1986; Water (Prevention and Control of Pollution) Cess (Amendment) Act, 1991; EIA notification 1994/2006; Biological Diversity Act, 2002 and the Biodiversity Rules, 2004; Water (Prevention and Control of Pollution) Cess (Amendment) Act, 2003. The Kerala State Government's regulations and rules for coastal area protection include, The Kerala Inland Fisheries and Aquaculture Act 2010, The Kerala Conservation of Paddy Land and Wetland Act, 2008, The Kerala Protection of River banks and regulation of removal of Sand Act 2001, The Kerala Irrigation and Water Conservation Act 2003.

Apart from these enactments, the State and Central governments takes the responsibility for coastal zone protection and management. The National Coastal Zone Management Authority and State Coastal Zone Management Authority were established in this regard. They deals with controlling the environmental issues like pollution, regulating illegal construction, coastal management and the like. They take actions against those who violate the government rules and follow the coastal zone managementplan of the state. The various state government departments like that of Environment, Fisheries, Port and Harbour, Tourism, etc also shares the responsibility in this regard. Similarly the government have set up various research and development institutions that focus on fisheries and coastal resources. Other major institutions who share the responsibility of coastal ecosystem conservation and studies about marine resources include, CMFRI, National Centre for Earth

Sciences, Centre for Water Resource Development and Management, Kerala University of Fisheries and Ocean Technology, NIO, CIFT, CUSAT , The Kerala State Coastal Area Development Agency and the like (GOK,2015).

5.7. Coastal Zone Management in Kerala

The coastal zone of Kerala is under intensive use. Major coastal activities are threatening the biodiversity of coastal environment. Among all the coastal states India Kerala has the highest density of population in the coastal belt.

5.7.1. Needs for CZM in Kerala:

- **Over exploitation of coastal resources**

Extremely high population pressure, intense human activities, indiscriminate mechanisation of fishing, urbanisation, industrialisation, pollution, inappropriate resource use and absence of management practices contribute in reduction of productivity of coastal waters, quality deterioration, reduction in marine fish catch and finally posing hardship for livelihood to the local community. Mechanisation in fishing, particularly the use of trawlers adversely affects the total fish availability in coastal waters and the fisherman face extreme hardships.

- **Degradation of marine and coastal habitats**

Wetlands, mangroves, mud banks, beaches estuaries and cliffs are important habitats having close linkage with local economic activities. Now they are in various stages of degradation. Wetlands are increasingly being diverted for undesirable uses and mangroves are being depleted. Reclamation, silting and pollution from industries and human wastes are damaging the ecosystem.

- **Coastal erosion**

The coastal erosion has become critical for Kerala state, which is already facing the shortage of land due to its high density of population. Sea walls have been constructed across the coast line. However, these are of limited applicability. About 370 Km of Kerala coast is subject to coastal erosion of various magnitudes due to

several factors like irregular monsoon and subsequent formation of waves and geological factors, sea level rise, turbulent zones, etc. The erosion tendencies may increase with extensive human activates. (Baba 1979).

5.7.2. Areas of Sea - Erosion in Kerala:

Sea - erosion now exists all along Kerala coast in different intensity, especially, in the monsoon. Kerala Irrigation Department who are associated with Anti - sea - erosion works have prepared a list of places which are prone to and likely to cause sea - erosion. They are:-

- Poovar to Vizhinjam area
- Kovalam to Valiathura
- Perunnathuruthu to Neendakara
- Neendakara to Kayamkulam
- Kayamkulam Pozhi to Ambalappuzha
- Ambalappuzha to Thumboli
- Andhakaren Azhi to Chellanam
- Chellanam to Cochin Harbour
- Cochin Harbour (Vypeen) to Azhikkode
- Azhikkode to Kozhipram
- Engadiyoor to Chavakkad
- Velliamkottu to Ponnani
- Tirur- Parappanangadi to Kadalundi
- Kadalundi to Elathur
- Cheriamangad to Tikkodi (Theakkodi)
- Ayanikkadu to Murad - Vadakara
- Madakkara to Puthiyappa Angadi
- Thrikkaripur to Neelaswaram
- Kanjangad to Kasargode – Manjeswaram

5.7.3. Causes of Sea Erosion

- Heavy monsoon showers with thunder and cyclones.
- Loose sandy sea - shore.
- Sub - terranian pressure from low - inland areas.
- Increase of water level in the sea.
- Destruction of mud deposits in the sea.
- Heavy discharge of water devoid of alluvium (silt and clay).

- **Destruction of Mangrove Forests:**

Evergreen mangroves known as 'tidal forests' constitute a fascinating ecosystem.For centuries, this ecosystem has been of great use and value to mankind. It helps in preventing soil erosion, floods and othernatural calamities; Mangroves protective buffer zone help shield coastlines from storm surges and wave action, minimizing damage to property and losses of life from hurricanes and storms, and also have been useful in treating effluent. Mangroves absorb carbon dioxide and store carbon in their sediments, thereby lessening the impacts ofglobal warming; and help in the protection of associated marine ecosystems. Provides food, fuel, fodder anda host of other useful products. Mangrove and estuaries are the breeding ground for many estuarine species and nursery ground for many marine species. Many birds also find their habitat in mangrove forests. Mangrove Forests are largely facing deforestation. Mangrove forests are treated as “wastelands,” or useless swamps. During the beginning of the last century, Kerala had 700 sq. kms of Mangrove forests. Today, they are reduced to just 50 sq.kms (Mohanan 1997) and restricted to isolated areas. The reasons that have contributed to its decline are encroachment due to high population density on the coasts, commercial prawn farming, sand mining, dumping of wastes etc.

- **Tourism**

Developmental projects in the name of tourism are damaging the highly fragile ecosystem of the coasts. Private entrepreneurs, in the name of tourism and development, have taken control of the coast. Developmental projects in the name of

tourism are damaging the highly fragile ecosystem of the coasts. Bird population and mangrove forests are the most affected. Most alarming is the desertion of the Kayal areas by the birds due to the degeneration of their roosting places along the coasts by the tourism activities.

- **Encroachment of beaches and coastal lands**

Beach is the best protection for coast and is the habitat for many marine and intertidal organisms. It is an open space available to the coastal communities for different activities. There are periodic encroachments in the beaches and other coastal lands for settlement and other activities even when their susceptibility to erosion is well known. Systematic planning for habitat development is a felt need of the coastal area.

- **Coastal Pollution**

Water pollution is an important issue in the state. Domestic wastes, industrial wastes, plastic wastes, fertilisers and pesticide residues reach coastal waters. Lower reaches of all major rivers and the stream passing through urban areas are highly polluted. Coconut retting in the backwaters, a traditional activity, also contributes to coastal water pollution. Aquatic lives are seriously affected. The Cochin mouth is also subjected to oil spill, though in limited extent.

- **Coastal flooding &Salt water intrusion**

Flooding due to heavy rainfall is a common feature in the coastal belt of Kerala. In addition to this, the urbanisation, settlement expansion, construction of artificial structures, reclamation of wetlands and such others also contribute to this.

Salt water intrusion in to the agricultural lands due to flooding creates problem to the coastal agricultural production. Apart from this, due to regulation of river water flow, as a result of dam construction in the upper reaches and also due to river sand mining saltwater/ freshwater interface has been pushed landward which leads to degradation of ground water quality.

- **Mining of beach placers or heavy minerals**

Kerala is endowed with a significant amount of beach placers or heavy mineral deposits in stretch between Neendakara to Kayamkulam. It is a mineral of strategic importance with very high industrial value. Mining of placer deposit affects stability of beach and sometimes hinder fishing and related activities. There are certain conflicts among the various stakeholders in this area.

- **Economic backwardness**

The coastal communities are economically backward, resource poor and have limited access to other economic activities. The traditional sectors like fisheries and coir making are over saturated. The problem is further compounded due to degradation of the resource base resulting in decrease in availability. The performance of fisheries sector is not so sound.

- **Housing, health, drinking water & sanitation**

The coastal community faces problems in all the basic sectors. Housing problems like lack of area, government regulations, beaurocratic hurdles, poor quality construction and even the damage of property and houses by high tides and natural calamities are all affecting the fisher folk. They are also affected by health hazards. Scarcity of drinking water is a serious problem. Surface water available in lower reaches of rivers in the coastal area suffers saline intrusion and pollution. Groundwater is also confronted with similar problems. Lack of sanitation and associated health problems are fall out of financial constraints and high density of population. Absence of appropriate toilet facilities, open defecation and unhygienic surroundings create health hazards.

- **Social and educational backwardness**

Large infant mortality rate, low literacy rate, and early entry of children into fishing also point to the backward status of the coastal community. Literacy rate is too low making them more vulnerable to the problems like beaurocratic hurdles and red-tapism while availing government implemented welfare funds and banks loans.

They also find it difficult to choose alternate occupation, owning to low skill and education. In this regard, the NGOs and government can provide skill training and capacity building programmes. Health issues are another evil that is rampant in the fisher folk community, which can be attributed to their risky mode of job, exposure to adverse weather conditions, pollution, and even habits like liquor addiction and lack of awareness.

- **Inadequate infrastructure facilities**

Infrastructure facilities covering roads, fish landing centres, cold storage, fishing harbour, fish processing units and even ice plants are inadequate to cater the state's needs. There is also a problem of improper marketing facilities.

- **Problem of Agriculture and other traditional sectors**

Fall in coconut production due to diseases is a serious problem encountered in the coastal belt. Saline/brackish water intrusion in to paddy fields from adjoining inland brackish water bodies and loss of agricultural land due to erosion are other problems confronted by this area. Due to the decrease of wetlands and water pollution, shell collection, catching of small fishes and similar activities are restricted, thereby local community depending on these resources faces considerable problem.

- **CRZ violation**

Kerala is the first state for which violation mapping was carried out throughout the coasts. Though Kerala has a well-prepared CZM Plan, the State's interest is to relax the notification so as to accommodate the 'development' in the state. Different committees were constituted to dilute the present accepted plan. The plan enforces all that is mentioned in the original notification. The latest report submitted in 2014 by state tourism department to KCZMA calls for urgent modifications of CRZ norms claims that it can open up new avenues and opportunities for the development of tourism and economy of the State

- **Absence of systematic conservation plan (CZM Plan)**

Biodiversity of Kerala coast is not given serious attention for proper conservation although there are sporadic initiatives at various levels, both at the Governmental and non- governmental level. In addition there is a significant avifauna population including large migrating species a host of fishes and other aquatic species warranting protection. Isolated attempts at various levels indicate interests of the local people to participate interest in conservational activities.

5.8. Identification of ICZM Sites in Kerala

The major ICZM sites in Kerala are listed below:

1. Kasaragod – Thaikadapuram coast to Ramathali Coast – covering Nileshwar Municipal area, Padne and Valyiaparamba Panchayaths
2. Kannur – Azhikode Estuary to Dharmadom Estuary Panchayath – covering Azhikode, Chirakkal, Muzhapillangad, Eddakkad and Dharmadom Panchayaths and Kannur Corporation area.
3. Kozhikode – Kadalundi -Beypore –Korapuzha estuary
4. Malappuram – Ponnani estuaray
5. Thrissur – Annapuzha-Azhikode-Chettuva.
6. Eranakulam – Vypeen islands
7. Alappuzha – Thottapally Estuary to Kayakulam estuary
8. Kollam – Ashtamudy Estuary including Monroe Island
9. Thiruvananthapuram Varkala - Kadianamkiulam.(GoK,2015)

5.9. District Profiles with regard to ICZM Plans

The following are the district profiles of the nine coastal districts of Kerala. The main ecological and economical features of importance, susceptibility to natural hazards, and ICZM areas are covered.

5.9.1. Kasargod District

- There are changes in sea level observed, in addition with the use of houseboats and resultant pollution with tourism development. The most vulnerable island is Valiaparamba, so adequate measures must be taken in this regard.
- As a measure of ICZM implemented, the Thaikadappuram- Ramanthali Estuary was considered for the same under the Kerala Government's 2030 ICZM plan, by improving the socio economic conditions of the fishing folk and conserving the marine resources simultaneously.
- Economic utilisation of coastal resources and setting up of co-operatives and micro enterprises
- Raise fish productivity by means of marine friendly approaches under the rules and legal measures of the state government.
- Well drafted institutional frameworks, renewable energy sources, technical measures and human resource development are emphasised.
- Sustainability of wetland fisheries, aquaculture, agriculture, eco tourism and sea weed farming are emphasised as special measures.
- Apart from these, pollution control, conservation measures and basic public infrastructures like provision of road facilities, power supply, etc. are stressed (ICZM Kerala Concept Note, GOK, 2015).

5.9.2 Kannur district

The area has moderate to high coastal erosion according to the CESS studies. The disaster management actions must be taken against the monsoon flooding and summer drought.

- For sustainable fishery development, institutional, technological and human resource based initiatives are taken
- In Azheekkal, Dharmadam and Mappila Bay, modernisation of fishing landing centres, and enhancing the existing facilities are carried out.
- Sustainable tourism initiatives and fish based small enterprises should be promoted.
- Facilities for solid waste management and household waste treatment are strengthened. Similarly, cleaning of beaches at Meenkunnu, Muzhappilangad and Payyambalam are carried out.
- Under ecosystem conservation, Kattaballi wetlands and Dharmadam thuruth are considered specifically, owing to the rich biodiversity present there. Similarly, mangrove conservation is also emphasised.
- Formation of SHGs with local fishing community are also considered (GOK,2015).

5.9.3 Kozhikode District

The district is rich in marine bio diversity, especially in areas of Kadalundi Estuary, Beypore Estuary and Korapuzha estuary. The ICZM considers 14 fishing villages under the Kozhikode Corporation, Kadalundi and Chaliyam Panchayats together. The tourism in Kappad and Beypore beaches can be promoted, by ensuring to avoid factors adding to pollution. However, the low lying areas of estuaries are vulnerable to sea level changes resultant from climate fluctuations and heavy rainfall.

- Under sustainable fishery development, the modernisation of fish landing centres in Chaliyam, Puthiyappa, etc., enhancing the existing facilities and also provision of chilled storage facilities are emphasised.
- Enhancing the scopes of aquaculture, agriculture, fish based enterprises, ecotourism, mussel cultivation and pollution control measures are to be taken.
- Mitigation measures to tackle coastal erosion must be taken.
- Kadalundi estuarine has the largest mangrove area in Kozhikode and it is rich in wide varieties of biodiversity. Kadalundi estuarine, Korapuzha estuary and Beypore are linked under zonal ecosystem management.
- Potable drinking water project and road connectivity initiatives cover the infrastructural development.
- As per the GOK ICZM report of 2015, an estimated 50 SHGs from the coastal regions of Kadalundi, Feroke, Chaliyam and Kozhikode Corporation are considered from capacity building and empowerment programmes.

5.9.4 Malappuram district

- Ponnani estuary is the most important coastal region in the area. The district has very narrow coastal plains which are less than 7.5m, midland and highlands. The major sustainable fisheries development initiatives include the modernisation of landing centres at Ponnani and Vakkad, provision of chilled storage facilities and also preparing and implementing ICZM measures.
- Cage fish cultivation, ranching of important species and Beeyam Kayal is considered for breeding native fish species.
- Agriculture, aquaculture and coir industry initiatives will be promoted.

- Backwater tourism and pollution control measures are to be adopted. Erosion mitigation measures must also be adopted.
- For wetland conservation, ecosystem zones are to be identified and managed. Beeyam kayal is one of the important biodiversity hotspot (ICZM Kerala Concept Note, GOK, 2015) .

5.9.5 Thrissur district:

The coastal plain of Thrissur have an average width of 75 km with elevations of 1m to 7.6 m above sea level, and several beach ridges.

- Under the sustainable fisheries development, provision for chilled storage facilities in Annapuzha, improving facilities of landing centres at Kaipamangalam, Annapuzha and Eriyad are considered. Also fish seed and shrimp cultivation is to be emphasised in areas like Azhikode. Apart from these, further ICZM plans can be initiated.
- Measures to promote agriculture, aquaculture, mussel cultivation and aquafarm initiatives are taken.
- Aquafarm tourism project is considered at Poyya area.
- Coir industry development, backwater and eco-tourism are to be strengthened. Sanitation and waste management measures are emphasised.
- Erosion control measures like installation of hollow tetra pods in the coastal sea, etc. are initiated.
- Biodiversity preservation and simultaneous improvement of the local communities is considered.

5.9.6 Ernakulam District

The district, can be divided into Coastal plains, mid land and high lands. The Vypin islands have great socio- cultural as well as economic and ecological

significance. It is a barrier island located between the Lakshadweep Sea and Vembanad estuary.

- Institutional frameworks, renewable energy sources, sustainable technologies and human resource development are initiated.
- Existing fish landing centres are to be improved, chilled storage facilities to be provided and ICZM initiative must be concentrated on Vypeen area especially.
- The fisheries university centre at Vypeen can aid in providing awareness and training of local fishing community members on importance of conservation and also of modern technologies.
- Aquaculture and agriculture are emphasised. Coir industry is affected by lack of skilled labours, which must be rectified by skill training.
- Aqua tourism of Vypeen area, ecotourism and backwater tourism are to be promoted. Linking of wetland tourism planning with wetland management planning is one such initiative.
- Pollution control measures include house boat waste management, sewage treatment, provision of proper sanitation facilities for households.
- Integrated management plan for mangroves are adopted.

5.9.7 Alappuzha District

- Alappuzha is one of the most vulnerable districts to climate change after Ernakulam. The Kayamkulam estuary and Thottapally spillway are of much ecological significance. The coastal areas, with inter related canals, backwaters and estuaries makes a sizeable portion of the district to be included under the CRZ. Poomeen Pozhi, Kochupozhi, Vavakkad Pozhi, Arappa Pozhi, Vadapozhi, Thumboli pozhi, Priyadarshini Pozhi, Odapozhi, Vazhakkottam Pozhi, Arakka Pozhi, Mararikkulam Pozhi, Chethipozhi, Chennavelipozhi and Arthungal Pozhi are some of the minor seasonal inlets

of the district. Vembanad region and related areas were brought under the Critically Vulnerable Coastal Area (CVCA) of CRZ in 2011. The district's coastal region is affected by the impacts of climate change, and in the vulnerability index calculated among 30 coastalfishing villages, Arthungal, Chethy and Thumboly were selected as being the most vulnerable areas to climate change impacts.

- Sustainable fisheries development, aquaculture, mussel cultivation and agriculture is promoted.
- Under ICZM initiatives, coir industry must be modernised.
- Sustainable development of wetland fisheries by fish seed production, cage faming, establishment of fish farms and fish seed production units are considered.
- Promotion of backwater and ecotourism, and also as a mode of travel.
- Enhancement of socioeconomic conditions of fisher folk of the area. They are also involved in the decision making in every level of the preparation and planning process.
- To fight coastal erosion, two three rows of hollow tetra pods are to be installed in the coastal sea.
- Wetland and biodiversity conservation is emphasised.
- The ICZM plans also aims at enhancing the development opportuinities in economic, social, cultural and recreational development.

5.9.8 Kollam District:

The district is famous for Ashtamudy Estuary and Monroe island. The Ashtamudy estuary has gained international popularity for being a wetland and is the second largest estuary in the state.

- Under the sustainable fisheries development, Neendakara and Shakthikulangara fish landing centres will be improved. Other measures will be taken to enhance the living conditions of the fisher folk.
- The fisher folk are to be given awareness and training on the latest technologies.
- In wetland cultivation, cage farming and breeding of native varieties of fishes can be promoted. Ornamental fish production is also emphasised.
- Aquaculture, mussel cultivation, agriculture and coir industry are given due emphasis.
- Promotion of backwater tourism by facilitating the amenities for house boast is carried out. Eco tourism is also developed by providing awareness and training to the local coastal communities. Measures are taken to conserve the ecosystem and at the same time improve the scope of tourism industry as well.
- Waste management measures are given major stress. Because wetlands, especially like Ashtamudy are affected by improper waste management issues.
- Neendakara, Munroe thuruth, Perumon, Panayam, Perayam, Thrikaruva, etc. are the targeted areas for providing capacity building training to the fisher folk.

5.9.9 Thiruvananthapuram District:

The state's capital consists of CRZ I (CRZ IA & CRZ IB), CRZ II, CRZ III and CRZ IV regions. Institutional, technical and human resource based measures are taken up for promoting sustainable fisheries development.

- Strengthening the food security of the area and enhancing the socio-economic conditions of the fisher folk are emphasised.

- Fish seed production units at Odayam, open water ranching, etc. are initiated.
- Agriculture, aquaculture and coir industry development are emphasised.
- Regarding eco tourism, both institutional development as well as active participation from the local communities measures are important.
- Apart from coastal erosion tackling measures, measures to conserve the cliffs of Varkala and Edava are also envisaged.
- Sanitation and waste management facilities are to be strengthened.
- Beneficiaries of capacity building initiatives mainly hails from Edava, Varkala, Anchethengu, Vettor and Vakkam (GOK,2015).

5.10. Future Prospects of ICZM

Considering the rich marine resources of the state and the simultaneous occurring of urbanisation, increased mechanisation of fisheries and other factors like property boom, tourism development, etc., the need for protecting the pristine marine environments from the harmful impacts of these is of utmost importance.

It is in this situation, the importance of integrated coastal management iss found to be significant in the areas of utilization, maintenance and preservation of coastal regions. For this, a holistic approach is visualised by the government, thorough integrating the socio-cultural activities with the ecological aspects. A wide level sectoral planning by taking together fisheries, agriculture, tourism, industries, institutions and public sector is carried out. For this, various policies are to formulated considering the resource monitoring and management, investment scope, and land use planning suitable for the area for sustainable development. Therefore, it is necessary to consult the environmental scientists before formulating the economic palns for the region, because any damage in the ecological balance can have greater disadvantages. However, often the important principles related to the environmental features of the region are ignored before formulating the economic policies and land use plans. This brings about conflicting situations. So, in order to rectify and avoid

such problems, holistic and integrated approach must be adopted while framing and planning ICZM rules. A co-ordination must be brought about through efficient management and communication among all the existing participants of the region. Institutions must be provided the responsibility for carrying out ICZM jurisdictions (Muthukrishnan.A., 2010). These policy objectives must be carried out in view of socio-economic, political and cultural situations existing in the region, while bringing about an understanding between the coastal population and the ruling bodies.

5.11. Capacity building of Kerala State Coastal Zone Management authority and other institutions

Despite having high literacy, rapid economic growth and strong environmental awareness among the people and the local bodies, the implementation and monitoring of ICZM rules and regulations are not up to the mark. Poor coordination between the various government departments, local bodies, local population and lack of capacity building activities are the main reasons for the same. It is in this situation, that the need of integrated approach is important.

Coordination and integration at various levels of planning and implementation, frameworks of regulations can be distributed to each sector in order to incorporate the conservation efforts into the regular functioning of the sector departments. The CRZ Notification, 2011 must be implemented strictly, with added importance to KCZMA. Local bodies must be provided with timely support to carry out the management activities as per such ICZM regulations. KCZMA works under the Science & Technology Department, Government of Kerala with assistance from the Kerala State Council for Science, Technology and Environment and receives cooperation from the Centre for Earth Science Studies (CESS). It provides technical, administrative and legal monitoring of the implemented rules (GOK ICZM Kerala Concept Note,2015).

The Centre for Sustainable Coastal Management/Institute for Coastal Sustainability and Management acts as the executing agency for capacity building

activity, in collaboration with the KCZMA, which is the main enforcement agency. Apart from these, the State level Resource Persons, Officials of the line departments, elected representatives of the State and three-tier local governments, members of the Technical Advisory Group and Districting Planning Committee, interested non-govermental organizations, etc. will be also included. Also, for the smooth functioning of the system, assistance will be provided to the training facilities of the Government of Kerala, such as the Institute of Management in Government (IMG), Kerala Institute of Local Governments (KILA), State Institute of Rural Development (SIRD), Extension Training Centres (ETC) for organizing the orientation and training programmes. Educational assistance with the aid of World Bank, NGOs, etc., is provided to the coastal population. The Kerala University of Fisheries and Ocean Sciences (KUFOS), Kochi also have extended its cooperation in this regard. Various Research and Development institutions for studying and researching about Sustainable Coastal management and its prospects are also present. In addition to these institutes, the Institute of Climate Change studies can also focus and emphasis more on studying the issues in coastal regions and framing adaptive capacity enhancing mitigations plans in this regard (GOK ICZM Concept Note, 2015).

5.12. Community Based Coastal Resource Management (CBCRM)

CBCRM or Community Based Coastal Resource Management is a complex approach for tackling multidisciplinary problems that affects the coastal regions and the local communities. It concentrates on the issue of open access and the related consequences upon the livelihoods of the coastal communities. It ensures the active participation of the local community in achieving the access, responsibility and control over the coastal resources, in a sustainable manner. The cases of many countries show the local communities losing their inherent rights over the coastal resources, due to the central management systems and regulations. CBCRM addresses such issues by empowering them politically, socially and economically.

So, CBCRM tries to empower the coastal community, as a means of ensuring their progress through capacity building as well as the sustainable development of the region as a whole. In terms of coastal region, this empowerment indicates the

process of enhancing the ability to adapt to the various adverse situations and also manage the resources sustainably, with the help of NGOs, government agencies, etc. This also aims at the betterment of the livelihood aspects. Equity must be in the context of a sustainable future. The technological development and mechanisation must be modified into eco-friendly types after considering the state of the local ecosystem and prevailing biodiversity of the region. This aims at a comprehensive achievement of rehabilitation, enhancement and protection of the resources, socio-economic as well as ecological wellbeing, simultaneously incorporating the gender equality concept as well.

In CBCRM, the aspects of indigenous knowledge is given due importance. Because, every region will be different in various aspects, be in geological, biological, social or environmental. The components of CBCRM include the community ensuring their access over productive resources, proper sustainable management of the coastal resources, through community organisations, capacity building, etc. This is an multidisciplinary approach, by encompassing various social, economic, political, geographical and ecological aspects. Skill training is a major measure in this regard. Set up of community based organised and environmental conservation are two interlinked steps.

5.12.1. Stages of CBCRM:

The CBCRM mainly includes four stages, i.e., planning, implementation, monitoring and evaluation.

- In planning phase, the first job is assessment, and social, economic, ecological and institutional data are collected through primary and secondary sources. Participatory analysis of the data is done at community level. The key participants are identified, who are later provided with skill training and capacity building initiatives. The local community are consulted and the information gained can be used to formulate the necessary measures and plans as per the CBCRM features. Community development plans are prepared based on these and related action plans are adopted later.

- The implementation stage includes the execution of the CBCRM action plans by incorporating eco-friendly technological aids, and inputs, also considering the indigenous techniques. It encompasses the various sectors and the contribution of all stakeholders, starting from the primary levels. Community networks are strengthened in this phase.

- In monitoring phase, the progress and variations of the activities are recorded and analysed. It facilitates in constructive modifications in the existent policy measures and plans. For this, necessary indicators will be selected in advance.

- In evaluation stage, the effectiveness of the CBCRM activities which are implemented in the respective coastal region can be assessed and studied.

All together, the CBCRM aims at sustainable livelihood development of coastal communities in association with the conservation of the biodiversity and marine and coastal resources.

5.13. Community Based Coastal Zone Management:

The Community Based Integrated Coastal Zone Management includes the measures and steps aimed at the conservation and management of coastal zones, with active participation from the local coastal communities. The Bay of Bengal Large Marine Ecosystem (BOBLME) project describes the CBICZM as having mainly three objectives, namely,

- Community based fisheries development and also habitat management and conservation with the government playing a little role,

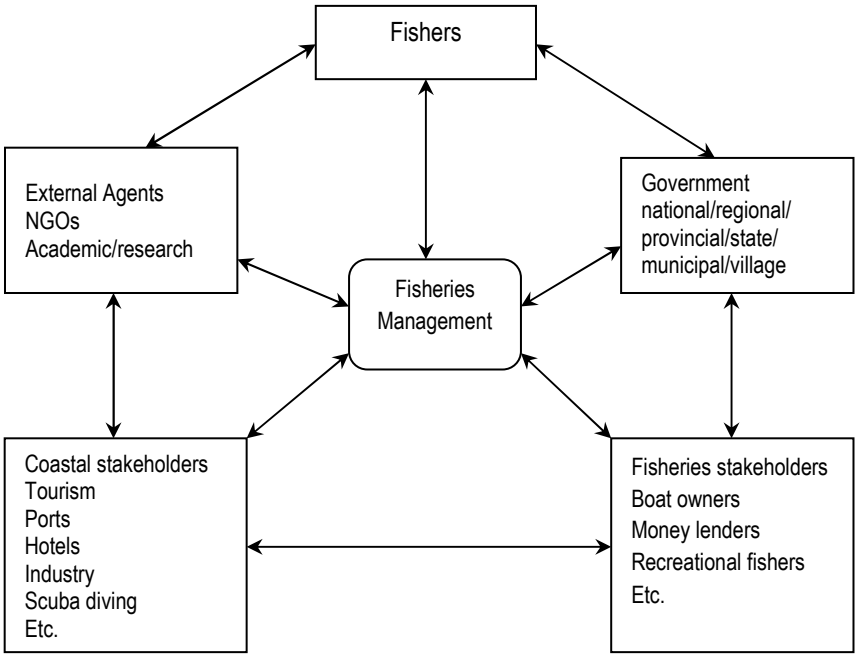
- Co-management of fisheries and active participation of fishing community and all other stakeholders, and them sharing the responsibility with the government, and

- To create and facilitate alternate job opportunities for members of fishing groups. Because excessive use of coastal resources leads to its depletion, and

also choosing alternate means of livelihood helps in improving the standard of living of the poor fisher folk (Dr. J. I. Samarakoon; Nightingale, Maeve; Hermes, Rudi; Joseph, B.L. ; Salagrama,V., 2011).

The concept of co-management of fisheries indicates the tie up between the government and public in conserving the coastal ecosystem and implementing the ICZM measures. The local fishing communities must have collaboration with the government's management measures, right from planning level. However, government based or community based are two extreme levels and the co-management can vary between these two extreme degrees.

Fig. 5.3: The Major Actors in Co-management of Fisheries Sector:



Source: Dr. J. I. Samarakoon; Nightingale, Maeve; Hermes, Rudi; Joseph, B.L.; Salagrama,V., 2011, (Review of Community-based Integrated Coastal Management: Best Practices and Lessons Learned in the Bay of Bengal, South Asia.)

For effectively managing the coastal resources, the lives of the coastal communities must be understood, and the basic understanding of how the lives of

the fisher folk are dependent and integrated with the native ecosystem and resources are to be studied. In India, the coastal regions are highly polluted, especially by the discharge of effluents, etc. So the initial steps must include pollution mitigation measures. Because in order to obtain positive results of ICZM measures, the negative externalities from the fisheries and related sectors, and also from other related aspects like industrialisation, urbanisation or tourism must be addressed. Resources and land must be used efficiently. In India, despite the various laws and regulations in this aim, the implementation is rather slow and fruitless mostly. This explains comparatively lower development of the coastal region and the living standards of the coastal population.

- A concept of **Ecosystem Approach to Fishery management** or EAF, specifically addresses the social, environmental as well as governance objectives, thereby incorporating and integrating the ideas of sustainable development with economic development. This is affected by the public or the fishing community, government, the marine habitats and local ecosystems, the fisheries resources and types, vulnerable species of the native biodiversity and also the impacts of various human activities like pollution or natural phenomena like the climate change or seasonal variations of weather, upon the harvest levels (Dr. J. I. Samarakoon; Nightingale, Maeve; Hermes, Rudi; Joseph, B.L. ; Salagrama,V., 2011).

- Similarly, two major steps to taken in CBICZM is to improve the linkage between Community Based CZM approaches and disaster management. The indigenous knowledge is of utmost importance, especially as the coastal population are familiar with the geographical and topographical features of the regions. Similarly, community risk perceptions can be analysed and studied. For instance, the 2004 Tsunami in India had affected the coastal communities very much, destroying their properties and affecting their livelihoods. So, by effectively using the methods of CBICZM, the disaster resilience can be increased among the vulnerable coastal fisher folk, which

will in turn help in tackling the natural disaster led problems too (Shaw, Rajib., 2010).

A major step in making the CBICZM effective is by mainstreaming the co-management. This can reduce the dependence upon unofficial and unsystematic measures or agencies. The fishing community can have direct collaboration with government, in areas of decision making, etc.. This will also adds to the rise in available alternate livelihood options. (Salagrama,V., 2011). Also, decentralisation of decision making is the crucial aspect in this regard. Because then only the integration of opinions from all stakeholders can find place in the policy frameworks. Democratic and sustainable approaches must be emphasised in this regard. Similarly measures to address the free rider problem, violation of fishing regulation, etc. must be adopted. The idea of "Start with what the people know", can be adopted here. The community based approach must have the vision of starting from the local scale, addressing the issues from the ground level, that is, from the coastal people, and also incorporating their ideas while framing the plans for solutions. (Aileen Hegarty, 1997).

5.14 Coastal Zone Management Activities and Responsible Fishing Practices

Data collected from the respondents and from the observation in the marine fishing villages, it was found that no organised efforts are taken to practice the code of conduct for responsible fishing in the State. Fisherfolk are totally ignorant about this code. In the FGDs, the participants pointed out that use of certain type of gears (example, nylon nets) cause injuries to fishes including juveniles, but nobody is bothered about it. They also revealed that usually there will be a considerable volume of juvenile fishes in the nets of trawlers and also in the nets of mechanised boats when trawl nets and purse seines are used. These juveniles are thrown away in the sea itself. Similarly, fisherfolk were not found taking initiatives for the protection of the coastal area through afforestation or sea wall construction, etc.

5.15. Case Study on Community Based Coastal Tourism in Kadalundi Vallikkunnu Community Reserve

A vast growing sector of the world, tourism is a fastest growing industry, with major contributions to the economy. Apart from providing the employment opportunities as well as the prospects of socio economic development in the respective destination countries, it also facilitates cultural integration and understanding of cultural diversities among various countries. However, the issues of hostility of residents, poor transportation and basic facilities are there. Therefore, the overriding concern for the industry must be to seek out ways to enhance rather than degrade its core products: the environment, upon which all of the humanity must depend for survival. In other words, the environment is tourisms resources. The close relationship between tourism and the environment and the importance of environmental planning are becoming increasingly recognized.

5.15.1. Community Based Tourism

The economic development can be aided by tourism development, and in this context the idea of community based tourism emerged. Community based tourism is a related aspect to this, in which the local population comprising of the financially marginalised sections and rural population, welcoming the tourists, providing them with the accommodation and related facilities, for visiting their region, understand and explore the region, the local habitats, their community aspects and the like. This involves an exchange of traditional cultures and values and helps in understanding the different communities and their customs, along with discovering and exploring the natural habitats and attractions of the place.

The residents of the area can emerge as land managers, entrepreneurs, service and produce providers or employees. For local people, apart from a source of living, it is also a mode of exposure to foreign cultures through the visits of tourists. It is also an example of community involved decision making. Cross-cultural integration of communities and sustainable tourism are indeed an innovative means of economic development. The major outputs include the generation of additional

income by travel activities, odd jobs associated with tourism, increased encouragement for locals to conserve the bio diversity of the area, the development of market for co-operatives new products, and also the rural development and implementation of sustainable natural resource management projects by the governments,etc.

The major characteristics of community tourism are as follows:

- Integrates natural beauty and the daily life of rural communities
- Promotes productive sustainable practices within its tourism offerings
- Adapts itself to the dynamics of rural life and preserves the welcoming, relaxed, rustic atmosphere that characterizes the rural areas of the country.
- Is maintained by local initiative and participation, and strengthens local organizations, which are made up of various families or of the community as a whole.
- Integrates the locals in this economic activity, distributes the benefits evenhandedly, and supplements farming income.
- Promotes land ownership by the local population

5.15.2 Kadalundi Vallikunnu Community Reserve

The study looks into the Kadalundi Vallikunnu Community Reserve (KVCR) which is a community based tourist destination in Kozhikode district of Kerala. The study aimed at analysing the problems and prospects of community based tourism in KVCR, based on the opinions and feedbacks collected from the local populations and the officials alike. The main merits and demerits of KVCR affecting the local community and tourism sector in generally were studied. These were carried out by using the scaling and indexing methods mainly.

About the Kadalundi region, it is an estuary with rich mangrove ecosystem, migratory bird habitat and marine resources. The large portion of shallow wetland is

susceptible to intertidal fluctuations, with vast patches of mudflats. The region's resource potential is utilised efficiently by means of sand mining, shell mining, fishing, oyster catching, mussel farming, peat collection and coir retting. Tourism has also gained popularity in the area, thereby providing wide scopes for education, entertainment, research and livelihood aspects. The Kadalundi estuary was declared as the Kadalundi-Vallikunnu Community Reserve due to its ecological significance as a habitat of diversity of wetland and migratory birds and also heavy anthropogenic pressures.

The KVCR is a major step towards the development of tourism. However, the local community is in a pathetic condition. With lowering of income and employment opportunities, their standard of living has lowered, which can in turn affect their educational attainment and health. The transformation and development of Kadalundi region into a community based eco-tourism spot is the prime remedy that can be adopted in this regard. This way, it helps in raising the incomes and standard of living of the local population. It was found that the majority of young males preferred technical education as a way to acquire jobs rather easily. A majority of the local people worked as casual labourers, and they depended on financial institutions for non- subsistence purposes. The KVCR is implemented and managed poorly. In spite of this, the local population have raised the point that the tourism potential of the area under KVCR is remaining still underutilized. It was also found that positive physical impacts of KVCR were higher than the negative effects. However, the case of socio-economic aspects is an exception. So, it can be concluded that it is high time for focused developmental approach from the side of both the central and the state governments. This is by considering the future prospects of the region and by a balanced approach, considering all the related aspects.

5.15.3. SWOT Analysis

Based on the field visits and the qualitative information gathered from the Focused Group Discussions a SWOT framework is developed. SWOT Analysis is a useful technique for understanding your Strengths and Weaknesses, and for

identifying both the Opportunities open to you and the Threats you face. The SWOT framework observes the positive and negative factors that have implications in the promotion and development of KVCR. Positive factors comprises of strengths and opportunities whereas weaknesses and threats indicates negative or harmful effects.

Any factor that is advantageous to competition represents strength and on the opposing side, disadvantageous factors are weakness. An opportunity is the desirable gathering of environmental factors and a threat is the unfavourable development of the environment, which negatively affects the destination (Stapleton and Thomas, 1998). Once a SWOT analysis is conducted, the outcome has to be integrated into the marketing plan.

Strengths and opportunities needs to be exploited in the most efficient way and weaknesses and threats needs to be minimized to the highest possible degree. In order to situate the current scenario of KVCR, it is important to evaluate the strengths, weaknesses, opportunities and threats. The SWOT framework observes the positive and negative factors that have implications in the promotion and development of tourism destinations. The strength, weakness, opportunities and threats which have been identified based on the Survey conducted among the community members and tourists is shown in the table.

Table 5.1. SWOT Analysis

STRENGTHS	**WEAKNESS**
Rich biodiversity and scenic beauty with an estuary, mangrove forests and migratory birds Variety in flora and fauna Destination suited for boating and related activity Resources and facilities for environmental education, interpretation and awareness. Existence of the tourism facilitators and local restaurants Existence of the basic infrastructure(Coastal highway,Calicut airport and Kadalundi railway station) Labour capacity which has well knowledge needed for tourism activities can be employed Hospitality nature of local population	Insufficient experience for tourism facilitators Low cooperation among tourism agencies and government officials Local authorities have less control over development activities Poor profitability and economic leakages to people outside the community reserve Inadequacy of transport facilities Funds constraining the development of regions. Inadequacy of information channels. Inadequacy of marketing. Lack of adequate infrastructural support. Lack of proper accommodation facilities for tourists, birdwatchers and researchers
OPPORTUNITIES	**THREATS**
Growth of tourism industry Tourism by mangrove conservation and beach management Rising consciousness for environmental protection and value for ecosystem conservation and on carrying capacity issues. New job and income possibilities generated because of KVCR To improve the awareness on nature conservation in local and cultural level New financial sources for protection, preservation and conservation of natural areas	Destruction of natural habitats. Sand mining and soil erosion Transformation of the region from natural activities to a commercial product purely for profit making. Danger to the already fragile ecosystem. Rise in human activity i.e. littering of waste, encroachment and noise pollution. Increase in the flow of tourist influencing local culture fabric. Decrease in air quality and water quality

Source: Primary Data

5.15.4. Garrett's Ranking Analysis

To find out the most significant factors which influence the respondents towards KVCR, Garrett's ranking technique was used. Under this method, respondents have been

asked to assign the rank for all the factors and results of such ranking have been converted into score value with the help of the following formula:

Percent position= 100(Rij-0.5)/Nj

Where,

Rij= rank given for the ith factor by the jth respondents

Nj= number of factors ranked by the jth respondents.

The percentage position of each rank was converted into scores using Garrett's table. Then for each factor the scores of each individual are added and then mean value is considered to be the most important.

Table 5.2: *Garret Ranking Selection Factor Result*

Factors	**Number of preference**						**Garret score**	**Average**	Garret Rank
	1	2	3	4	5	6			
Demand for local products	2156	1449	1080	598	432	92	5807	58.07	**II**
Infrastructure	616	315	1026	920	828	575	4280	42.8	**VI**
Stimulation of local economy	693	1008	1026	736	756	437	4656	46.56	**IV**
Basic needs	2849	1638	810	460	360	46	6163	61.63	**I**
Environmental Protection	1232	1008	1080	1058	540	230	5148	51.48	**III**
Overall satisfaction	693	882	648	782	720	644	4369	43.69	**V**

Source: Primary Data

The above table exhibits Garrett's ranking and scores. From the table, the Garrett's scores which helps to decide the most important factors influencing by the respondents .The table highlights that, the highest score is 61.63, 1st rank is given for basic needs; the second rank is given for demand for local products i.e. 58.07. The lowest rank is 42.8, given for infrastructure. So the above Garrett's ranking table, we can conclude that basic need which is the most important factor influenced by the respondents while arranging a tour.

5.15.5. Findings

- "The major portion of the population in the area belongs to socially disadvantaged groups.
- Considering the economic and employment situation in the area, it was observed that nearly 52 percent of the households have annual income below 20,000 and the earning members of these households are mostly unskilled casual labourers. Only a small portion (7 per cent) of the earning population has secure government employers. .
- The utilization of the financial aid thus obtained points to the fact that loans are availed for non-subsistence purpose i.e. not for employment generation or for improvement of the income earning opportunities.
- Lack of proper management system is an important obstacle for the implementation of KVCR. Community Reserve Management Committee (CRMC) with members nominated from Panchayaths are not able to manage such a big project funded by central and state governments.
- Strict rules and laws were implemented for the conservation of the reserve which are very important as far as the reserve is concerned but in turn it effects the livelihood of the local people very badly. However, the low earnings for the local community clearly depicts that the tourism potential of KVCR is still underutilized.
- Environmental awareness, self-employment opportunities, positive attitude of project officials, demand for local products, conservation of natural resources etc are accepted at high ratings by local people in KVCR.
- The stress areas in the biological and physical negative impacts are decrease in sensitivity of the ecosystem, decrease in abundance and diversity of flora and fauna, soil erosion and sand mining, problems due to coir retting and decrease in aesthetics of the area.

- When compared with the negative biological and physical impacts, positive biological and physical impact was high. There are no stress areas in positive biological and physical impacts. There are too many stress areas both in positive and negative socio economic impacts. But the negative impact was very high in the case of socio economic conditions at KVCR" (Pavithran.A.P, Sachin, Menon,N.R., Sankaranaryanan, K.C., Arunachalam, P., 2014).

This Chapter analyses the Coastal Zone Management and its Impact on society citing a case study of Kadalundi Vallikkunnu Community Reserve.With all these measures, and proper management of community based tourism, on a sustainable manner, the economic progress can be achieved for the local community.So, apart from a biodiversity hotspot, the estuary can be of economic importance if used and managed properly. The proper management fish resources, safeguarding important migratory birds' habitats, can aid in achieving sustainability. Along with this, community based tourism and cooperatives can work in achieving sustainable development.According to the respondents, the major eco-development strategies have the important aim of providing and facilitating the alternate income generating activities to the native inhabitants and thus reduce their dependency on natural resources like sand and mangroves.

Chapter 6

CONCLUSIONS AND POLICY OPTIONS

6.1 Conclusions

This study was conducted with the major objective of knowing the socio-economic and ecological pressures on the fishermen community in the wake of climate change. The existing socio-economic status and the infrastructure facilities available for the marine fisher-folk of Kerala has also been assessed based on the sample study.

In the present study, numerous aspects that influence the marine fisheries sector, and its vulnerability to the climate change are examined. The study is focused mainly on the socio-economic conditions of the fisher-folk, their quality of life, income and employment details , available infrastructural facilities, including the fishing infrastructure, climate change indicators affecting them, sustainability aspect, Coastal Zone Management, tourism related scope in the coastal region, the steps towards inclusive development, chances for alternate means of livelihood for the fishing community, policy options and further scope for the studies in this regard.

Right from mechanisation in 1980s, the sector has seen huge transformations with regard to the fishing infrastructure and implements, organisations and plans and policies that are aimed at the welfare of fisher-folks. The mechanised, motorised fisher-folk are having an advantage over the traditional fishermen in having more catch, and availability of resources.

The intense competition, coupled with the harmful effects of climate change and pollution are making the prospects of traditional fishermen extremely dim. The issues can accelerate from basic physical or biological disturbances to economic, social or political frames, as there is a close knit connection between all the stakeholders of the system; right from the ordinary fishermen, traders, exporters, to general public and government.

The alternate economic approach of incorporating multidimensional fields in studying, analysing and solving the major issues that affect the marginalised groups like the fishing groups is necessary in the present situation.

6.1.1 Socio-economic Profile of the Community

The existing socio-economic status of the marine fisher-folk of Kerala has been assessed based on the sample study. By socio-economic conditions, it includes religious status of the community, in which they are Hindus, Christians or Muslims, gender status, the family size in which the increasing trend is people preferring nuclear family setup, the age groups. While analysing the age groups, it was found that nearly all the working respondents were below 60 years of age. The socio-economic conditions of the fishing community are comparatively backward vis-à-vis the general population.

Here, the socio-economic status-wise classification into APL, BPL, or Andhyodaya schemes were studied, where we could find that majority of them belonged to below poverty level, indicating their poor standard of living. Similarly, lack of education is another persistent issue that can be observed in the case of fisher-folk. This is due to the vicious cycle of poverty, which leads them to drop out of schools and take up employment. The poor educational qualifications make it difficult for them to have access to better employment opportunities. However, the younger generation among the fisher-folk are increasingly reluctant to take up fishing as an occupation, owing to the poor profitability existing in the sector.

The household expenditure and savings rate make it evident that low saving rates indicate their low income, making them susceptible to borrowing money and

keep them in debts. The increasing dependency on money lenders and private institutions who charge exorbitant rates of interest only worsened their situation..

The lowest percentage of respondents who have borrowed from the nationalised banks is a clear indicator of the fact that even today, these banks are not easily approachable to the marginalised fishing community. Duringdata collection and the Focussed Group Discussions, it was observed that the fishermen do not prefer nationalised banks for borrowings due to requirements of collateral securities and prolonged formalities.

Regarding land ownership and housing, most of them are living in rented houses, and owns land less than 10 cents. The increased expenditure on liquor, smoking and gambling reduces their savings considerably. The unhealthy consumption expenditure in this regard is posing a major threat to their savings and limited income levels, apart from increased social and health issues.

After taking stock of the socio-economic conditions of the fisher-folk covered under the study, it is found that there exists wide disparity among the household's different coastal districts in Kerala. For instance, the living condition of fisher-folk of Kannur or Kozhikode is different from that of Trivandrum or Kollam districts. The economic condition of the fisher-folk was found pathetic in spite of different developmental and welfare schemes implemented by the government.

6.1.2 Income and Employment:

As explained above, the low income coupled with the uncertainty in fish catch make it difficult for the common fisher-folk to meet the two ends each day. During the days of no work, they obtain no income, and such situations if occur continuously, drives them into high indebtedness. The lack of ability to choose alternate employment opportunities is another issue. These are further aggravated by the bureaucratic hurdles and redtapism which are in fact exploiting their low capacity. In spite of the State having top ranks in HDI, the fisher-folk are having poorer standards of living when compared to the general population of the State. The risk and uncertainty associated with the occupation, along with the high costs of

maintenance of the implements and also the competition existing for the common resources, younger people are reluctant to join the industry.

Regarding the fishing experience of them, a majority of the respondents had an average of 20 years of experience in this field. And most of them work for only a few days every week, depending on the income they can obtain each time from the catch. The uncertainty related to employment is a major causative factor that drives them into indebtedness.

6.1.3 Infrastructural Facilities:

The houses of most of the fisher-folk were rented.The houses have concrete or tiled roofing with majority having cement flooring.Some of themhave marble or tilefloorings. The fisher-folk face a lot of damages to their dwellings generally from the seasonal changes in climate, in the form of high tides, storms and or cyclones.

It was found that almost all the fishing villages have roads and transportation facilities. All the coastal districts have sufficient number of primary and secondary schools.Electricity and internet facilities are also available. However, safe drinking water still remains as a question mark.Proximity to saline water makes the ground water unsuitable for human consumption. Public taps have been installed. But supply of water is irregular and of poor quality. Lack of pure drinking water is the major cause for their health problems.Lack of adequate health care facilities often results in epidemics such as dysentery, flue, etc. Community halls, railway station, all weather roads are also not easily accessible to the fisher- folk in many villages. This shortage has its own influence in the socio-economic status of the members of this community

In many fishing villages higher content of ferrous and higher count of coliform bacteria make the ground water unsuitable for human consumption. Water from open wells suitable for drinking is available only in 38 fishing villages of the State. Other fishing villages depend on public water distribution system which is available at some corners but irregular in supply.

The cooking fuel is mostly LPG, with some of the respondents depending upon firewood also. In Kerala, there are about 80-90 fishing villages which lack proper drainage facilities. Total sanitation program is essential for the entire fishing villages of the State to keep the fishing villages under good sanitary and hygienic conditions.

6.1.4 Fishing Infrastructure:

Among the respondents surveyed, there were traditional fishermen, mechanised fishermen, motorised fishermen, middlemen, traders, and the like. The fishing infrastructure used by the fisher folk varies depending on the type of fishermen. While a majority of them belonged to the traditional fisher folk category, most of them uses *vallom* or motorised boats as vessels. This is followed by canoes and mechanised crafts. However, not all of them are able to own fishing vessels, due to high costs of maintenance. So, they also work as labourers or take boats and other motor engines for rent.

The major fishing gears used are hooks and lines, gill nets, purse seine, trawls. The most commonly used gear is gill net. Some of the respondents who did not engage directly in fishing activities were also there, like traders and labourers.

In spite of technical revolution in the sector and mechanisation, the influence of both in the case of fish finding devices have been considerably low, and this is evident from the analysis showing that majority of the respondents did not use any fish finding device. Only some had depended on GPS, and hardly a few on Echo sounders. The use of mobile phones is common, which mainly helps them in communicating the market positions.

Marketing of the fish catch is a major challenge faced by the fishermen in Kerala. This was one of the important issues raised by the participants in all the FGDs conducted during the study. The participants complained that the fishermen do not get a reasonable price for their catch due to the operation of unethical intermediaries. In many landing centres the representatives of large sized processing units decide the price of the catch brought by the fishermen. For this purpose, these

intermediaries make some hidden agreements among them and never bid a higher price for the catch. Then, the fishermen are forced to dispose of their catch.at low prices.

6.1.5 Fish Catch Related Issues:

Reduced volume of fish catch was pointed out as a very important problem faced by the fishermen. Nearly 82 per cent of the respondents have marked that the volume of fish catch has been shrinking over the last many years.

In the FGDs, the most important and very serious issue raised by the participants was the decreasing volume of fish catch, particularly during the off season. They have pointed out reasons such as uncontrolled fishing by the mechanised vessels and use of banned fishing gears. They further pointed out that there is no action against such vessels which they frequently see in the territorial waters and in the EEZ. Some participants suggested implementing trawl ban during the period from January to March every year.

The varieties of fish caught are also related to the migration and breeding patterns of fish species. This is influenced by various factors like trawling, high competition led resource depletion, climate change issues, pollution and so on. Owing to the uncertainty in fish catch and very poor catch during dry season, most of the fisher-folk households are forced to borrow funds to meet the daily minimum expenditure. Thus, livelihood status of the fisher folk was found poor in economic and social terms.

6.1.6 Climate Change Related Issues:

The change and variability in climate over a period of time can have extended effects on the world sustainability system as well as the susceptible communities, which are often marginalised from the main society. The major effects of climate change take the form of ecological, geographical, economical or even social dimensions. The fisheries sector being closely related to the nature and dependent on the ocean resources is extremely vulnerable to the climate change.

The ecological impacts of climate variability on the fisheries sector include the variation in fish availability, resource depletion, disturbances in migration and breeding pattern, varying seasonality in fish distribution, etc. In Kerala, along the coastal areas, during post monsoon times, mud bank formations are observed, which can shift according to the availability of rainfall, and seasonal variation. Even a very little rise in sea surface temperature can lead to major threats to the marine organisms. Similarly, increased salinity of sea water can affect the fish species. Increased sea water salinity can even affect the soil salinity along the coasts. The coral bleaching, endangering of certain fish species, migration of certain fishes like oil sardine along the North- Western coast are all related to climate variability.

Similarly, coastal upwelling, which is the phenomenon wherein cooler water moves to the surface and enabling more biological activities, can provide better fishing grounds. The uncertainty in upwelling is another issue.

In the survey, it was found that many fish species have disappeared over time. Changes are there in species and the more observable change in sea water coloration is also common along the coasts. The occurrence of new species in the area, changes in sea water level and the differences in tidal patterns are also noticed.

The direct impacts that affects the fisheries sector are occurrence of natural hazards like storms, coastal flooding, etc., which can damage the fishing infrastructure, health issues, coastal erosion, difficulties in familiar navigation routes, and the like. Economically these impacts can lead to financial loss for the fisher-folk. Also, poor catch leads to lower income obtained. And all these together can drive them to indebtedness and further backwardness.

Non availability of fish, absence of certain traditional fishes, coastal erosion, loss of gears due to rough sea, pollution etc. were found to be the most important, but uncontrollable issues recently faced by the fisher folk of Kerala as a whole. These issues were reported from all the coastal districts of the State. It is realised that such issues are the direct and indirect impact of the climate change on the socio-economic condition of the fisher folk of Kerala.

6.1.7 Vulnerability of Fisheries Sector:

Vulnerability relates to the limit or extent up to which stressful situations can affect the subject. The exposure of the sector to the harmful impacts of climate change, the resilience it can have towards these impacts and the adaptive capacity of the related actors and stakeholders determines the vulnerability of the sector to the impacts of climate variability.

Upon considering the views of the community level actors, both pollution and rising fishing pressure that lead to increased exploitation of the marine resources, are also considered as major stressors on fisheries resources. Coastal zone has various uses or resourcefulness which the people exploit for livelihood and other purposes. They include, the use of land, habitations (urban and rural households, beach resorts), agricultural practices, agriculture/fishery related traditional and small scale industries, agriculture and fishery related trade, fish processing, storage, ice plants, boatbuilding and repairing yards, infrastructure amenities for port development, transport activities, waterfront expansion for recreation and tourism, mining, industries (heavy and medium), coastal mangrove deforestation, water, fishing, aquaculture, artificial reefs (fish habitats), shipping / transport, mining of minerals, corals and fossil shells from the sea, clay and sand mining from estuaries/backwaters, dumping, port development, recreation and tourism, water use for industries and near shore drilling for oil etc.

The harmful climate change impacts can be tackled by means of building adaptive capacity and this can be initiated by means of capacity building initiatives from the part of all the stakeholders. Human vulnerability can be related to issues of education, health, cultural or social aspects. Similarly, occupational vulnerability can be linked to the mechanisation in the sector and the unequal distribution of income and resources, the higher competition, uncertainty and risks related to the same, etc. The planning and mitigation strategies to address the various climate related issues must therefore aim at increasing the resilience and adaptive capacity of the fisher folk.

6.1.8 Ecological Pressures and Sustainability:

The fisheries sector is facing a lot of issues related to various aspects that can affect the ecological balance and sustainability of the system. To tackle the issues that are ranging from low catch, resource depletion, health hazards, low income, indebtedness, natural hazards and poor adaptive capacity, the sustainable frameworks are to be adopted, which aims at conservation of the ecosystem and sustainable development as a whole.

This has put forwards to the rise of the concept called "sustainomics", which is more of a trans-disciplinary framework that can be considered an ideal and suitable path to welfare. Here, economic and social elements are incorporated with the environmental factors and together is utilised to facilitate capacity building of the fisher folk.

6.1.9 Coastal Zone Management:

The CZM aims at addressing issues of environmental and socio-economic nature along the coastal region. This can take the forms of conservation and preservation of coastal ecosystems and populations, conservation of resources, limiting the exploitation of coastal resources, controlling pollution and constructional activities in the protected zones, and passing policies and regulations regarding the same. Planning, management and execution of policies for costal conservation is the main agenda under CZM.

The objectives include capacity building as well as conservation of ecological and cultural aspects with a view to reduce poverty and bring in economic growth and sustainable development. The integrated management of the coastal ecosystems and holistic approach promoted in this view helps the fisher folk in various levels from gaining an improved living standard to reduction of susceptibility to climate change impacts.

The Human capital empowering strategy is a valuable measure in bringing development to the fisheries' sector. This includes strengthening of adaptive

capacity and incorporating all stakeholders in the participatory approaches at the various levels of planning and execution of strategies. All the related indicators and factors, like ecological, social, economic and political aspects are to be considered. Along with these, the external influences like climate change, natural hazards and the like.

The major issues that CZM address in Kerala's coast are climate change impacts like coastal erosion, coastal flooding, sea level rise, resource depletion and conservation, mangrove conservation, tourism related aspects, control against the illegal encroachment of beaches and lagoons, setting limit to constructional activities in the protected zone, addressing the issues of coastal pollution and extensive illegal mining, and the like. Apart from these, it also helps in capacity building of the fishing community, through facilitating the availability of public and basic infrastructural facilities like housing, electricity, drinking water, etc. it also aims at uplifting the community from social and economic backwardness through various plans and policies, support for related sectors like agricultural development, etc. The authorities can take strict measures against Violations of CRZ norms.

A healthy coordination and co-operation among all the participants of the region is necessary for the successful implementation of CZM plan and tourism is a very profitable sector and it can thrive in coastal regions, which holds much prospects for the industry to flourish. Despite the various advantages like development of the region, the extensive development of the industry can be harmful to the native ecological balance. Because, with development and further industrialisation the pollution of the coastal region increases, which in turn harm the sustainability of the indigenous ecosystem as well as of the traditional community of the region.

However, concepts like Community Based Coastal Tourism aims at bringing together the native population as well as the authorities and the public in promoting ecotourism. The analysis in regard to KadalundiVallikkunnu community reserve shows that when the native community turns the host for the tourism,it can raise the employment opportunities of the native population. This concept also incorporates

the idea of cultural exchange and discovering of the natural habitats of the region. However, most of the uncontrolled exploitation of the coastal habitats that can hamper the ecosystem will be restricted, which can in turn affect the local community negatively, as they depend on the coastal resources considerably well.

6.1.10. Multidisciplinary Approach and Further Scope of Study:

The components relating to the planetary boundary must be studied and effective actions must be taken in that regard. Similarly, the multidisciplinary approach is necessary to tackle the vast interconnected issues which range from geographical to economical in nature. The linkages between scientific aspects, policies and practices must be reviewed and strengthened.

The field of alternate economics holds much scope in this regard, when the interdisciplinary nature of the issues is considered. The cost-benefit analysis, optimality based welfare approach, studies on related risks and uncertainties all can strengthen the measures that aims at a sustainable development of the sector.

6.2 Policy Implications:

For achieving the required and feasible solutions to the existing problems, attempts in multidimensional direction needs to be adopted, that encompasses the problems and suggestions on the part of the fisher folk and other stakeholders amply, and thereby concludes in formulating and implementing necessary action plans and welfare schemes.

The governments must set up committees and institutions to study the issues affecting the fisheries sector and action plans and policies can be adopted as per the recommendations of the experts after consulting with the related stakeholders. The involvement of local communities must be encouraged, because this helps in awareness building and encourages their resilience as well as adaptive capacity.

Inclusive and sustainable development frameworks and plans must be implemented efficiently. In this regard, spreading of awareness and educational upliftment of the fisher folk is necessary. Women empowerment among the fishing

community must be envisaged, as women suffer socially and occupationally from lesser acknowledgment to their work in the form of reduced levels of wages, etc. Mechanisation of the traditional fishermen, in their indigenous crafts, and such other innovative approaches must be adopted.Data collected from the respondents and from the observation in the marine fishing villages, it was found that no organised efforts are taken to practice the code of conduct for responsible fishing in the State. Fisher folk are totally ignorant about this code.

6.3 Suggestions:

The following suggestions are made on the basis of the findings of the study:

- Studies are required exclusively covering the fisher-folk of Kerala with a view to identify the consumption pattern and health conditions. Such studies should be carried out with the participation of government agencies only. This will make data collection more easy and reliable.

- The children of fishermen should be motivated to obtain graduate level or technical education. This will enable them to acquire employment and thereby the living condition of the family can be improved. For this purpose, infrastructural facilities need be improved in those fishing villages where they are absent now. Expenditure for this purpose has to be met from the MLA/MP funds (MLA- Member of Legislative Assembly, MP- Member of Parliament).

- Erosion of income can be prevented by promoting money savings habit among the fisher folk. Popularisation of micro finance and launching of tiny business by a small group in each fishing village may make wonders in this direction. This will also save them from the heavy burden of debt.

- Efforts are to be strengthened by the NGOs, etc. through organising awareness programmes to bring down the habit of liquor consumption. Similarly, the code of conduct for responsible fishing as suggested by the

FAO, need be popularised among the fishermen who are actively engaged in fishing. Here also the role of NGOs is very pertinent.

- There is an urgent need to improve the hygienic and health conditions in the marine fishery villages of Kerala. The data relating to the sources of drinking water too support this argument.

- In the FGDs, the most important and very serious issue raised by the participants was the decreasing volume of fish catch, particularly during the off season. They have pointed out reasons such as uncontrolled fishing by the mechanised vessels and use of banned fishing gears. They pointed out that there is no action against such vessels which they frequently see in the territorial waters and in the EEZ. This issue should be taken seriously by the government and strict control should be imposed.

- There are Fishery cooperative societies in all the marine fishing villages of Kerala. However, most of them are not working in the right direction now. The working of these cooperatives need be activated and should interfere in the marketing of fish so that fishermen can be saved from exploitation.

- Adoption of at least one fishing village, in each coastal district, by the State/ Central level institutions, particularly those functioning in the field related to fisheries or large sized private firms and introduction of various developmental programmes can make commendable changes. For this purpose, an amount should be earmarked under the head ‘corporate social responsibility’.

- Over and above, when the depletion in the fishery resources as a result of climate changes and in the meantime increasing population pressure in this sector are considered, a limit has to be fixed for the activities in the fishery sector. With this view, diversification of occupation should necessarily be encouraged well. Otherwise, the living condition of the fisher folk will remain the same in spite of large amount of public expenditure in this sector. The fisher folk should realise and accept this fact.

Conclusion:

The impact of climate change is a very serious issue before the mankind today. The increasing temperature and the resulting sea level rise and the changes in the seasonal rainfall directly hit the human life. The marine fisheries sector in Kerala are likely to take a major hit as climate change affects fish stocks, resulting in decreased yield and loss of livelihood of fisher-folk. As far as the state of Kerala is concerned, marine fishery has a prominent place in its economy. It is the only source of livelihood for 7.71 lakh marine fisher folk and out of this, around two lakhs of active fisher folk are engaged in fishing along the coastline, who are inhabited in the 222 marine villages. Therefore, even a slight depression in the marine fishery sector will adversely affect the livelihood of a major segment of the population and also the foreign exchange earnings of the country.

The above analysis indicates that the socio- economic condition of the fisher-folk of Kerala is not par with the general community. The level of education, monthly income, expenditure on food and non -food items, savings habit, hygienic conditions, number of unemployed people, etc. are the real indicators for this. It is besides this, the adverse impact of climate change in the fish landings is observed. Since climate change is an uncontrollable phenomenon, organised and sincere efforts are to be initiated to make aware not only the fisher folk, but the policy makers also to fix a limit for the activities in the fishery sector. Improving the level of education and encouraging diversification of occupation are the two important facts to be accepted and implemented.

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APPENDICES

Appendix 1

Distribution of Respondent Households According to Religion

DISTRICT	Fishing village	Religion						TOTAL (Nos.)
		Hindu		Christian		Muslim		
		Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	1.00	3.33	29.00	96.67	0.00	0.00	30.00
	Poovar	2.00	6.67	28.00	93.33	0.00	0.00	30.00
	South Kollamkode	0.00	0.00	30.00	100.00	0.00	0.00	30.00
	Paruthiyoor	0.00	0.00	30.00	100.00	0.00	0.00	30.00
	Punthura	1.00	3.33	27.00	90.00	2.00	6.67	30.00
	Kovalam	25.00	83.33	0.00	0.00	5.00	16.67	30.00
SUB-TOTAL		**29.00**	**16.11**	**144.00**	**80.00**	**7.00**	**3.89**	**180.00**
KOLLAM	Sakthikulangara	4.00	13.33	26.00	86.67	0.00	0.00	30.00
	Cheriazheekal	30.00	100.00	0.00	0.00	0.00	0.00	30.00
	Marathoorkulangara	27.00	90.00	0.00	0.00	3.00	10.00	30.00
	Mayyanad	7.00	23.33	23.00	76.67	0.00	0.00	30.00
	Neendakara	3.00	10.00	27.00	90.00	0.00	0.00	30.00
SUB-TOTAL		**71.00**	**47.33**	**76.00**	**50.67**	**3.00**	**2.00**	**150**
ALAPPUZHA	Thaikal	14.00	46.67	16.00	53.33	0.00	0.00	30.00
	Vadakkal	0.00	0.00	28.00	93.33	2.00	6.67	30.00
	Arattupuzha	26.00	86.67	0.00	0.00	4.00	13.33	30.00
	Pollethai	2.00	6.67	28.00	93.33	0.00	0.00	30.00
SUB-TOTAL		**42.00**	**35.00**	**72.00**	**60.00**	**6.00**	**5.00**	**120**
ERNAKULAM	Cheriyakadavu	8.00	26.67	22.00	73.33	0.00	0.00	30.00
	Chellanam	1.00	3.33	29.00	96.67	0.00	0.00	30.00
	Cherai	18.00	13.33	12.00	86.67	0.00	0.00	30.00
	Kannamli	0.00	0.00	30.00	0.00	0.00	0.00	30.00
SUB-TOTAL		**27.00**	**22.50**	**93.00**	**77.50**	**0.00**	**0.00**	**120.00**
THRISSUR	Vemballur	30.00	100.00	0.00	0.00	0.00	0.00	30.00
	Kaipamangalam	27.00	90.00	0.00	0.00	3.00	10.00	30.00
	Azhickode	30.00	100.00	0.00	0.00	0.00	0.00	30.00
SUB-TOTAL		**87.00**	**96.67**	**0.00**	**0.00**	**3.00**	**3.33**	**90.00**
MALAPPURAM	Kadalundinagar	0.00	0.00	0.00	0.00	30.00	100.00	30.00
	Parapanangadi	0.00	0.00	0.00	0.00	30.00	100.00	30.00
	Arayankadappuram	0.00	0.00	0.00	0.00	30.00	100.00	30.00
	Ariyalloor	0.00	0.00	0.00	0.00	30.00	100.00	30.00
SUB-TOTAL		**0.00**	**0.00**	**0.00**	**0.00**	**120.00**	**100.00**	**120.00**
KOZHIKKODE	Thopayil	0.00	0.00	0.00	0.00	30.00	100.00	30.00
	Puthiyangadi	30.00	100.00	0.00	0.00	0.00	0.00	30.00
	Puthiya kadavu	0.00	0.00	0.00	0.00	30.00	100.00	30.00
	Kampuram	0.00	0.00	0.00	0.00	30.00	100.00	30.00
	Puthiyappa	24.00	80.00	0.00	0.00	6.00	20.00	30.00
SUB-TOTAL		**54.00**	**36.00**	**0.00**	**0.00**	**96.00**	**64.00**	**150.00**
KANNUR	Palisseri	27.00	90.00	3.00	10.00	0.00	0.00	30.00
	Chalil Gopalpetta	26.00	86.67	2.00	6.67	2.00	6.67	30.00
SUB-TOTAL		**53.00**	**88.33**	**5.00**	**8.33**	**2.00**	**3.33**	**60.00**
KASARGODE	Kottikulam	30.00	100.00	0.00	0.00	0.00	0.00	30.00
	Hozdurg	30.00	100.00	0.00	0.00	0.00	0.00	30.00
SUB-TOTAL		**60.00**	**100.00**	**0.00**	**0.00**	**0.00**	**0.00**	**60.00**
GRAND-TOTAL		**423.00**	**40.29**	**390.00**	**37.14**	**237.00**	**22.57**	**1050.00**

Source : Primary Data

Appendix2

Socio-Economic Status of Respondent Households in the Coastal Districts of Kerala

DISTRICT	ishing villag	Status						TOTAL (Nos.)
		APL		BPL		Anthyodaya		
		Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumug	19.00	63.33	11.00	36.67	0.00	0.00	30.00
	Poovar	20.00	66.67	10.00	33.33	0.00	0.00	30.00
	South Kolla	13.00	43.33	17.00	56.67	0.00	0.00	30.00
	Paruthiyoor	11.00	36.67	19.00	63.33	0.00	0.00	30.00
	Punthura	16.00	53.33	14.00	46.67	0.00	0.00	30.00
	Kovalam	0.00	0.00	30.00	100.00	0.00	0.00	30.00
SUB-TOTAL		**79.00**	**43.89**	**101.00**	**56.11**	**0.00**	**0.00**	**180.00**
KOLLAM	Sakthikula	21.00	70.00	9.00	30.00	0.00	0.00	30.00
	Cheriazhee	6.00	20.00	24.00	80.00	0.00	0.00	30.00
	Marathoork	4.00	13.33	26.00	86.67	0.00	0.00	30.00
	Mayyanad	11.00	36.67	19.00	63.33	0.00	0.00	30.00
	Neendakara	15.00	50.00	15.00	50.00	0.00	0.00	30.00
SUB-TOTAL		**57.00**	**38.00**	**93.00**	**62.00**	**0.00**	**0.00**	**150.00**
ALAPPUZHA	Thaikal	13.00	43.33	17.00	56.67	0.00	0.00	30.00
	Vadakkal	24.00	80.00	6.00	20.00	0.00	0.00	30.00
	Arattupuzh	13.00	43.33	17.00	56.67	0.00	0.00	30.00
	Pollethai	16.00	53.33	14.00	46.67	0.00	0.00	30.00
SUB-TOTAL		**66.00**	**55.00**	**54.00**	**45.00**	**0.00**	**0.00**	**120.00**
ERNAKULAM	Cheriyakad	21.00	70.00	9.00	30.00	0.00	0.00	30.00
	Chellanam	7.00	23.33	23.00	76.67	0.00	0.00	30.00
	Cherai	9.00	30.00	21.00	70.00	0.00	0.00	30.00
	Kannamli	16.00	53.33	14.00	46.67	0.00	0.00	30.00
SUB-TOTAL		**53.00**	**44.17**	**67.00**	**55.83**	**0.00**	**0.00**	**120.00**
THRISSUR	Vemballur	13.00	43.33	16.00	53.33	1.00	3.33	30.00
	Kaipamang	12.00	40.00	18.00	60.00	0.00	0.00	30.00
	Azhickode	11.00	36.67	17.00	56.67	2.00	6.67	30.00
SUB-TOTAL		**36.00**	**40.00**	**51.00**	**56.67**	**3.00**	**3.33**	**90.00**
MALAPPURAM	Kadalundin	14.00	46.67	16.00	53.33	0.00	0.00	30.00
	Parapanang	9.00	30.00	21.00	70.00	0.00	0.00	30.00
	Arayankada	26.00	86.67	4.00	13.33	0.00	0.00	30.00
	Ariyalloor	13.00	43.33	17.00	56.67	0.00	0.00	30.00
SUB-TOTAL		**62.00**	**51.67**	**58.00**	**48.33**	**0.00**	**0.00**	**120.00**
KOZHIKKODE	Thopayil	5.00	16.67	25.00	83.33	0.00	0.00	30.00
	Puthiyanga	5.00	16.67	25.00	83.33	0.00	0.00	30.00
	Puthiya kad	3.00	10.00	27.00	90.00	0.00	0.00	30.00
	Kampuram	0.00	0.00	30.00	100.00	0.00	0.00	30.00
	Puthiyappa	1.00	3.33	29.00	96.67	0.00	0.00	30.00
SUB-TOTAL		**14.00**	**9.33**	**136.00**	**90.67**	**0.00**	**0.00**	**150.00**
KANNUR	Palisseri	2.00	6.67	28.00	93.33	0.00	0.00	30.00
	Chalil Gopa	3.00	10.00	27.00	90.00	0.00	0.00	30.00
SUB-TOTAL		**5.00**	**8.33**	**55.00**	**91.67**	**0.00**	**0.00**	**60.00**
KASARGODE	Kottikulam	6.00	20.00	24.00	80.00	0.00	0.00	30.00
	Hozdurg	10.00	33.33	20.00	66.67	0.00	0.00	30.00
SUB-TOTAL		**16.00**	**26.67**	**44.00**	**73.33**	**0.00**	**0.00**	**60.00**
GRAND-TOTAL		**388.00**	**36.95**	**659.00**	**62.76**	**3.00**	**0.29**	**1050.00**

Source : Primary Data

APL - Above Poverty line

BPL - Below Poverty Line

Appendix 3

Classification of Respondent Households According to Nature of Family

DISTRICT	Fishing village	Nature of Family				TOTAL	
		Nuclear		Joint			
		Nos	%	Nos	%		
TRIVANDRUM	Shankumugham	21	70.00	9	30.00	30	
	Poovar	20	66.67	10	33.33	30	
	South Kollamkode	28	93.33	2	6.67	30	
	Paruthiyoor	29	96.67	1	3.33	30	
	Punthura	27	90.00	3	10.00	30	
	Kovalam	26	86.67	4	13.33	30	
SUB-TOTAL		151.00	83.89	29.00	16.11	180	
KOLLAM	Sakthikulangara	24	80.00	6	20.00	30	
	Cheriazheekal	22	73.33	8	26.67	30	
	Marathoorkulangara	26	86.67	4	13.33	30	
	Mayyanad	29	96.67	1	3.33	30	
	Neendakara	30	100.00	0	0.00	30	
SUB-TOTAL		131.00	87.33	19.00	12.67	150	
ALAPPUZHA	Thaikal	27	90.00	3	10.00	30	
	Vadakkal	25	83.33	5	16.67	30	
	Arattupuzha	24	80.00	6	20.00	30	
	Pollethai	25	83.33	5	16.67	30	
SUB-TOTAL		101.00	84.17	19.00	15.83	120	
ERNAKULAM	Cheriyakadavu	22	73.33	8	26.67	30	
	Chellanam	30	100.00	0	0.00	30	
	Cherai	30	100.00	0	0.00	30	
	Kannamli	27	90.00	3	10.00	30	
SUB-TOTAL		109.00	90.83	11.00	9.17	120	
THRISSUR	Vemballur	27	90.00	3	10.00	30	
	Kaipamangalam	29	96.67	1	3.33	30	
	Azhickode	21	70.00	9	30.00	30	
SUB-TOTAL		77.00	85.56	13.00	14.44	90	
MALAPPURAM	Kadalundinagar	14	46.67	16	53.33	30	
	Parapanangadi	11	36.67	19	63.33	30	
	Arayankadappuram	20	66.67	10	33.33	30	
	Ariyalloor	18	60.00	12	40.00	30	
SUB-TOTAL		63.00	52.50	57.00	47.50	120	
KOZHIKKODE	Thopayil	19	63.33	11	36.67	30	
	Puthiyangadi	20	66.67	10	33.33	30	
	Puthiya kadavu	19	63.33	11	36.67	30	
	Kampuram	14	46.67	16	53.33	30	
	Puthiyappa	28	93.33	2	6.67	30	
SUB-TOTAL		100.00	66.67	50.00	33.33	150	
KANNUR	Palisseri	24	80.00	6	20.00	30	
	Chalil Gopalpetta	30	100.00	0	0.00	30	
SUB-TOTAL		54.00	90.00	6.00	10.00	60	
KASARGODE	Kottikulam	20	66.67	10	33.33	30	
	Hozdurg	23	76.67	7	23.33	30	
SUB-TOTAL		43.00	71.67	17.00	28.33	60	
GRAND-TOTAL		829.00	78.95	221.00	21.05	1050	

Source : Primary Data

Appendix.4

Gender -wise Categorisation of Respondents

DISTRICT	Fishing village	Male		Female		TOTAL (Nos.)
		Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	75	51.02	72	48.98	147
	Poovar	81	55.48	65	44.52	146
	South Kollamkode	72	51.06	69	48.94	141
	Paruthiyoor	59	48.36	63	51.64	122
	Punthura	81	55.48	65	44.52	146
	Kovalam	49	47.57	54	52.43	103
SUB-TOTAL		417	51.80	388	48.20	805
KOLLAM	Sakthikulangara	61	51.69	57	48.31	118
	Cheriazheekal	67	54.03	57	45.97	124
	Marathoorkulanga	57	49.57	58	50.43	115
	Mayyanad	73	51.03	71	48.97	144
	Neendakara	62	48.06	67	51.94	129
SUB-TOTAL		320	50.79	310	49.21	630
ALAPPUZHA	Thaikal	71	52.59	64	47.41	135
	Vadakkal	65	53.28	57	46.72	122
	Arattupuzha	61	47.29	68	52.71	129
	Pollethai	66	52.38	60	47.62	126
SUB-TOTAL		263	51.45	249	48.55	512
ERNAKULAM	Cheriyakadavu	64	50.39	63	49.61	127
	Chellanam	67	54.92	55	45.08	122
	Cherai	58	56.86	44	43.14	102
	Kannamli	65	47.45	72	52.55	137
SUB-TOTAL		254	52.05	234	47.95	488
THRISSUR	Vemballur	63	54.78	52	45.22	115
	Kaipamangalam	62	52.54	56	47.46	118
	Azhickode	75	48.70	79	51.30	154
SUB-TOTAL		200	51.68	187	48.32	387
MALAPPURAM	Kadalundinagar	76.00	43.43	99.00	56.57	175
	Parapanangadi	83.00	44.39	104.00	55.61	187
	Arayankadappura	81.00	52.60	73.00	47.40	154
	Ariyalloor	92.00	54.76	76.00	45.24	168
SUB-TOTAL		332	48.54	352	51.46	684
KOZHIKKODE	Thopayil	85	48.57	90	51.43	175
	Puthiyangadi	71	48.97	74	51.03	145
	Puthiya kadavu	79	48.47	84	51.53	163
	Kampuram	87	55.41	70	44.59	157
	Puthiyappa	73	55.30	59	44.70	132
SUB-TOTAL		395	51.10	377	48.90	772
KANNUR	Palisseri	57	53.27	50	46.73	107
	Chalil Gopalpetta	71	55.04	58	44.96	129
SUB-TOTAL		128	54.24	108	45.76	236
KASARGODE	Kottikulam	84	48.55	89	51.45	173
	Hozdurg	69	46.62	79	53.38	148
SUB-TOTAL		153	47.66	168	52.34	321
GRAND-TOTAL		2462	50.92	2373	49.08	4835

Source : Primary Data

Appendix 5

Age - wise categorisation of Respondents' Family Members

District	Fishing village	Age Group																OTAL (Nos
		Upto 10		11 to 20	21 to 30			31 to 40		41 to 50		51 to 60		61 to 70		71 & Above		
		Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	21	14.29	22	14.97	24	16.33	23	15.65	25	17.01	13	8.84	12	8.16	7	4.76	147
	Poovar	13	8.90	21	14.38	45	30.82	18	12.33	28	19.18	14	9.59	6	4.11	1	0.68	146
	South Kollamkod	29	20.57	21	14.89	32	22.70	19	13.48	23	16.31	13	9.22	2	1.42	2	1.42	141
	Paruthiyoor	23	18.85	25	20.49	27	22.13	21	17.21	18	14.75	7	5.74	0	0.00	1	0.82	122
	Punthura	19	13.01	32	21.92	30	20.55	25	17.12	22	15.07	12	8.22	5	3.42	1	0.68	146
	Kovalam	2	1.94	31	30.10	24	23.30	16	15.53	17	16.50	13	12.62	0	0.00	0	0.00	103
SUB-TOTAL		107	13.29	152	18.88	182	22.61	122	15.16	133	16.52	72	8.94	25	3.11	12	1.49	**805**
KOLLAM	Sakthikulangara	11	9.32	27	22.88	12	10.17	22	18.64	18	15.25	12	10.17	10	8.47	6	5.08	118
	Cheriazheekal	16	12.90	17	13.71	28	22.58	16	12.90	24	19.35	17	13.71	2	1.61	4	3.23	124
	Marathoorkulang	12	10.43	17	14.78	24	20.87	16	13.91	25	21.74	16	13.91	4	3.48	1	0.87	115
	Mayyanad	8	5.56	23	15.97	43	29.86	23	15.97	20	13.89	24	16.67	1	0.69	2	1.39	144
	Neendakara	21	16.28	30	23.26	18	13.95	26	20.16	17	13.18	7	5.43	8	6.20	2	1.55	129
SUB-TOTAL		68	10.79	114	18.10	125	19.84	103	16.35	104	16.51	76	12.06	25	3.97	15	2.38	**630**
ALAPPUZHA	Thaikal	24	17.78	18	13.33	28	20.74	20	14.81	16	11.85	14	10.37	15	####	0	0.00	135
	Vadakkal	12	9.84	31	25.41	16	13.11	20	16.39	24	19.67	12	9.84	7	5.74	0	0.00	122
	Arattupuzha	19	14.73	25	19.38	23	17.83	22	17.05	20	15.50	13	10.08	7	5.43	0	0.00	129
	Pollethai	15	11.90	19	15.08	28	22.22	23	18.25	22	17.46	11	8.73	8	6.35	0	0.00	126
SUB-TOTAL		70	13.67	93	18.16	95	18.55	85	16.60	82	16.02	50	9.77	37	7.23	0	0.00	**512**
ERNAKULAM	Cheriyakadavu	14	11.02	18	14.17	25	19.69	22	17.32	20	15.75	22	17.32	6	4.72	0	0.00	127
	Chellanam	14	11.48	27	22.13	19	15.57	24	19.67	22	18.03	10	8.20	6	4.92	0	0.00	122
	Cherai	1	0.98	14	13.73	17	16.67	13	12.75	22	21.57	27	26.47	8	7.84	0	0.00	102
	Kannamli	16	11.69	36	26.29	15	10.96	24	17.53	23	16.79	13	9.43	10	7.30	0	0.00	137
SUB-TOTAL		45	9.22	95	19.47	76	15.58	83	17.01	87	17.83	72	14.74	30	6.15	0	0.00	**488**
THRISSUR	Vemballur	11	9.57	15	13.04	22	19.13	12	10.43	25	21.74	18	15.65	8	6.96	4	3.48	115
	Kaipamangalam	6	5.08	21	17.80	24	20.34	21	17.80	22	18.64	16	13.56	6	5.08	2	1.69	118
	Azhickode	29	18.83	17	11.04	25	16.23	35	22.73	17	11.04	17	11.04	12	7.79	2	1.30	154
SUB-TOTAL		46	11.89	53	13.70	71	18.35	68	17.57	64	16.54	51	13.18	26	6.72	8	2.07	**387**
MALAPPURAM	Kadalundinagar	25	14.29	37	21.14	42	24.00	25	14.29	21	12.00	14	8.00	7	4.00	4	2.29	175
	Parapanangadi	26	13.90	34	18.18	47	25.13	31	16.58	18	9.63	18	9.63	10	5.35	3	1.60	187
	Arayankadappuran	12	7.79	35	22.73	36	23.38	30	19.48	20	12.99	10	6.49	6	3.90	5	3.25	154
	Ariyalloor	13	7.74	34	20.24	41	24.40	37	22.02	16	9.52	17	10.12	8	4.76	2	1.19	168
SUB-TOTAL		76	11.11	140	20.47	166	24.27	123	17.98	75	10.96	59	8.63	31	4.53	14	2.05	**684**
KOZHIKKODE	Thopayil	23	13.14	25	14.29	48	27.43	41	23.43	22	12.57	12	6.86	3	1.71	1	0.57	175
	Puthiyangadi	4	2.76	24	16.55	35	24.14	19	13.10	33	22.76	22	15.17	4	2.76	4	2.76	145
	Puthiya kadavu	10	6.13	29	17.79	46	28.22	35	21.47	25	15.34	10	6.13	7	4.29	1	0.61	163
	Kampuram	9	5.73	20	12.74	50	31.85	31	19.75	20	12.74	18	11.46	5	3.18	4	2.55	157
	Puthiyappa	9	6.82	17	12.88	43	32.58	20	15.15	22	16.67	15	11.36	6	4.55	0	0.00	132
SUB-TOTAL		55	7.12	115	14.90	222	28.76	146	18.91	122	15.80	77	9.97	25	3.24	10	1.30	**772**
KANNUR	Palisseri	12	11.21	21	19.63	23	21.50	18	16.82	17	15.89	12	11.21	4	3.74	0	0.00	107
	Chalil Gopalpetta	12	9.30	18	13.95	35	27.13	19	14.73	25	19.38	13	10.08	7	5.43	0	0.00	129
SUB-TOTAL		24	10.17	39	16.53	58	24.58	37	15.68	42	17.80	25	10.59	11	4.66	0	0.00	**236**
KASARGODE	Kottikulam	8	4.62	30	17.34	39	22.54	45	26.01	24	13.87	15	8.67	11	6.36	1	0.58	173
	Hozdurg	10	6.76	17	11.49	36	24.32	43	29.05	19	12.84	17	11.49	5	3.38	1	0.68	148
SUB-TOTAL		18	5.61	47	14.64	75	23.36	88	27.41	43	13.40	32	9.97	16	4.98	2	0.62	**321**
GRAND-TOTAL		**509**	**10.53**	**848**	**17.54**	**1070**	**22.13**	**855**	**17.68**	**752**	**15.55**	**514**	**10.63**	**226**	**4.67**	**61**	**1.26**	**4835**

Source : Primary Data

Appendix 6

Distribution of Respondents' Family Members According to Education

District	Village	Education								
		Up to Std.8		Std. 9 to 12		Technical		Nil		Total
		Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.
TRIVANDRUM	Shankumug	70	47.62	58	39.46	19	12.93	0	0.00	147
	Poovar	73	50.00	55	37.67	8	5.48	10	6.85	146
	South Kolla	46	32.62	42	29.79	34	24.11	19	13.48	141
	Paruthiyoor	45	36.89	38	31.15	33	27.05	6	4.92	122
	Punthura	53	36.30	38	26.03	55	37.67	0	0.00	146
	Kovalam	48	46.60	50	48.54	5	4.85	0	0.00	103
SUB TOTAL		**335**	**41.72**	**281**	**34.99**	**154**	**19.18**	**35**	**4.11**	**805**
KOLLAM	Sakthikular	45	38.14	48	40.68	15	12.71	10	8.47	118
	Cheriazhee	51	41.13	51	16.94	17	13.71	5	4.03	124
	Marathoork	46	40.00	49	42.61	15	13.04	5	4.35	115
	Mayyanad	35	25.00	109	75.69	0	0.00	0	0.00	144
	Neendakara	55	42.64	58	44.96	9	6.98	7	5.43	129
SUB-TOTAL		**232**	**36.98**	**315**	**50.00**	**56**	**8.89**	**27**	**4.29**	**630**
ALAPPUZHA	Thaikal	79	58.52	36	26.67	1	0.74	19	15.56	135
	Vadakkal	63	51.64	48	39.34	8	6.56	3	2.46	122
	Arattupuzh	61	47.29	61	47.29	2	1.55	5	3.88	129
	Pollethai	57	45.24	38	30.16	4	3.17	27	21.43	126
SUB-TOTAL		**260**	**50.29**	**183**	**35.40**	**15**	**2.90**	**54**	**10.44**	**512**
ERNAKULAM	Cheriyakad	65	51.18	47	37.01	13	10.24	2	1.57	127
	Chellanam	83	68.03	36	29.51	1	0.82	2	1.64	122
	Cherai	57	55.88	32	31.37	4	3.92	9	8.82	102
	Kannamli	79	57.66	44	32.12	7	5.11	7	2.92	137
SUB-TOTAL		**284**	**59.23**	**159**	**32.25**	**25**	**5.07**	**20**	**3.45**	**488**
THRISSUR	Vemballur	58	50.43	41	35.65	11	9.57	5	4.35	115
	ipamangala	48	40.68	45	38.14	20	16.95	5	4.24	118
	Azhickode	75	48.70	53	34.42	25	16.23	1	0.65	154
SUB-TOTAL		**181**	**46.77**	**139**	**35.92**	**56**	**14.47**	**11**	**2.84**	**387**
MALAPPURAM	adalundinag	91	52.00	53	30.29	26	14.86	5	2.86	175
	arapananga	106	56.68	72	38.50	9	4.81	0	0.00	187
	yankadappu	71	46.10	83	53.90	0	0.00	0	0.00	154
	Ariyalloor	76	45.24	69	41.07	17	10.12	6	3.57	168
SUB-TOTAL		344	50.29	277	40.50	52	7.60	11	1.61	**684**
KOZHIKKODE	Thopayil	87	49.71	63	36.00	20	11.43	5	2.86	175
	Puthiyangad	46	31.72	71	48.97	16	11.03	12	8.28	145
	uthiya kadav	67	41.10	68	41.72	28	17.18	0	0.00	163
	Kampuram	70	44.59	63	40.13	19	12.10	5	3.18	157
	Puthiyappa	46	34.85	57	43.18	29	21.97	0	0.00	132
SUB-TOTAL		**316**	**40.99**	**322**	**41.76**	**112**	**15.05**	**22**	**2.20**	**772**
KANNUR	Palisseri	23	21.50	56	52.34	19	17.76	9	8.41	107
	alil Gopalpe	30	23.26	51	39.53	28	21.71	20	15.50	129
SUB-TOTAL		53	22.46	107	45.34	47	19.92	29	12.29	**236**
KASARGODE	Kottikulam	55	31.79	81	46.82	10	5.78	27	15.61	173
	Hozdurg	63	42.57	67	45.27	6	4.05	12	8.11	148
SUB-TOTAL		118	36.76	148	46.11	16	4.98	39	12.15	**321**
GRAND-TOTAL		2123	43.91	1931	39.94	533	11.02	248	5.13	**4835**

Source : Primary Data

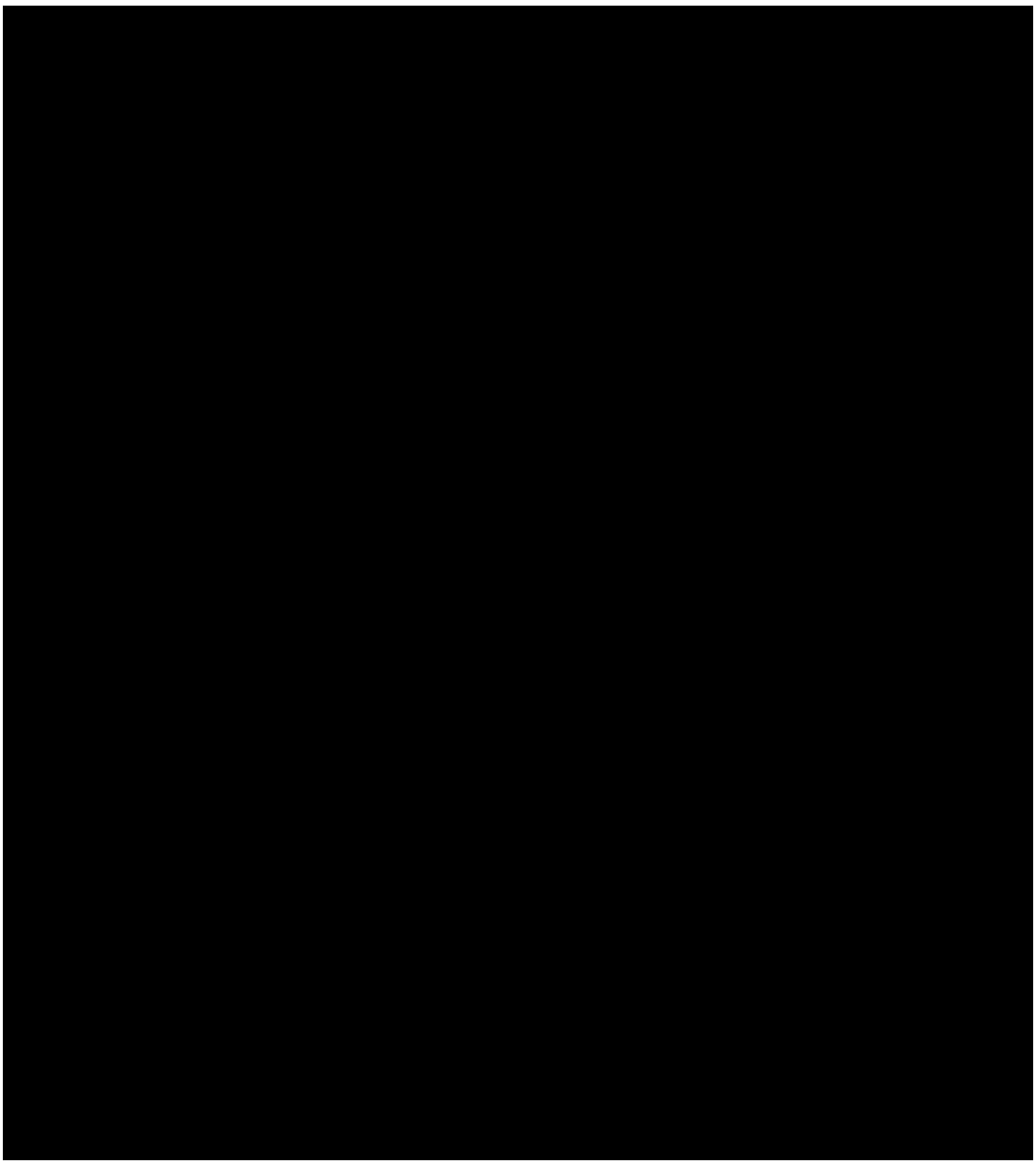
Appendix 7

Distribution of Respondents' Family Members Based on the Occupation

DISTRICT	VILLAGE	Occupation																		TOTAL(Nos.)
		Fishing		Student		Fish vendor		Business		Peeling		Teacher		Govt job		Others		Nill		
		Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	40	27.21	8	5.44	9	6.12	0	0.00	0	0.00	6	4.08	5	3.40	33	22.45	46	31.29	147
	Poovar	35	23.97	11	7.53	10	6.85	7	4.79	0	0.00	3	2.05	4	2.74	22	15.07	54	36.99	146
	South Kollamkode	24	17.02	5	3.55	18	12.77	2	1.42	0	0.00	4	2.84	6	4.26	25	17.73	57	40.43	141
	Paruthiyoor	42	34.43	19	15.57	6	4.92	0	0.00	0	0.00	1	0.82	2	1.64	27	22.13	25	20.49	122
	Punthura	38	26.03	51	34.93	14	9.59	1	0.68	0	0.00	2	1.37	3	2.05	13	8.90	24	16.44	146
	Kovalam	13	12.62	29	28.16	2	1.94	7	6.80	0	0.00	2	1.94	4	3.88	18	17.48	28	27.18	103
SUB TOTAL		**192**	**23.85**	**123.00**	15.28	**59**	7.33	**17**	2.11	**0**	0.00	**18**	2.24	**24**	2.98	**138**	17.14	**234**	29.07	**805**
KOLLAM	Sakthikulangara	30	25.42	29	24.58	14	11.86	3	2.54	15	12.71	2	1.69	2	1.69	13	11.02	10	8.47	118
	Cheriazheekal	38	30.65	21	16.94	9	7.26	3	2.42	0	0.00	1	0.81	4	3.23	24	19.35	24	19.35	124
	Marathoorkulanga	36	31.30	26	22.61	10	8.70	0	0.00	0	0.00	4	3.48	2	1.74	11	9.57	26	22.61	115
	Mayyanad	48	33.33	10	6.94	11	7.64	0	0.00	1	0.69	0	0.00	1	0.69	0	0.00	73	50.69	144
	Neendakara	25	19.38	20	15.50	16	12.40	0	0.00	21	16.28	1	0.78	2	1.55	0	0.00	44	34.11	129
SUB-TOTAL		**177**	28.10	**106.00**	16.83	**60**	9.52	**6**	0.95	**37**	5.87	**8**	1.27	**11**	1.75	**48**	7.62	**177**	**28**	**630**
ALAPPUZHA	Thaikal	36	26.67	3	2.22	11	8.15	1	0.74	0	0.00	0	0.00	0	0.00	24	17.78	60	44.44	135
	Vadakkal	37	30.33	30	24.59	7	5.74	0	0.00	6	4.92	2	1.64	1	0.82	19	15.57	20	16.39	122
	Arattupuzha	29	22.48	25	19.38	9	6.98	0	0.00	0	0.00	1	0.78	2	1.55	22	17.05	41	31.78	129
	Pollethai	23	18.25	27	21.43	12	9.52	1	0.79	0	0.00	2	1.59	3	2.38	28	22.22	30	23.81	126
SUB-TOTAL		**125**	24.41	**85.00**	16.60	**39**	7.62	**2**	0.39	**6**	1.17	**5**	0.98	**6**	1.17	**93**	18.16	**151**	29.49	**512**
ERNAKULAM	Cheriyakadavu	28	22.05	26	20.47	4	3.15	0	0.00	0	0.00	10	7.87	2	1.57	27	21.26	30	23.62	127
	Chellanam	37	30.33	19	15.57	14	11.48	0	0.00	3	2.46	0	0.00	0	0.00	29	23.77	20	16.39	122
	Cherai	33	32.35	6	5.88	6	5.88	2	1.96	0	0.00	2	1.96	3	2.94	22	21.57	28	27.45	102
	Kannamli	33	24.09	44	32.12	12	8.76	0	0.00	3	2.19	8	5.84	1	0.73	18	13.14	18	13.14	137
SUB-TOTAL		**131**	26.84	**95.00**	19.47	**36**	7.38	**2**	0.41	**6**	1.23	**20**	4.10	**6**	1.23	**96**	19.67	**96**	19.67	**488**
THRISSUR	Vemballur	29	25.22	23	20.00	15	13.04	1	0.87	0	0.00	3	2.61	4	3.48	22	19.13	18	15.65	115
	Kaipamangalam	32	27.12	21	17.80	18	15.25	0	0.00	0	0.00	6	5.08	1	0.85	13	11.02	27	22.88	118
	Azhickode	37	24.03	24	15.58	21	13.64	0	0.00	0	0.00	0	0.00	1	0.65	31	20.13	40	25.97	154
SUB-TOTAL		**98**	25.32	**68.00**	17.57	**54**	13.95	**1**	0.26	**0**	0.00	**9**	2.33	**6**	1.55	**66**	17.05	**85**	21.96	**387**
MALAPPURAM	Kadalundinagar	38	21.71	40	22.86	12	6.86	1	0.57	0	0.00	3	1.71	2	1.14	44	25.14	35	20.00	175
	Parapanangadi	40	21.39	41	21.93	20	10.70	2	1.07	0	0.00	2	1.07	5	2.67	35	18.72	42	22.46	187
	Arayankadappuran	53	34.42	41	26.62	10	6.49	0	0.00	0	0.00	0	0.00	1	0.65	29	18.83	20	12.99	154
	Ariyalloor	58	34.52	19	11.31	13	7.74	2	1.19	0	0.00	0	0.00	2	1.19	27	16.07	47	27.98	168
SUB-TOTAL		**189**	27.63	**141.00**	20.61	**55**	8.04	**5**	0.73	**0**	0.00	**5**	0.73	**10**	1.46	**135**	19.74	**144**	21.05	**684**
KOZHIKKODE	Thopayil	43	24.57	28	16.00	**23**	13.14	4	2.29	2	1.14	3	1.71	0	0.00	45	25.71	27	15.43	175
	Puthiyangadi	47	32.41	13	8.97	12	8.28	0	0.00	0	0.00	1	0.69	4	2.76	19	13.10	49	33.79	145
	Puthiya kadavu	40	24.54	28	17.18	18	11.04	3	1.84	3	1.84	2	1.23	2	1.23	54	33.13	13	7.98	163
	Kampuram	50	31.85	8	5.10	17	10.83	1	0.64	0	0.00	0	0.00	1	0.64	40	25.48	40	25.48	157
	Puthiyappa	48	36.36	26	19.70	18	13.64	1	0.76	0	0.00	2	1.52	2	1.52	14	10.61	21	15.91	132
SUB-TOTAL		**228**	29.53	**103.00**	13.34	**88**	11.40	**9**	1.17	**5**	0.65	**8**	1.04	**9**	1.17	**172**	22.28	**150**	19.43	**772**
KANNUR	Palisseri	32	29.91	42	39.25	9	8.41	0	0.00	0	0.00	2	1.87	0	0.00	13	12.15	9	8.41	107
	Chalil Gopalpetta	39	30.23	38	29.46	12	9.30	2	1.55	0	0.00	0	0.00	0	0.00	27	20.93	11	8.53	129
SUB-TOTAL		**71**	30.08	**80.00**	33.90	**21**	8.90	**2**	0.85	**0**	0.00	**2**	0.85	**0**	0.00	**40**	16.95	**20**	8.47	**236**
KASARGODE	Kottikulam	90	52.02	23	13.29	7	4.05	2	1.16	0	0.00	1	0.58	4	2.31	13	7.51	33	19.08	173
	Hozdurg	49	33.11	18	12.16	17	11.49	2	1.35	0	0.00	0	0.00	1	0.68	39	26.35	22	14.86	148
SUB-TOTAL		**139**	43.30	**41.00**	12.77	**24**	7.48	**4**	1.25	**0**	0.00	**1**	0.31	**5**	1.56	**52**	16.20	**55**	17.13	**321**
GRAND-TOTAL		**1350**	27.92	**842.00**	17.41	**436**	9.02	**48**	0.99	**54**	1.12	**76**	1.57	**77**	1.59	**840**	17.37	**1112**	23.00	**4835**

Source : Primary Data

Appendix 8



Appendix 9

Details of Bank Account Held by the Respondents												
DISTRICT	Fishing village	Type of Bank										TOTAL
		Nationalized Banks		Scheduled Banks		Co-operative Banks		Post Office		No Bank A/c		
		Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	15.00	50.00	8.00	0.00	0.00	0.00	1.00	3.33	6.00	46.67	30.00
	Poovar	25.00	83.33	0.00	0.00	0.00	0.00	0.00	0.00	5.00	16.67	30.00
	South Kollamkode	23.00	76.67	0.00	0.00	0.00	0.00	2.00	6.67	5.00	16.67	30.00
	Paruthiyoor	27.00	90.00	0.00	0.00	2.00	6.67	0.00	0.00	1.00	3.33	30.00
	Punthura	19.00	63.33	2.00	6.67	3.00	10.00	1.00	3.33	5.00	16.67	30.00
	Kovalam	30.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00
Sub-TOTAL		**139.00**	**77.22**	**10.00**	**5.56**	**5.00**	**2.78**	**4.00**	**2.22**	**22.00**	**12.22**	**180.00**
KOLLAM	Sakthikulangara	24.00	80.00	3.00	10.00	3.00	10.00	0.00	0.00	0.00	0.00	30.00
	Cheriazheekal	6.00	20.00	0.00	0.00	22.00	73.33	2.00	6.67	0.00	0.00	30.00
	Marathoorkulangar	7.00	23.33	2.00	6.67	21.00	70.00	0.00	0.00	0.00	0.00	30.00
	Mayyanad	24.00	83.33	3.00	10.00	2.00	6.67	1.00	3.33	0.00	0.00	30.00
	Neendakara	14.00	46.67	15.00	50.00	1.00	3.33	0.00	0.00	0.00	0.00	30.00
SUB-TOTAL		**75.00**	**50.00**	**23.00**	**15.33**	**49.00**	**32.67**	**3.00**	**2.00**	**0.00**	**0.00**	**150.00**
ALAPPUZHA	Thaikal	12.00	40.00	5.00	16.67	11.00	36.67	2.00	6.67	0.00	0.00	30.00
	Vadakkal	21.00	70.00	7.00	23.33	2.00	6.67	0.00	0.00	0.00	0.00	30.00
	Arattupuzha	17.00	56.67	6.00	20.00	7.00	23.33	0.00	0.00	0.00	0.00	30.00
	Pollethai	6.00	20.00	0.00	0.00	23.00	76.67	1.00	3.33	0.00	0.00	30.00
SUB-TOTAL		**56.00**	**46.67**	**18.00**	**15.00**	**43.00**	**35.83**	**3.00**	**2.50**	**0.00**	**0.00**	**120.00**
ERNAKULAM	Cheriyakadavu	4.00	13.33	23.00	76.67	3.00	10.00	0.00	0.00	0.00	0.00	30.00
	Chellanam	4.00	13.33	0.00	0.00	26.00	86.67	0.00	0.00	0.00	0.00	30.00
	Cherai	4.00	13.33	2.00	6.67	24.00	80.00	0.00	0.00	0.00	0.00	30.00
	Kannamli	0.00	0.00	28.00	93.33	1.00	3.33	1.00	3.33	0.00	0.00	30.00
SUB-TOTAL		**12.00**	**10.00**	**53.00**	**44.17**	**54.00**	**45.00**	**1.00**	**0.83**	**0.00**	**0.00**	**120.00**
THRISSUR	Vemballur	28.00	93.33	0.00	0.00	0.00	0.00	0.00	0.00	2.00	6.67	30.00
	Kaipamangalam	1.00	3.33	20.00	66.67	3.00	10.00	1.00	3.33	5.00	16.67	30.00
	Azhickode	24.00	80.00	1.00	3.33	0.00	0.00	1.00	3.33	4.00	13.33	30.00
SUB-TOTAL		53.00	58.89	21.00	23.33	3.00	3.33	2.00	2.22	11.00	12.22	90.00
MALAPPURAM	Kadalundinagar	10.00	26.67	2.00	6.67	7.00	23.33	0.00	0.00	11.00	36.67	30.00
	Parapanangadi	16.00	53.33	1.00	3.33	3.00	10.00	0.00	0.00	10.00	33.33	30.00
	Arayankadappuran	12.00	40.00	0.00	0.00	6.00	20.00	0.00	0.00	12.00	40.00	30.00
	Ariyalloor	12.00	40.00	4.00	13.33	13.00	43.33	0.00	0.00	1.00	3.33	30.00
SUB-TOTAL		**50.00**	**41.67**	**7.00**	**5.83**	**29.00**	**24.17**	**0.00**	**0.00**	**34.00**	**28.33**	**120.00**
KOZHIKKODE	Thopayil	18.00	60.00	9.00	30.00	3.00	10.00	0.00	0.00	0.00	0.00	30.00
	Puthiyangadi	24.00	80.00	4.00	13.33	2.00	6.67	0.00	0.00	0.00	0.00	30.00
	Puthiya kadavu	23.00	76.67	5.00	16.67	2.00	6.67	0.00	0.00	0.00	0.00	30.00
	Kampuram	11.00	36.67	4.00	13.33	15.00	50.00	0.00	0.00	0.00	0.00	30.00
	Puthiyappa	8.00	26.67	22.00	73.33	0.00	0.00	0.00	0.00	0.00	0.00	30.00
SUB-TOTAL		**84.00**	**56.00**	**44.00**	**29.33**	**22.00**	**14.67**	**0.00**	**0.00**	**0.00**	**0.00**	**150.00**
KANNUR	Palisseri	2.00	6.67	25.00	83.33	3.00	10.00	0.00	0.00	0.00	0.00	30.00
	Chalil Gopalpetta	1.00	3.33	28.00	93.33	1.00	3.33	0.00	0.00	0.00	0.00	30.00
SUB-TOTAL		**3.00**	**5.00**	**53.00**	**88.33**	**4.00**	**6.67**	**0.00**	**0.00**	**0.00**	**0.00**	**60.00**
KASARGODE	Kottikulam	28.00	93.33	1.00	3.33	0.00	0.00	0.00	0.00	1.00	3.33	30.00
	Hozdurg	15.00	50.00	8.00	26.67	5.00	16.67	1.00	3.33	1.00	3.33	30.00
SUB-TOTAL		**43.00**	**71.67**	**9.00**	**15.00**	**5.00**	**8.33**	**1.00**	**1.67**	**2.00**	**3.33**	**60.00**
GRAND-TOTAL		515.00	49.05	238	22.67	214	20.38	14	1.33	69	6.57	1050.00

Source : Primary Data

Appendix 10

Monthly Savings of Respondents

DISTRICT	VILLAGE	Monthly Savings: Up to Rs. 1000		Rs.1001 to 2000		Rs. 2000 & Above		Nil		TOTAL (Nos.)
		Nos.	%	Nos.	%	Nos.	%	Nos.	%	
TRIVANDRUM	Shankumugham	18.00	60.00	1.00	3.33	1.00	3.33	10.00	33.33	30.00
	Poovar	27.00	90.00	0.00	0.00	3.00	10.00	0.00	0.00	30.00
	South Kollamkode	22.00	73.33	2.00	6.67	4.00	13.33	2.00	6.67	30.00
	Paruthiyoor	16.00	53.33	5.00	16.67	0.00	0.00	9.00	30.00	30.00
	Punthura	12.00	40.00	2.00	6.67	4.00	13.33	12.00	40.00	30.00
	Kovalam	14.00	46.67	8.00	26.67	1.00	3.33	7.00	23.33	30.00
SUB-TOTAL		109.00	60.56	18.00	10.00	13.00	7.22	40.00	22.22	180.00
KOLLAM	Sakthikulangara	9.00	30.00	3.00	10.00	0.00	0.00	18.00	60.00	30.00
	Cheriazheekal	6.00	20.00	3.00	10.00	1.00	3.33	20.00	66.67	30.00
	Marathoorkulangara	7.00	23.33	0.00	0.00	0.00	0.00	23.00	76.67	30.00
	Mayyanad	4.00	13.33	0.00	0.00	0.00	0.00	26.00	86.67	30.00
	Neendakara	12.00	40.00	2.00	6.67	1.00	3.33	15.00	50.00	30.00
SUB-TOTAL		38.00	25.33	8.00	5.33	2.00	1.33	102.00	68.00	150.00
ALAPPUZHA	Thaikal	13.00	43.33	5.00	16.67	0.00	0.00	12.00	40.00	30.00
	Vadakkal	8.00	26.67	17.00	56.67	0.00	0.00	5.00	16.67	30.00
	Arattupuzha	14.00	46.67	10.00	33.33	0.00	0.00	6.00	20.00	30.00
	Pollethai	2.00	6.67	28.00	93.33	0.00	0.00	0.00	0.00	30.00
SUB-TOTAL		37.00	30.83	60.00	50.00	0.00	0.00	23.00	19.17	120.00
ERNAKULAM	Cheriyakadavu	11.00	36.67	1.00	3.33	0.00	0.00	18.00	60.00	30.00
	Chellanam	28.00	93.33	1.00	3.33	0.00	0.00	1.00	3.33	30.00
	Cherai	5.00	16.67	1.00	3.33	1.00	3.33	23.00	76.67	30.00
	Kannamli	15.00	50.00	2.00	6.67	1.00	3.33	12.00	40.00	30.00
SUB-TOTAL		59.00	49.17	5.00	4.17	2.00	1.67	54.00	45.00	120.00
THRISSUR	Vemballur	1.00	3.33	1.00	3.33	0.00	0.00	28.00	93.33	30.00
	Kaipamangalam	0.00	0.00	1.00	3.33	0.00	0.00	29.00	96.67	30.00
	Azhickode	2.00	6.67	0.00	0.00	0.00	0.00	28.00	93.33	30.00
SUB-TOTAL		3.00	3.33	2.00	2.22	0.00	0.00	85.00	94.44	90.00
MALAPPURAM	Kadalundinagar	7.00	23.33	0.00	0.00	0.00	0.00	23.00	76.67	30.00
	Parapanangadi	2.00	6.67	0.00	0.00	0.00	0.00	28.00	93.33	30.00
	Arayankadappuram	12.00	40.00	3.00	10.00	0.00	0.00	15.00	50.00	30.00
	Ariyalloor	4.00	13.33	4.00	13.33	11.00	36.67	11.00	36.67	30.00
SUB-TOTAL		25.00	20.83	7.00	5.83	11.00	9.17	77.00	64.17	120.00
KOZHIKKODE	Thopayil	0.00	0.00	0.00	0.00	0.00	0.00	30.00	100.00	30.00
	Puthiyangadi	1.00	3.33	0.00	0.00	1.00	3.33	28.00	93.33	30.00
	Puthiya kadavu	6.00	20.00	3.00	10.00	0.00	0.00	21.00	70.00	30.00
	Kampuram	17.00	56.67	2.00	6.67	1.00	3.33	10.00	33.33	30.00
	Puthiyappa	14.00	46.67	0.00	0.00	0.00	0.00	16.00	53.33	30.00
SUB-TOTAL		38.00	25.33	5.00	3.33	2.00	1.33	105.00	70.00	150.00
KANNUR	Palisseri	4.00	13.33	0.00	0.00	0.00	0.00	26.00	86.67	30.00
	Chalil Gopalpetta	5.00	16.67	0.00	0.00	0.00	0.00	25.00	83.33	30.00
SUB-TOTAL		9.00	15.00	0.00	0.00	0.00	0.00	51.00	85.00	60.00
KASARGODE	Kottikulam	17.00	56.67	4.00	13.33	0.00	0.00	9.00	30.00	30.00
	Hozdurg	6.00	20.00	2.00	6.67	0.00	0.00	22.00	73.33	30.00
SUB-TOTAL		23.00	38.33	6.00	10.00	0.00	0.00	31.00	51.67	60.00
GRAND-TOTAL		341.00	32.48	111.00	10.57	30.00	2.86	568.00	54.10	1050.00

Source : Primary Data

Appendix 11

Details of Indebtedness of the Respondents

DISTRICT	Fishing village	Amount of Borrowings: Up to Rs. 25,000		Rs.25,001 to 50,000/-		Rs.50,001 to 75,000/-		Rs.75,001 to 1,00,000/-		Rs.1,00,000 & above		Nill		TOTAL (Nos.)
		Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	2.00	6.67	2.00	6.67	2.00	6.67	4.00	13.33	18.00	60.00	2.00	6.67	30
	Poovar	0.00	0.00	4.00	13.33	1.00	3.33	4.00	13.33	11.00	36.67	10.00	33.33	30
	South Kollamkode	0.00	0.00	0.00	0.00	1.00	3.33	0.00	0.00	19.00	63.33	10.00	33.33	30
	Paruthiyoor	1.00	3.33	3.00	10.00	1.00	3.33	4.00	13.33	15.00	50.00	6.00	20.00	30
	Punthura	1.00	3.33	3.00	10.00	1.00	3.33	2.00	6.67	20.00	66.67	3.00	10.00	30
	Kovalam	10.00	33.33	1.00	3.33	0.00	0.00	10.00	33.33	1.00	3.33	8.00	26.67	30
SUB-TOTAL		**14.00**	**7.78**	**13.00**	**7.22**	**6.00**	**3.33**	**24.00**	**13.33**	**84.00**	**46.67**	**39.00**	**21.67**	**180**
KOLLAM	Sakthikulangara	2.00	6.67	4.00	13.00	2.00	7.00	2.00	6.67	12.00	40.00	8.00	26.67	**30.00**
	Cheriazheekal	11.00	36.67	1.00	3.33	0.00	0.00	0.00	0.00	3.00	10.00	15.00	50.00	**30.00**
	Marathoorkulangara	6.00	20.00	2.00	6.67	0.00	0.00	0.00	0.00	4.00	13.33	18.00	60.00	**30.00**
	Mayyanad	0.00	0.00	4.00	13.33	0.00	0.00	10.00	33.33	14.00	46.67	2.00	6.67	**30.00**
	Neendakara	4.00	13.33	2.00	6.67	0.00	0.00	2.00	6.67	17.00	56.67	5.00	16.67	**30.00**
SUB-TOTAL		**23.00**	**15.33**	**13.00**	**8.67**	**2.00**	**1.33**	**14.00**	**9.33**	**50.00**	**33.33**	**48.00**	**32.00**	**150.00**
ALAPPUZHA	Thaikal	1.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.00	96.67	**30.00**
	Vadakkal	7.00	23.33	4.00	13.33	0.00	0.00	2.00	6.67	13.00	43.33	4.00	13.33	**30.00**
	Arattupuzha	0.00	0.00	5.00	16.67	0.00	0.00	8.00	26.67	5.00	16.67	12.00	40.00	**30.00**
	Pollethai	1.00	3.33	8.00	26.67	1.00	3.33	2.00	6.67	8.00	26.67	10.00	33.33	**30.00**
SUB-TOTAL		**9.00**	**7.50**	**17.00**	**14.17**	**1.00**	**0.83**	**12.00**	**10.00**	**26.00**	**21.67**	**55.00**	**45.83**	**120.00**
ERNAKULAM	Cheriyakadavu	6.00	20.00	3.00	10.00	1.00	3.33	2.00	6.67	1.00	3.33	17.00	56.67	**30.00**
	Chellanam	0.00	0.00	0.00	0.00	1.00	3.33	1.00	3.33	1.00	3.33	27.00	90.00	**30.00**
	Cherai	1.00	3.33	2.00	6.67	0.00	0.00	1.00	3.33	2.00	6.67	24.00	80.00	**30.00**
	Kannamli	0.00	0.00	1.00	3.33	0.00	0.00	1.00	3.33	2.00	6.67	26.00	86.67	**30.00**
SUB-TOTAL		**7.00**	**5.83**	**6.00**	**5.00**	**2.00**	**1.67**	**5.00**	**4.17**	**6.00**	**5.00**	**94.00**	**78.33**	**120.00**
THRISSUR	Vemballur	6.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.33	23.00	76.67	**30.00**
	Kaipamangalam	0.00	0.00	2.00	6.67	3.00	10.00	5.00	16.67	12.00	40.00	8.00	26.67	**30.00**
	Azhickode	3.00	10.00	3.00	10.00	2.00	6.67	1.00	3.33	12.00	40.00	9.00	30.00	**30.00**
SUB-TOTAL		**9.00**	**10.00**	**5.00**	**5.56**	**5.00**	**5.56**	**6.00**	**6.67**	**25.00**	**27.78**	**40.00**	**44.44**	**90.00**
MALAPPURAM	Kadalundinagar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	100.00	**30.00**
	Parapanangadi	2.00	6.67	2.00	6.67	0.00	0.00	3.00	10.00	1.00	3.33	22.00	73.33	**30.00**
	Arayankadappuram	1.00	3.33	2.00	6.67	0.00	0.00	0.00	0.00	1.00	3.33	26.00	86.67	**30.00**
	Ariyalloor	0.00	0.00	1.00	3.33	0.00	0.00	2.00	6.67	4.00	13.33	23.00	76.67	**30.00**
SUB-TOTAL		**3.00**	**2.50**	**5.00**	**4.17**	**0.00**	**0.00**	**5.00**	**4.17**	**6.00**	**5.00**	**101.00**	**84.17**	**120.00**
KOZHIKKODE	Thopayil	5.00	16.67	4.00	13.33	1.00	3.33	4.00	13.33	1.00	3.33	15.00	50.00	**30.00**
	Puthiyangadi	1.00	3.33	8.00	26.67	0.00	0.00	4.00	13.33	8.00	26.67	9.00	30.00	**30.00**
	Puthiya kadavu	0.00	0.00	3.00	10.00	1.00	3.33	7.00	23.33	10.00	33.33	9.00	30.00	**30.00**
	Kampuram	3.00	10.00	4.00	13.33	2.00	6.67	1.00	3.33	8.00	26.67	12.00	40.00	**30.00**
	Puthiyappa	0.00	0.00	0.00	0.00	0.00	0.00	3.00	10.00	10.00	33.33	17.00	56.67	**30.00**
SUB-TOTAL		**9.00**	**6.00**	**19.00**	**12.67**	**4.00**	**2.67**	**19.00**	**12.67**	**37.00**	**24.67**	**62.00**	**41.33**	**150.00**
KANNUR	Palisseri	2.00	6.67	1.00	3.33	1.00	3.33	7.00	23.33	7.00	23.33	12.00	40.00	**30.00**
	Chalil Gopalpetta	3.00	10.00	1.00	3.33	0.00	0.00	3.00	10.00	13.00	43.33	10.00	33.33	**30.00**
SUB-TOTAL		**5.00**	**8.33**	**2.00**	**3.33**	**1.00**	**1.67**	**10.00**	**16.67**	**20.00**	**33.33**	**22.00**	**36.67**	**60.00**
KASARGODE	Kottikulam	13.00	43.33	1.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	16.00	53.33	**30.00**
	Hozdurg	2.00	6.67	1.00	3.33	2.00	6.67	6.00	20.00	6.00	20.00	13.00	43.33	**30.00**
SUB-TOTAL		**15.00**	**25.00**	**2.00**	**3.33**	**2.00**	**3.33**	**6.00**	**10.00**	**6.00**	**10.00**	**29.00**	**48.33**	**60.00**
GRAND-TOTAL		**94.00**	**8.95**	**82.00**	**7.81**	**23.00**	**2.19**	**101.00**	**9.62**	**260.00**	**24.76**	**490.00**	**46.67**	**1050.00**

Source : Primary Data

Appendix 12

Distribution of House Holds According to Ownership on Land

DISTRICT	Fishing village	Area (Cent) of land										TOTAL
		Upto 5 cents		5 to 10 cents		10 to 15 cents		Above 15 cents		Nil		
		Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	24	80.00	5	16.67	1	3.33	0	0.00	0	0.00	30
	Poovar	22	73.33	7	23.33	0	0.00	0	0.00	1	3.33	30
	South Kollamkode	16	53.33	10	33.33	3	10.00	1	3.33	0	0.00	30
	Paruthiyoor	24	80.00	4	13.33	2	6.67	0	0.00	0	0.00	30
	Punthura	29	96.67	1	3.33	0	0.00	0	0.00	0	0.00	30
	Kovalam	30	100.00	0	0.00	0	0.00	0	0.00	0	0.00	30
SUB-TOTAL		**145**	**80.56**	**27**	**15.00**	**6**	**3.33**	**1**	**0.56**	**1**	**0.56**	**180**
KOLLAM	Sakthikulangara	11	36.67	17	56.67	0	0.00	0	0.00	2	6.67	30
	Cheriazheekal	14	46.67	13	43.33	1	3.33	2	6.67	0	0.00	30
	Marathoorkulangara	14	46.67	6	20.00	6	20.00	3	10.00	1	3.33	30
	Mayyanad	12	40.00	18	60.00	0	0.00	0	0.00	0	0.00	30
	Neendakara	18	60.00	12	40.00	0	0.00	0	0.00	0	0.00	30
SUB-TOTAL		**69**	**46.00**	**66**	**44.00**	**7**	**4.67**	**5**	**3.33**	**3**	**2.00**	**150**
ALAPPUZHA	Thaikal	18	60.00	8	26.67	2	6.67	1	3.33	1	3.33	30
	Vadakkal	20	66.67	5	16.67	1	3.33	1	3.33	3	10.00	30
	Arattupuzha	26	86.67	4	13.33	0	0.00	0	0.00	0	0.00	30
	Pollethai	3	10.00	18	60.00	5	16.67	2	6.67	2	6.67	30
SUB-TOTAL		**67**	**55.83**	**35**	**29.17**	**8**	**6.67**	**4**	**3.33**	**6**	**5.00**	**120**
ERNAKULAM	Cheriyakadavu	29	96.67	0	0.00	0	0.00	0	0.00	1	3.33	30
	Chellanam	27	90.00	0	0.00	0	0.00	0	0.00	3	10.00	30
	Cherai	18	60.00	10	33.33	2	6.67	0	0.00	0	0.00	30
	Kannamli	30	100.00	0	0.00	0	0.00	0	0.00	0	0.00	30
SUB-TOTAL		**104**	**86.67**	**10**	**8.33**	**2**	**1.67**	**0**	**0.00**	**4**	**3.33**	**120**
THRISSUR	Vemballur	9	30.00	14	46.67	1	3.33	3	10.00	3	10.00	30
	Kaipamangalam	11	36.67	12	40.00	5	16.67	2	6.67	0	0.00	30
	Azhickode	8	26.67	11	36.67	4	13.33	5	16.67	2	6.67	30
SUB-TOTAL		**28**	**31.11**	**37**	**41.11**	**10**	**11.11**	**10**	**11.11**	**5**	**5.56**	**90**
MALAPPURAM	Kadalundinagar	18	60.00	12	40.00	0	0.00	0	0.00	0	0.00	30
	Parapanangadi	11	36.67	16	53.33	1	3.33	1	3.33	1	3.33	30
	Arayankadappuram	1	3.33	17	56.67	4	13.33	3	10.00	5	16.67	30
	Ariyalloor	21	70.00	9	30.00	0	0.00	0	0.00	0	0.00	30
SUB-TOTAL		**51**	**42.50**	**54**	**45.00**	**5**	**4.17**	**4**	**3.33**	**6**	**5.00**	**120**
KOZHIKKODE	Thopayil	30	100.00	0	0.00	0	0.00	0	0.00	0	0.00	30
	Puthiyangadi	27	90.00	3	10.00	0	0.00	0	0.00	0	0.00	30
	Puthiya kadavu	28	93.33	1	3.33	0	0.00	0	0.00	1	3.33	30
	Kampuram	28	93.33	0	0.00	0	0.00	0	0.00	2	6.67	30
	Puthiyappa	19	63.33	10	33.33	1	3.33	0	0.00	0	0.00	30
SUB-TOTAL		**132**	**88.00**	**14**	**9.33**	**1**	**0.67**	**0**	**0.00**	**3**	**2.00**	**150**
KANNUR	Palisseri	24	80.00	3	10.00	2	6.67	0	0.00	1	3.33	30
	Chalil Gopalpetta	23	76.67	6	20.00	1	3.33	0	0.00	0	0.00	30
SUB-TOTAL		**47**	**78.33**	**9**	**15.00**	**3**	**5.00**	**0**	**0.00**	**1**	**1.67**	**60**
KASARGODE	Kottikulam	26	86.67	2	6.67	2	6.67	0	0.00	0	0.00	30
	Hozdurg	18	60.00	6	20.00	5	16.67	1	3.33	0	0.00	30
SUB-TOTAL		**44**	**73.33**	**8**	**13.33**	**7**	**11.67**	**1**	**1.67**	**0**	**0.00**	**60**
GRAND-TOTAL		**687**	**65.43**	**260**	**24.76**	**49**	**4.67**	**25**	**2.38**	**29**	**2.76**	**1050**

Source : Primary Data

Appendix 13

Catogerisation of Respondents According to Ownership on House						
Ownership on House						
DISTRICT	VILLAGE	Own		Rented		Total
		Nos.	%	Nos.	%	
TRIVANDRUM	Shankumugham	30	100.00	0	0.00	30.00
	Poovar	30	100.00	0	0.00	30.00
	South Kollamkode	26	86.67	4	13.33	30.00
	Paruthiyoor	28	93.33	2	6.67	30.00
	Punthura	22	73.33	8	26.67	30.00
	Kovalam	30	100.00	0	0.00	30.00
SUB TOTAL		166	92.22	14	6.67	180.00
KOLLAM	Sakthikulangara	23	76.67	7	23.33	30.00
	Cheriazheekal	26	86.67	4	13.33	30.00
	Marathoorkulangara	28	93.33	2	6.67	30.00
	Mayyanad	30	100.00	0	0.00	30.00
	Neendakara	26	86.67	4	13.33	30.00
SUB-TOTAL		133	88.67	17	11.33	150.00
ALAPPUZHA	Thaikal	29	96.67	1	3.33	30.00
	Vadakkal	29	96.67	1	3.33	30.00
	Arattupuzha	30	100.00	0	0.00	30.00
	Pollethai	29	96.67	1	3.33	30.00
SUB-TOTAL		117	97.50	3	2.50	120.00
ERNAKULAM	Cheriyakadavu	28	93.33	2	6.67	30.00
	Chellanam	25	83.33	5	16.67	30.00
	Cherai	30	100.00	0	0.00	30.00
	Kannamli	29	96.67	1	3.33	30.00
SUB-TOTAL		112	93.33	8	3.33	120.00
THRISSUR	Vemballur	29	96.67	1	3.33	30.00
	Kaipamangalam	26	86.67	4	13.33	30.00
	Azhickode	25	83.33	5	16.67	30.00
SUB-TOTAL		80	88.89	10	11.11	90.00
MALAPPURAM	Kadalundinagar	24	80.00	6	20.00	30.00
	Parapanangadi	30	100.00	0	0.00	30.00
	Arayankadappuram	30	100.00	0	0.00	30.00
	Ariyalloor	30	100.00	0	0.00	30.00
SUB-TOTAL		114	95.00	6	5.00	120.00
KOZHIKKODE	Thopayil	30	100.00	0	0.00	30.00
	Puthiyangadi	30	100.00	0	0.00	30.00
	Puthiya kadavu	29	96.67	1	3.33	30.00
	Kampuram	29	96.67	1	3.33	30.00
	Puthiyappa	28	93.33	2	6.67	30.00
SUB-TOTAL		146	97.33	4	2.67	150.00
KANNUR	Palisseri	26	86.67	4	13.33	30.00
	Chalil Gopalpetta	28	93.33	2	6.67	30.00
SUB-TOTAL		54	90.00	6	10.00	60.00
KASARGODE	Kottikulam	28	93.33	2	6.67	30.00
	Hozdurg	28	93.33	2	6.67	30.00
SUB-TOTAL		56	93.33	4	6.67	60.00
GRAND-TOTAL		978	93.14	72	6.86	1050.00
Source : Primary Data						

Appendix 14

Distribution of Houses According to Type of Roof

DISTRICT	VILLAGE	Type of house								
		Hut		Thatched		Tiled		Concrete		
		Nos	%	Nos	%	Nos	%	Nos	%	Total (Nos.)
TRIVANDRUM	Shankumugham	2	6.67	2	6.67	7	23.33	19	63.33	30
	Poovar	2	6.67	5	16.67	9	30.00	14	46.67	30
	South Kollamkode	1	3.33	4	13.33	8	26.67	17	56.67	30
	Paruthiyoor	0	0.00	0	0.00	2	6.67	28	93.33	30
	Punthura	0	0.00	11	36.67	1	3.33	18	60.00	30
	Kovalam	0	0.00	0	0.00	0	0.00	30	100.00	30
SUB TOTAL		**5**	**2.78**	**22**	**12.22**	**27**	**15.00**	**126**	**70.00**	**180**
KOLLAM	Sakthikulangara	1	3.33	11	36.67	0	0.00	18	60.00	30
	Cheriazheekal	0	0.00	0	0.00	2	6.67	28	93.33	30
	Marathoorkulangara	0	0.00	0	0.00	4	13.33	26	86.67	30
	Mayyanad	3	10.00	27	90.00	0	0.00	0	0.00	30
	Neendakara	2	6.67	14	46.67	2	6.67	12	40.00	30
SUB-TOTAL		**6**	**4.00**	**52**	**34.67**	**8**	**5.33**	**84**	**56.00**	**150**
ALAPPUZHA	Thaikal	1	3.33	0	0.00	6	20.00	23	76.67	30
	Vadakkal	0	0.00	7	23.33	11	36.67	12	40.00	30
	Arattupuzha	1	3.33	3	10.00	4	13.33	22	73.33	30
	Pollethai	4	13.33	13	43.33	6	20.00	7	23.33	30
SUB-TOTAL		**6**	**5.00**	**23**	**19.17**	**27**	**22.50**	**64**	**53.33**	**120**
ERNAKULAM	Cheriyakadavu	0	0.00	2	6.67	7	23.33	21	70.00	30
	Chellanam	1	3.33	1	3.33	19	63.33	9	30.00	30
	Cherai	0	0.00	0	0.00	29	96.67	1	3.33	30
	Kannamli	0	0.00	8	26.67	3	10.00	19	63.33	30
SUB-TOTAL		**1**	**0.83**	**11**	**9.17**	**58**	**48.33**	**50**	**41.67**	**120**
THRISSUR	Vemballur	0	0.00	23	76.67	5	16.67	2	6.67	30
	Kaipamangalam	0	0.00	3	10.00	7	23.33	20	66.67	30
	Azhickode	0	0.00	8	26.67	4	13.33	18	60.00	30
SUB-TOTAL		**0**	**0.00**	**34**	**37.78**	**16**	**17.78**	**40**	**44.44**	**90**
MALAPPURAM	Kadalundinagar	2	6.67	10	33.33	1	3.33	17	56.67	30
	Parapanangadi	1	3.33	0	0.00	17	56.67	12	40.00	30
	Arayankadappuram	1	3.33	1	3.33	7	23.33	21	70.00	30
	Ariyalloor	0	0.00	0	0.00	12	40.00	18	60.00	30
SUB-TOTAL		**4**	**3.33**	**11**	**9.17**	**37**	**30.83**	**68**	**56.67**	**120**
KOZHIKKODE	Thopayil	0	0.00	2	6.67	24	80.00	4	13.33	30
	Puthiyangadi	0	0.00	0	0.00	22	73.33	8	26.67	30
	Puthiya kadavu	0	0.00	2	6.67	20	66.67	8	26.67	30
	Kampuram	1	3.33	0	0.00	27	90.00	2	6.67	30
	Puthiyappa	0	0.00	25	83.33	4	13.33	1	3.33	30
SUB-TOTAL		**1**	**0.67**	**29**	**19.33**	**97**	**64.67**	**23**	**15.33**	**150**
KANNUR	Palisseri	3	10.00	7	23.33	2	6.67	18	60.00	30
	Chalil Gopalpetta	0	0.00	18	60.00	3	10.00	9	30.00	30
SUB-TOTAL		**3**	**5.00**	**25**	**41.67**	**5**	**8.33**	**27**	**45.00**	**60**
KASARGODE	Kottikulam	1	3.33	4	13.33	21	70.00	4	13.33	30
	Hozdurg	3	10.00	7	23.33	1	3.33	19	63.33	30
SUB-TOTAL		**4**	**6.67**	**11**	**18.33**	**22**	**36.67**	**23**	**38.33**	**60**
GRAND-TOTAL		**30**	**2.86**	**218**	**20.76**	**297**	**28.29**	**505**	**48.10**	**1050**

Source : Primary Data

Appendix 15

Distribution of Houses According to Plinth Area

DISTRICT	VILLAGE	Plinth Area (in Sq.ft.)						Total (Nos.)
		up to 500		500-1000		Above 1000		
		Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	17	56.67	13	43.33	0	0.00	30
	Poovar	8	26.67	22	73.33	0	0.00	30
	South Kollamkode	5	16.67	22	73.33	3	10.00	30
	Paruthiyoor	21	70.00	8	26.67	1	3.33	30
	Punthura	15	50.00	15	50.00	0	0.00	30
	Kovalam	30	100.00	0	0.00	0	0.00	30
SUB TOTAL		**96**	**53.33**	**80**	**44.44**	**4**	**2.22**	**180**
KOLLAM	Sakthikulangara	28	93.33	2	6.67	0	0.00	30
	Cheriazheekal	16	53.33	14	47.00	0	0.00	30
	Marathoorkulangara	14	46.67	11	36.67	5	16.67	30
	Mayyanad	2	6.67	27	90.00	1	3.33	30
	Neendakara	2	7.00	18	60.00	10	33.33	30
SUB-TOTAL		**62**	**41.33**	**72**	**48.00**	**16**	**10.67**	**150**
ALAPPUZHA	Thaikal	30	100.00	0	0.00	0	0.00	30
	Vadakkal	19	63.33	9	30.00	2	6.67	30
	Arattupuzha	21	70.00	8	26.67	1	3.33	30
	Pollethai	24	80.00	6	20.00	0	0.00	30
SUB-TOTAL		**94**	**78.33**	**23**	**19.17**	**3**	**2.50**	**120**
ERNAKULAM	Cheriyakadavu	27	90.00	3	10.00	0	0.00	30
	Chellanam	28	93.33	2	6.67	0	0.00	30
	Cherai	25	83.33	5	16.67	0	0.00	30
	Kannamli	27	90.00	3	10.00	0	0.00	30
SUB-TOTAL		**107**	**89.17**	**13**	**10.83**	**0**	**0.00**	**120**
THRISSUR	Vemballur	29	96.67	0	0.00	1	3.33	30
	Kaipamangalam	3	10.00	22	73.33	5	16.67	30
	Azhickode	6	20.00	4	13.33	20	66.67	30
SUB-TOTAL		**38**	**42.22**	**26**	**28.89**	**26**	**28.89**	**90**
MALAPPURAM	Kadalundinagar	30	100.00	0	0.00	0	0.00	30
	Parapanangadi	9	30.00	21	70.00	0	0.00	30
	Arayankadappuram	24	80.00	6	20.00	0	0.00	30
	Ariyalloor	3	10.00	23	76.67	4	13.33	30
SUB-TOTAL		**66**	**55.00**	**50**	**41.67**	**4**	**3.33**	**120**
KOZHIKKODE	Thopayil	28	93.33	2	6.67	0	0.00	30
	Puthiyangadi	4	13.33	24	80.00	2	6.67	30
	Puthiya kadavu	22	73.33	2	6.67	6	20.00	30
	Kampuram	8	26.67	14	46.67	8	26.67	30
	Puthiyappa	17	56.67	12	40.00	1	3.33	30
SUB-TOTAL		**79**	**52.67**	**54**	**36.00**	**17**	**11.33**	**150**
KANNUR	Palisseri	24	80.00	4	13.33	2	6.67	30
	Chalil Gopalpetta	28	93.33	2	6.67	0	0.00	30
SUB-TOTAL		**52**	**86.67**	**6**	**10.00**	**2**	**3.33**	**60**
KASARGODE	Kottikulam	16	53.33	14	46.67	0	0.00	30
	Hozdurg	20	66.67	9	30.00	1	3.33	30
SUB-TOTAL		**36**	**60.00**	**23**	**38.33**	**1**	**1.67**	**60**
GRAND-TOTAL		**630**	**60.00**	**347**	**33.05**	**73**	**6.95**	**1050**

Source : Primary Data

Appendix 16

Classification of Fisherfolk Houses According to Type of Flooring

DISTRICT	VILLAGE	Type of Flooring												TOTAL (Nos.)
		Mud		Cement		Mosaic		Tiled		Marble		Granite		
		Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	0	0.00	17	56.67	3	10.00	10	33.33	0	0.00	0	0.00	30
	Poovar	3	10.00	16	53.33	3	10.00	7	23.33	1	3.33	0	0.00	30
	South Kollamkode	0	0.00	22	73.33	5	16.67	3	10.00	0	0.00	0	0.00	30
	Paruthiyoor	0	0.00	1	3.33	0	0.00	29	96.67	0	0.00	0	0.00	30
	Punthura	0	0.00	23	76.67	1	3.33	4	13.33	1	3.33	1	3.33	30
	Kovalam	0	0.00	30	100.00	0	0.00	0	0.00	0	0.00	0	0.00	30
SUB TOTAL		**3**	**1.67**	**109**	**60.56**	**12**	**6.67**	**53**	**29.44**	**2**	**1.11**	**1**	**0.56**	**180**
KOLLAM	Sakthikulangara	0	0.00	18	60.00	3	10.00	6	20.00	3	10.00	0	0.00	30
	Cheriazheekal	0	0.00	29	96.67	0	0.00	1	3.33	0	0.00	0	0.00	30
	Marathoorkulangara	0	0.00	24	80.00	0	0.00	6	20.00	0	0.00	0	0.00	30
	Mayyanad	1	3.33	29	96.67	0	0.00	0	0.00	0	0.00	0	0.00	30
	Neendakara	0	0.00	19	63.33	2	6.67	8	26.67	1	3.33	0	0.00	30
SUB-TOTAL		**1**	**0.67**	**119**	**79.33**	**5**	**3.33**	**21**	**14.00**	**4**	**2.67**	**0**	**0.00**	**150**
ALAPPUZHA	Thaikal	0	0.00	22	73.33	1	3.33	7	23.33	0	0.00	0	0.00	30
	Vadakkal	0	0.00	24	80.00	1	3.33	5	16.67	0	0.00	0	0.00	30
	Arattupuzha	1	3.33	16	53.33	1	3.33	12	40.00	0	0.00	0	0.00	30
	Pollethai	0	0.00	28	93.33	0	0.00	2	6.67	0	0.00	0	0.00	30
SUB-TOTAL		**1**	**0.83**	**90**	**75.00**	**3**	**2.50**	**26**	**21.67**	**0**	**0.00**	**0**	**0.00**	**120**
ERNAKULAM	Cheriyakadavu	0	0.00	17	56.67	5	16.67	6	20.00	2	6.67	0	0.00	30
	Chellanam	0	0.00	18	60.00	4	13.33	8	26.67	0	0.00	0	0.00	30
	Cherai	0	0.00	23	76.67	0	0.00	7	23.33	0	0.00	0	0.00	30
	Kannamli	0	0.00	17	56.67	0	0.00	13	43.33	0	0.00	0	0.00	30
SUB-TOTAL		**0**	**0.00**	**75**	**62.50**	**9**	**7.50**	**34**	**28.33**	**2**	**1.67**	**0**	**0.00**	**120**
THRISSUR	Vemballur	1	3.33	27	90.00	0	0.00	1	3.33	1	3.33	0	0.00	30
	Kaipamangalam	3	10.00	18	60.00	0	0.00	7	23.33	1	3.33	1	3.33	30
	Azhickode	7	23.33	16	53.33	0	0.00	2	6.67	2	6.67	3	10.00	30
SUB-TOTAL		**11**	**12.22**	**61**	**67.78**	**0**	**0.00**	**10**	**11.11**	**4**	**4.44**	**4**	**4.44**	**90**
MALAPPURAM	Kadalundinagar	3	10.00	23	76.67	1	3.33	3	10.00	0	0.00	0	0.00	30
	Parapanangadi	1	3.33	22	73.33	1	3.33	3	10.00	3	10.00	0	0.00	30
	Arayankadappuram	2	6.67	18	60.00	0	0.00	9	30.00	1	3.33	0	0.00	30
	Ariyalloor	0	0.00	22	73.33	0	0.00	8	26.67	0	0.00	0	0.00	30
SUB-TOTAL		**6**	**5.00**	**85**	**70.83**	**2**	**1.67**	**23**	**19.17**	**4**	**3.33**	**0**	**0.00**	**120**
KOZHIKKODE	Thopayil	0	0.00	13	43.33	8	26.67	9	30.00	0	0.00	0	0.00	30
	Puthiyangadi	2	6.67	19	63.33	4	13.33	2	6.67	3	10.00	0	0.00	30
	Puthiya kadavu	1	3.33	21	70.00	1	3.33	7	23.33	0	0.00	0	0.00	30
	Kampuram	0	0.00	8	26.67	14	46.67	7	23.33	1	3.33	0	0.00	30
	Puthiyappa	0	0.00	26	86.67	0	0.00	4	13.33	0	0.00	0	0.00	30
SUB-TOTAL		**3**	**2.00**	**87**	**58.00**	**27**	**18.00**	**29**	**19.33**	**4**	**2.67**	**0**	**0.00**	**150**
KANNUR	Palisseri	4	13.33	25	83.33	0	0.00	1	3.33	0	0.00	0	0.00	30
	Chalil Gopalpetta	0	0.00	29	96.67	0	0.00	1	3.33	0	0.00	0	0.00	30
SUB-TOTAL		**4**	**6.67**	**54**	**90.00**	**0**	**0.00**	**2**	**3.33**	**0**	**0.00**	**0**	**0.00**	**60**
KASARGODE	Kottikulam	2	6.67	26	86.67	1	3.33	1	3.33	0	0.00	0	0.00	30
	Hozdurg	2	6.67	16	53.33	0	0.00	0	0.00	12	40.00	0	0.00	30
SUB-TOTAL		**4**	**6.67**	**42**	**70.00**	**1**	**1.67**	**1**	**1.67**	**12**	**20.00**	**0**	**0.00**	**60**
GRAND-TOTAL		**33**	**3.14**	**722**	**68.76**	**59**	**5.62**	**199**	**18.95**	**32**	**3.05**	**5**	**0.48**	**1050**

Source : Primary Data

Appendix 17

Status of Electrification of Respondents' Houses						
Electrified						
DISTRICT	VILLAGE	YES		NO		Total
		Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	28	93.33	2	6.67	30
	Poovar	29	96.67	1	3.33	30
	South Kollamkode	30	100.00	0	0.00	30
	Paruthiyoor	30	100.00	0	0.00	30
	Punthura	30	100.00	0	0.00	30
	Kovalam	30	100.00	0	0.00	30
SUB TOTAL		177	98.33	3	1.67	180
KOLLAM	Sakthikulangara	30	100.00	0	0.00	30
	Cheriazheekal	30	100.00	0	0.00	30
	Marathoorkulangara	30	100.00	0	0.00	30
	Mayyanad	29	96.67	1	3.00	30
	Neendakara	30	100.00	0	0.00	30
SUB-TOTAL		149	99.33	1	0.67	150
ALAPPUZHA	Thaikal	30	100.00	0	0.00	30
	Vadakkal	30	100.00	0	0.00	30
	Arattupuzha	28	93.33	2	6.67	30
	Pollethai	29	96.67	1	3.33	30
SUB-TOTAL		117	97.50	3	2.50	120
ERNAKULAM	Cheriyakadavu	29	96.67	1	3.33	30
	Chellanam	30	100.00	0	0.00	30
	Cherai	29	96.67	1	3.33	30
	Kannamli	28	93.33	2	6.67	30
SUB-TOTAL		116	96.67	4	3.33	120
THRISSUR	Vemballur	30	100.00	0	0.00	30
	Kaipamangalam	27	90.00	3	10.00	30
	Azhickode	26	86.67	4	13.33	30
SUB-TOTAL		83	92.22	7	7.78	90
MALAPPURAM	Kadalundinagar	29	96.67	1	3.33	30
	Parapanangadi	27	90.00	3	10.00	30
	Arayankadappuram	29	96.67	1	3.33	30
	Ariyalloor	30	100.00	0	0.00	30
SUB-TOTAL		115	95.83	5	4.17	120
KOZHIKKODE	Thopayil	30	100.00	0	0.00	30
	Puthiyangadi	30	100.00	0	0.00	30
	Puthiya kadavu	30	100.00	0	0.00	30
	Kampuram	30	100.00	0	0.00	30
	Puthiyappa	17	56.67	13	43.33	30
SUB-TOTAL		137	91.33	13	8.67	150
KANNUR	Palisseri	26	86.67	4	13.33	30
	Chalil Gopalpetta	27	90.00	3	10.00	30
SUB-TOTAL		53	88.33	7	11.67	60
KASARGODE	Kottikulam	29	96.67	1	3.33	30
	Hozdurg	29	96.67	1	3.33	30
SUB-TOTAL		58	96.67	2	3.33	60
GRAND-TOTAL		1005	95.71	45	4.29	1050

Source : Primary Data

Appendix 18

Categorisation of Respondents Based on Source of Drinking Water

DISTRICT	Fishing village	Source of Drinking Water												TOTAL (Nos.)
		Pond		Well		Potable water		Public tap		Purchased water		Borewell		
		Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	0	0.00	4	13.33	0	0.00	5	16.67	0	0.00	21	70.00	30
	Poovar	0	0.00	0	0.00	0	0.00	30	100.00	0	0.00	0	0.00	30
	South Kollamkode	0	0.00	11	36.67	0	0.00	16	53.33	3	10.00	0	0.00	30
	Paruthiyoor	2	6.67	0	0.00	1	3.33	27	90.00	0	0.00	0	0.00	30
	Punthura	0	0.00	0	0.00	13	43.33	10	33.33	0	0.00	7	23.33	30
	Kovalam	0	0.00	0	0.00	29	96.67	0	0.00	0	0.00	1	3.33	30
SUB-TOTAL		**2**	**1.11**	**15**	**6.11**	**43**	**24.44**	**88**	**48.89**	**3**	**1.67**	**29**	**17.78**	**180**
KOLLAM	Sakthikulangara	0	0.00	1	3.33	0	0.00	19	63.33	10	33.33	0	0.00	30
	Cheriazheekal	0	0.00	0	0.00	24	80.00	6	20.00	0	0.00	0	0.00	30
	Marathoorkulangara	1	3.33	0	0.00	29	96.67	0	0.00	0	0.00	0	0.00	30
	Mayyanad	0	0.00	0	0.00	0	0.00	30	100.00	0	0.00	0	0.00	30
	Neendakara	0	0.00	0	0.00	0	0.00	29	96.67	0	0.00	1	3.33	30
SUB-TOTAL		**1**	**0.67**	**1**	**0.67**	**53**	**35.33**	**84**	**56.00**	**10**	**6.67**	**1**	**0.67**	150
ALAPPUZHA	Thaikal	1	3.33	27	90.00	0	0.00	1	3.33	0	0.00	1	3.33	30
	Vadakkal	0	0.00	0	0.00	0	0.00	15	50.00	15	50.00	0	0.00	30
	Arattupuzha	2	6.67	2	6.67	2	6.67	24	80.00	0	0.00	0	0.00	30
	Pollethai	0	0.00	2	6.67	0	0.00	0	0.00	0	0.00	28	93.33	30
SUB-TOTAL		**3**	**2.50**	**31**	**25.83**	**2**	**1.67**	**40**	**33.33**	**15**	**12.50**	**29**	**24.17**	**120**
ERNAKULAM	Cheriyakadavu	1	3.33	0	0.00	0	0.00	17	56.67	12	40.00	0	0.00	30
	Chellanam	0	0.00	4	13.33	0	0.00	26	86.67	0	0.00	0	0.00	30
	Cherai	0	0.00	0	0.00	8	26.67	21	70.00	1	3.33	0	0.00	30
	Kannamli	1	3.33	0	0.00	0	0.00	28	93.33	1	3.33	0	0.00	30
SUB-TOTAL		**2**	**1.67**	**4**	**3.33**	**8**	**6.67**	**92**	**76.67**	**14**	**11.67**	**0**	**0.83**	**120**
THRISSUR	Vemballur	0	0.00	1	3.33	5	16.67	23	76.67	0	0.00	1	3.33	30
	Kaipamangalam	0	0.00	2	6.67	4	13.33	19	63.33	0	0.00	5	16.67	30
	Azhickode	0	0.00	1	3.33	6	20.00	19	63.33	0	0.00	4	13.33	30
SUB-TOTAL		**0**	**0.00**	**4**	**4.44**	**15**	**16.67**	**61**	**67.78**	**0**	**0.00**	**10**	**11.11**	**90**
MALAPPURAM	Kadalundinagar	0	0.00	3	10.00	4	13.33	11	36.67	2	6.67	10	33.33	30
	Parapanangadi	1	3.33	17	56.67	7	23.33	2	6.67	2	6.67	1	3.33	30
	Arayankadappuram	0	0.00	21	70.00	2	6.67	1	3.33	4	13.33	2	6.67	30
	Ariyalloor	1	3.33	16	53.33	8	26.67	0	0.00	1	3.33	4	13.33	30
SUB-TOTAL		**2**	**1.67**	**57**	**47.50**	**21**	**17.50**	**14**	**11.67**	**9**	**7.50**	**17**	**14.17**	**120**
KOZHIKKODE	Thopayil	0	0.00	0	0.00	29	96.67	1	3.33	0	0.00	0	0.00	30
	Puthiyangadi	1	3.33	0	0.00	27	90.00	2	6.67	0	0.00	0	0.00	30
	Puthiya kadavu	1	3.33	2	6.67	25	83.33	2	6.67	0	0.00	0	0.00	30
	Kampuram	1	3.33	0	0.00	26	86.67	3	10.00	0	0.00	0	0.00	30
	Puthiyappa	0	0.00	10	33.33	2	6.67	0	0.00	1	3.33	17	56.67	30
SUB-TOTAL		**3**	**2.00**	**12**	**8.00**	**109**	**72.67**	**8**	**5.33**	**1**	**0.67**	**17**	**11.33**	**150**
KANNUR	Palisseri	2	6.67	1	3.33	0	0.00	16	53.33	6	20.00	5	16.67	30
	Chalil Gopalpetta	2	6.67	0	0.00	3	10.00	15	50.00	7	23.33	3	10.00	30
SUB-TOTAL		**4**	**6.67**	**1**	**1.67**	**3**	**5.00**	**31**	**51.67**	**13**	**21.67**	**8**	**13.33**	**60**
KASARGODE	Kottikulam	1	3.33	8	26.67	5	16.67	10	33.33	2	6.67	4	13.33	30
	Hozdurg	1	3.33	6	20.00	1	3.33	9	30.00	2	6.67	11	36.67	30
SUB-TOTAL		**2**	**3.33**	**14**	**23.33**	**6**	**10.00**	**19**	**31.67**	**4**	**6.67**	**15**	**25.00**	**60**
GRAND-TOTAL		**19**	**1.81**	**139**	**13.24**	**260**	**24.76**	**437**	**41.62**	**69**	**6.57**	**126**	**12.00**	**1050**

Source : Primary Data

Appendix 19

Type of Fuel used by the Households for Cooking

District	Fishing village	Fuel Used: Firewood		Gas		Firewood& Kerosene		Firewood& Gas		Kerosene& Gas		Firewood, Gas&		Total (Nos.)
		Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%	
TRIVANDRUM	Shankumugham	4	13.33	5	16.67	1	3.33	0	0.00	19	63.33	1	3.33	30
	Poovar	5	16.67	19	63.33	0	0.00	0	0.00	6	20.00	0	0.00	30
	South Kollamkode	3	10.00	12	40.00	0	0.00	0	0.00	14	46.67	1	3.33	30
	Paruthiyoor	0	0.00	24	80.00	0	0.00	0	0.00	5	16.67	1	3.33	30
	Punthura	2	6.67	18	60.00	1	3.33	0	0.00	4	13.33	5	16.67	30
	Kovalam	0	0.00	29	96.67	0	0.00	1	3.33	0	0.00	0	0.00	30
SUB-TOTAL		**14**	**7.78**	**107**	**59.44**	**2**	**1.11**	**1**	**0.56**	**48**	**26.67**	**8**	**4.44**	**180**
KOLLAM	Sakthikulangara	0	0.00	7	23.33	1	3.33	20	66.67	0	0.00	2	6.67	30
	Cheriazheekal	0	0.00	0	0.00	0	0.00	15	50.00	0	0.00	15	50.00	30
	Marathoorkulangara	1	3.33	1	3.33	0	0.00	13	43.33	0	0.00	15	50.00	30
	Mayyanad	0	0.00	15	50.00	0	0.00	11	36.67	2	6.67	2	6.67	30
	Neendakara	0	0.00	11	36.67	2	6.67	13	43.33	2	6.67	2	6.67	30
SUB-TOTAL		**1**	**0.67**	**34**	**22.67**	**3**	**2.00**	**72**	**48.00**	**4**	**2.67**	**36**	**24.00**	**150**
ALAPPUZHA	Thaikal	6	20.00	0	0.00	1	3.33	20	66.67	1	3.33	2	6.67	30
	Vadakkal	0	0.00	1	3.33	2	6.67	13	43.33	3	10.00	11	36.67	30
	Arattupuzha	3	10.00	4	13.33	2	6.67	18	60.00	0	0.00	3	10.00	30
	Pollethai	1	3.33	13	43.33	1	3.33	12	40.00	1	3.33	2	6.67	30
SUB-TOTAL		**10**	**8.33**	**18**	**15.00**	**6**	**5.00**	**63**	**52.50**	**5**	**4.17**	**18**	**15.00**	**120**
ERNAKULAM	Cheriyakadavu	1	3.33	17	56.67	0	0.00	10	33.33	0	0.00	2	6.67	30
	Chellanam	4	13.33	2	6.67	10	33.33	9	30.00	1	3.33	4	13.33	30
	Cherai	0	0.00	13	43.33	6	20.00	4	13.33	0	0.00	7	23.33	30
	Kannamli	2	6.67	14	46.67	0	0.00	2	6.67	0	0.00	12	40.00	30
SUB-TOTAL		**7**	**5.83**	**46**	**38.33**	**16**	**13.33**	**25**	**20.83**	**1**	**0.83**	**25**	**20.83**	**120**
THRISSUR	Vemballur	13	43.33	13	43.33	2	6.67	2	6.67	0	0.00	0	0.00	30
	Kaipamangalam	10	33.33	17	56.67	1	3.33	0	0.00	0	0.00	2	6.67	30
	Azhickode	12	40.00	15	50.00	1	3.33	1	3.33	0	0.00	1	3.33	30
SUB-TOTAL		**35**	**38.89**	**45**	**50.00**	**4**	**4.44**	**3**	**3.33**	**0**	**0.00**	**3**	**3.33**	**90**
MALAPPURAM	Kadalundinagar	13	43.33	1	3.33	0	0.00	16	53.33	0	0.00	0	0.00	30
	Parapanangadi	16	53.33	14	46.67	0	0.00	0	0.00	0	0.00	0	0.00	30
	Arayankadappuram	6	20.00	24	80.00	0	0.00	0	0.00	0	0.00	0	0.00	30
	Ariyalloor	1	3.33	0	0.00	8	26.67	11	36.67	3	10.00	7	23.33	30
SUB-TOTAL		**36**	**30.00**	**39**	**32.50**	**8**	**6.67**	**27**	**22.50**	**3**	**2.50**	**7**	**5.83**	**120**
KOZHIKKODE	Thopayil	11	36.67	0	0.00	0	0.00	19	63.33	0	0.00	0	0.00	30
	Puthiyangadi	6	20.00	2	6.67	0	0.00	21	70.00	1	3.33	0	0.00	30
	Puthiya kadavu	11	36.67	11	36.67	0	0.00	8	26.67	0	0.00	0	0.00	30
	Kampuram	7	23.33	3	10.00	1	3.33	18	60.00	0	0.00	1	3.33	30
	Puthiyappa	0	0.00	30	100.00	0	0.00	0	0.00	0	0.00	0	0.00	30
SUB-TOTAL		**35**	**23.33**	**46**	**30.67**	**1**	**0.67**	**66**	**44.00**	**1**	**0.67**	**1**	**0.67**	**150**
KANNUR	Palisseri	5	16.67	11	36.67	3	10.00	5	16.67	1	3.33	5	16.67	30
	Chalil Gopalpetta	3	10.00	22	73.33	2	6.67	1	3.33	0	0.00	2	6.67	30
SUB-TOTAL		**8**	**13.33**	**33**	**55.00**	**5**	**8.33**	**6**	**10.00**	**1**	**1.67**	**7**	**11.67**	**60**
KASARGODE	Kottikulam	15	50.00	5	16.67	1	3.33	7	23.33	0	0.00	2	6.67	30
	Hozdurg	8	26.67	7	23.33	1	3.33	11	36.67	1	3.33	2	6.67	30
SUB-TOTAL		**23**	**38.33**	**12**	**20.00**	**2**	**3.33**	**18**	**30.00**	**1**	**1.67**	**4**	**6.67**	**60**
GRAND-TOTAL		**169**	**16.10**	**380**	**36.19**	**47**	**4.48**	**281**	**26.76**	**64**	**6.10**	**109**	**10.38**	**1050**

Source : Primary Data

Appendix 20

Distribution of Houses According to Type of Lavatory										
		Lavatory								
DISTRICT	Fishing village	Open Air		Hung latrine		Ring		Septic tank		TOTAL (Nos.)
		Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	0	0.00	0	0.00	9	30.00	21	70.00	30
	Poovar	6	20.00	24	80.00	0	0.00	0	0.00	30
	South Kollamkode	1	3.33	9	30.00	1	3.33	19	63.33	30
	Paruthiyoor	0	0.00	0	0.00	0	0.00	30	100.00	30
	Punthura	0	0.00	0	0.00	0	0.00	30	100.00	30
	Kovalam	0	0.00	0	0.00	0	0.00	30	100.00	30
SUB-TOTAL		7	3.89	33	18.33	10	5.56	130	72.22	180
KOLLAM	Sakthikulangara	0	0.00	0	0.00	16	53.33	14	46.67	30
	Cheriazheekal	0	0.00	1	3.33	1	3.33	28	93.33	30
	Marathoorkulanga	0	0.00	0	0.00	0	0.00	30	100.00	30
	Mayyanad	0	0.00	0	0.00	30	100.00	0	0.00	30
	Neendakara	0	0.00	0	0.00	17	56.67	13	43.33	30
SUB-TOTAL		0	0.00	1	0.67	64	42.67	85	56.67	150
ALAPPUZHA	Thaikal	0	0.00	1	3.33	4	13.33	25	83.33	30
	Vadakkal	0	0.00	1	3.33	3	10.00	26	86.67	30
	Arattupuzha	0	0.00	0	0.00	27	90.00	3	10.00	30
	Pollethai	0	0.00	1	3.33	23	76.67	6	20.00	30
SUB-TOTAL		0	0.00	3	2.50	57	47.50	60	50.00	120
ERNAKULAM	Cheriyakadavu	0	0.00	0	0.00	0	0.00	30	100.00	30
	Chellanam	0	0.00	0	0.00	2	6.67	28	93.33	30
	Cherai	0	0.00	2	6.67	24	80.00	4	13.33	30
	Kannamli	0	0.00	0	0.00	0	0.00	30	100.00	30
SUB-TOTAL		0	0.00	2	1.67	26	21.67	92	76.67	120
THRISSUR	Vemballur	0	0.00	0	0.00	0	0.00	30	100.00	30
	Kaipamangalam	0	0.00	0	0.00	2	6.67	28	93.33	30
	Azhickode	0	0.00	1	3.33	29	96.67	0	0.00	30
SUB-TOTAL		0	0.00	1	1.11	31	34.44	58	64.44	90
MALAPPURAM	Kadalundinagar	0	0.00	8	26.67	14	46.67	8	26.67	30
	Parapanangadi	0	0.00	1	3.33	16	53.33	13	43.33	30
	Arayankadappuran	0	0.00	0	0.00	0	0.00	30	100.00	30
	Ariyalloor	0	0.00	0	0.00	0	0.00	30	100.00	30
SUB-TOTAL		0	0.00	9	7.50	30	25.00	81	67.50	120
KOZHIKKODE	Thopayil	0	0.00	0	0.00	0	0.00	30	100.00	30
	Puthiyangadi	0	0.00	0	0.00	0	0.00	30	100.00	30
	Puthiya kadavu	0	0.00	1	3.33	1	3.33	28	93.33	30
	Kampuram	0	0.00	0	0.00	4	13.33	26	86.67	30
	Puthiyappa	0	0.00	0	0.00	27	90.00	3	10.00	30
SUB-TOTAL		0	0.00	1	0.67	32	21.33	117	78.00	150
KANNUR	Palisseri	0	0.00	5	16.67	13	43.33	12	40.00	30
	Chalil Gopalpetta	0	0.00	6	20.00	20	66.67	4	13.33	30
SUB-TOTAL		0	0.00	11	18.33	33	55.00	16	26.67	60
KASARGODE	Kottikulam	0	0.00	0	0.00	13	43.33	17	56.67	30
	Hozdurg	0	0.00	0	0.00	0	0.00	30	100.00	30
SUB-TOTAL		0	0.00	0	0.00	13	21.67	47	78.33	60
GRAND-TOTAL		7	0.67	61	5.81	296	28.19	686	65.33	1050

Source : Primary Data

Appendix 21

Details of Amount Spent for Consumption of Liquor, Smoking, etc.

Monthly Expenditure on Liquor,Smoking, etc..

DISTRICT	Habits	No. of Respondents						Total(Nos.)
		Up to Rs. 1000		Above Rs. 1000		Nil		
		Nos.	%	Nos.	%	Nos.	%	
TRIVANDRUM	Liquor	48	26.67	95	52.78	37	20.56	180
	Gambling	5	2.78	0	0.00	175	97.22	180
	Smoking	7	3.89	0	0.00	173	96.11	180
	Other Intoxicative	62	34.44	12	6.67	106	58.89	180
KOLLAM	Liquor	120	80.00	4	2.67	26	17.33	150
	Gambling	1	0.67	0	0.00	149	99.33	150
	Smoking	13	8.67	0	0.00	137	91.33	150
	Other Intoxicative	2	1.33	0	0.00	148	98.67	150
ALAPPUZHA	Liquor	30	25.00	8	6.67	82	68.33	120
	Gambling	8	6.67	0	0.00	112	93.33	120
	Smoking	42	35.00	0	0.00	78	65.00	120
	Other Intoxicative	39	32.50	0	0.00	81	67.50	120
ERNAKULAM	Liquor	28	23.33	5	4.17	87	72.50	120
	Gambling	0	0.00	0	0.00	120	100.00	120
	Smoking	13	10.83	0	0.00	107	89.17	120
	Other Intoxicative	3	2.50	0	0.00	117	97.50	120
THRISSUR	Liquor	28	31.11	12	13.33	50	55.56	90
	Gambling	0	0.00	1	1.11	89	98.89	90
	Smoking	0	0.00	0	0.00	90	100.00	90
	Other Intoxicative	6	6.67	14	15.56	70	77.78	90
MALAPPURAM	Liquor	0	0.00	0	0.00	120	100.00	120
	Gambling	0	0.00	0	0.00	120	100.00	120
	Smoking	0	0.00	0	0.00	120	100.00	120
	Other Intoxicative	20	16.67	0	0.00	100	83.33	120
KOZHIKKODE	Liquor	15	10.00	1	0.67	134	89.33	150
	Gambling	0	0.00	0	0.00	150	100.00	150
	Smoking	0	0.00	0	0.00	150	100.00	150
	Other Intoxicative	0	0.00	0	0.00	150	100.00	150
KANNUR	Liquor	28	46.67	0	0.00	32	53.33	60
	Gambling	4	6.67	0	0.00	56	93.33	60
	Smoking	13	21.67	0	0.00	47	78.33	60
	Other Intoxicative	12	20.00	0	0.00	48	80.00	60
KASARGODE	Liquor	16	26.67	13	21.67	31	51.67	60
	Gambling	0	0.00	0	0.00	60	100.00	60
	Smoking	1	1.67	0	0.00	59	98.33	60
	Other Intoxicative	4	6.67	0	0.00	56	93.33	60
KERALA	Liquor	313	29.81	138	13.14	599	57.05	1050
	Gambling	18	1.71	1	0.10	1031	98.19	1050
	Smoking	89	8.48	0	0.00	961	91.52	1050
	Other Intoxicative	148	14.10	26	2.48	876	83.43	1050

Source : Primary Data

Appendix 22

Fishing Category of the Respondents								
Fishing Category								
DISTRICT	VILLAGE	Traditional		Acquired		Migrant		TOTAL (Nos.)
		Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	30	100.00	0	0.00	0	0.00	30
	Poovar	28	93.33	1	3.33	1	3.33	30
	South Kollamkode	29	96.67	0	0.00	1	3.33	30
	Paruthiyoor	29	96.67	0	0.00	1	3.33	30
	Punthura	30	100.00	0	0.00	0	0.00	30
	Kovalam	30	100.00	0	0.00	0	0.00	30
SUB-TOTAL		176	97.78	1	0.56	3	1.67	180
KOLLAM	Sakthikulangara	29	96.67	1	3.33	0	0.00	30
	Cheriazheekal	30	100.00	0	0.00	0	0.00	30
	Marathoorkulangara	30	100.00	0	0.00	0	0.00	30
	Mayyanad	29	96.67	1	3.33	0	0.00	30
	Neendakara	27	86.67	3	6.67	0	0.00	30
SUB-TOTAL		145	96.67	5	3.33	0	0.00	150
ALAPPUZHA	Thaikal	28	93.33	1	3.33	1	3.33	30
	Vadakkal	30	100.00	0	0.00	0	0.00	30
	Arattupuzha	27	83.33	3	10.00	0	6.67	30
	Pollethai	30	100.00	0	0.00	0	0.00	30
SUB-TOTAL		115	95.83	4	3.33	1	0.83	120
ERNAKULAM	Cheriyakadavu	24	80.00	4	13.33	2	6.67	30
	Chellanam	27	90.00	1	3.33	2	6.67	30
	Cherai	29	96.67	0	0.00	1	3.33	30
	Kannamli	24	80.00	2	6.67	4	13.33	30
SUB-TOTAL		104	86.67	7	5.83	9	7.50	120
THRISSUR	Vemballur	30	100.00	0	0.00	0	0.00	30
	Kaipamangalam	30	90.00	0	0.00	0	0.00	30
	Azhickode	30	100.00	0	0.00	0	0.00	30
SUB-TOTAL		90	100.00	0	0.00	0	0.00	90
MALAPPURAM	Kadalundinagar	28	93.33	0	0.00	2	6.67	30
	Parapanangadi	26	86.67	1	3.33	3	10.00	30
	Arayankadappuram	27	90.00	3	10.00	0	13.33	30
	Ariyalloor	30	100.00	0	0.00	0	0.00	30
SUB-TOTAL		111	92.50	4	3.33	5	4.17	120
KOZHIKKODE	Thopayil	29	96.67	1	3.33	0	0.00	30
	Puthiyangadi	30	100.00	0	0.00	0	0.00	30
	Puthiya kadavu	30	100.00	0	0.00	0	0.00	30
	Kampuram	29	96.67	1	3.33	0	0.00	30
	Puthiyappa	26	86.67	2	6.67	2	6.67	30
SUB-TOTAL		144	96.00	4	2.67	2	1.33	150
KANNUR	Palisseri	27	90.00	3	10.00	0	0.00	30
	Chalil Gopalpetta	27	80.00	1	3.33	2	6.67	30
SUB-TOTAL		54	85.00	4	6.67	2	3.33	60
KASARGODE	Kottikulam	22	73.33	3	10.00	5	16.67	30
	Hozdurg	24	80.00	1	3.33	5	16.67	30
SUB-TOTAL		46	66.67	4	6.67	10	26.67	60
GRAND-TOTAL		985	93.81	33	3.14	32	3.05	1050

Source : Primary Data

Appendix 23

Type of Participation in Fishing

Type of Fisherman								
DISTRICT	VILLAGE	Partner of a Group		Lonely		Not Applicable		TOTAL (Nos.)
		Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	18	60.00	0	0.00	12	40.00	30
	Poovar	20	66.67	2	6.67	8	26.67	30
	South Kollamkode	18	60.00	3	10.00	9	30.00	30
	Paruthiyoor	15	50.00	0	0.00	15	50.00	30
	Punthura	19	63.33	4	13.33	7	23.33	30
	Kovalam	20	66.67	0	0.00	10	33.33	30
SUB-TOTAL		110	61.11	9	5.00	61	33.89	180
KOLLAM	Sakthikulangara	18	60.00	0	0.00	12	40.00	30
	Cheriazheekal	21	70.00	3	10.00	6	20.00	30
	Marathoorkulangara	16	53.33	2	6.67	12	40.00	30
	Mayyanad	14	46.67	2	6.67	14	46.67	30
	Neendakara	20	66.67	0	0.00	10	33.33	30
SUB-TOTAL		89	59.33	7	4.67	54	36.00	150
ALAPPUZHA	Thaikal	14	46.67	10	33.33	6	20.00	30
	Vadakkal	17	56.67	4	13.33	9	30.00	30
	Arattupuzha	18	60.00	8	26.67	4	13.33	30
	Pollethai	9	30.00	9	30.00	12	40.00	30
SUB-TOTAL		58	48.33	31	25.83	31	25.83	120
ERNAKULAM	Cheriyakadavu	14	46.67	5	16.67	11	36.67	30
	Chellanam	15	50.00	2	6.67	13	43.33	30
	Cherai	17	56.67	7	23.33	6	20.00	30
	Kannamli	16	53.33	4	13.33	10	33.33	30
SUB-TOTAL		62	51.67	18	15.00	40	33.33	120
THRISSUR	Vemballur	17	56.67	9	30.00	4	13.33	30
	Kaipamangalam	15	50.00	5	16.67	10	33.33	30
	Azhickode	18	60.00	0	0.00	12	40.00	30
SUB-TOTAL		50	55.56	14	15.56	26	28.89	90
MALAPPURAM	Kadalundinagar	16	53.33	7	23.33	7	23.33	30
	Parapanangadi	20	66.67	0	0.00	10	33.33	30
	Arayankadappuram	18	60.00	2	6.67	10	33.33	30
	Ariyalloor	19	63.33	7	23.33	4	13.33	30
SUB-TOTAL		73	60.83	16	13.33	31	25.83	120
KOZHIKKODE	Thopayil	16	53.33	3	10.00	11	36.67	30
	Puthiyangadi	19	63.33	3	10.00	8	26.67	30
	Puthiya kadavu	14	46.67	1	3.33	15	50.00	30
	Kampuram	20	66.67	2	6.67	8	26.67	30
	Puthiyappa	19	63.33	4	13.33	7	23.33	30
SUB-TOTAL		88	58.67	13	8.67	49	32.67	150
KANNUR	Palisseri	12	40.00	6	20.00	12	40.00	30
	Chalil Gopalpetta	18	60.00	5	16.67	7	23.33	30
SUB-TOTAL		30	50.00	11	18.33	19	31.67	60
KASARGODE	Kottikulam	10	33.33	12	40.00	8	26.67	30
	Hozdurg	12	40.00	6	20.00	12	40.00	30
SUB-TOTAL		22	36.67	18	30.00	20	33.33	60
GRAND-TOTAL		582	55.43	137	13.05	331	31.52	1050

Source : Primary Data

Appendix 24

Type of Fishing Vessel Used by the Respondents

DISTRICT	VILLAGE	Fishing Vessel												TOTAL (Nos.)
		Canoe		Vallam (IB/OB)		Motorized craft(OBM)		Mechanized craft		Others		Nil		
		Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	4	13.33	8	26.67	5	16.67	0	0.00	1	3.33	12	40.00	30
	Poovar	2	6.67	18	60.00	2	6.67	0	0.00	0	0.00	8	26.67	30
	South Kollamkode	6	20.00	15	50.00	0	0.00	0	0.00	0	0.00	9	30.00	30
	Paruthiyoor	0	0.00	12	40.00	3	10.00	0	0.00	0	0.00	15	50.00	30
	Punthura	2	6.67	2	6.67	19	63.33	0	0.00	0	0.00	7	23.33	30
	Kovalam	0	0.00	8	26.67	12	40.00	0	0.00	0	0.00	10	33.33	30
SUB-TOTAL		14	7.78	63	35.00	41	22.78	0	0.00	1	0.56	61	33.89	180
KOLLAM	Sakthikulangara	0	0.00	0	0.00	5	16.67	13	43.33	0	0.00	12	40.00	30
	Cheriazheekal	0	0.00	7	23.33	9	30.00	8	26.67	0	0.00	6	20.00	30
	Marathoorkulangara	2	6.67	13	43.33	0	0.00	0	0.00	3	10.00	12	40.00	30
	Mayyanad	2	6.67	14	46.67	0	0.00	0	0.00	0	0.00	14	46.67	30
	Neendakara	0	0.00	6	20.00	8	26.67	5	16.67	1	3.33	10	33.33	30
SUB-TOTAL		4	2.67	40	26.67	22	14.67	26	17.33	4	2.67	54	36.00	150
ALAPPUZHA	Thaikal	1	3.33	12	40.00	2	6.67	1	3.33	8	26.67	6	20.00	30
	Vadakkal	0	0.00	9	30.00	8	26.67	1	3.33	3	10.00	9	30.00	30
	Arattupuzha	4	13.33	2	6.67	13	43.33	2	6.67	5	16.67	4	13.33	30
	Pollethai	9	30.00	0	0.00	7	23.33	0	0.00	2	6.67	12	40.00	30
SUB-TOTAL		14	11.67	23	19.17	30	25.00	4	3.33	18	15.00	31	25.83	120
ERNAKULAM	Cheriyakadavu	2	6.67	0	0.00	5	16.67	11	36.67	1	3.33	11	36.67	30
	Chellanam	1	3.33	0	0.00	15	50.00	0	0.00	1	3.33	13	43.33	30
	Cherai	7	23.33	10	33.33	7	23.33	0	0.00	0	0.00	6	20.00	30
	Kannamli	4	13.33	0	0.00	9	30.00	6	20.00	1	3.33	10	33.33	30
SUB-TOTAL		14	11.67	10	8.33	36	30.00	17	14.17	3	2.50	40	33.33	120
THRISSUR	Vemballur	8	26.67	17	56.67	0	0.00	0	0.00	1	3.33	4	13.33	30
	Kaipamangalam	5	16.67	15	50.00	0	0.00	0	0.00	0	0.00	10	33.33	30
	Azhickode	0	0.00	14	46.67	4	13.33	0	0.00	0	0.00	12	40.00	30
SUB-TOTAL		13	14.44	46	51.11	4	4.44	0	0.00	1	1.11	26	28.89	90
MALAPPURAM	Kadalundinagar	7	23.33	6	20.00	8	26.67	2	6.67	0	0.00	7	23.33	30
	Parapanangadi	0	0.00	20	66.67	0	0.00	0	0.00	0	0.00	10	33.33	30
	Arayankadappuram	2	6.67	10	33.33	6	20.00	2	6.67	0	0.00	10	33.33	30
	Ariyalloor	5	16.67	5	16.67	6	20.00	5	16.67	5	16.67	4	13.33	30
SUB-TOTAL		14	11.67	41	34.17	20	16.67	9	7.50	5	4.17	31	25.83	120
KOZHIKKODE	Thopayil	1	3.33	11	36.67	7	23.33	0	0.00	0	0.00	11	36.67	30
	Puthiyangadi	3	10.00	5	16.67	7	23.33	7	23.33	0	0.00	8	26.67	30
	Puthiya kadavu	1	3.33	7	23.33	7	23.33	0	0.00	0	0.00	15	50.00	30
	Kampuram	2	6.67	6	20.00	12	40.00	0	0.00	2	6.67	8	26.67	30
	Puthiyappa	4	13.33	5	16.67	8	26.67	5	16.67	1	3.33	7	23.33	30
SUB-TOTAL		11	7.33	34	22.67	41	27.33	12	8.00	3	2.00	49	32.67	150
KANNUR	Palisseri	4	13.33	7	23.33	5	16.67	0	0.00	2	6.67	12	40.00	30
	Chalil Gopalpetta	4	13.33	12	40.00	6	20.00	0	0.00	1	3.33	7	23.33	30
SUB-TOTAL		8	13.33	19	31.67	11	18.33	0	0.00	3	5.00	19	31.67	60
KASARGODE	Kottikulam	3	10.00	10	33.33	2	6.67	0	0.00	7	23.33	8	26.67	30
	Hozdurg	2	6.67	8	26.67	4	13.33	0	0.00	4	13.33	12	40.00	30
SUB-TOTAL		5	8.33	18	30.00	6	10.00	0	0.00	11	18.33	20	33.33	60
GRAND-TOTAL		97	9.24	294	28.00	211	20.10	68	6.48	49	4.67	331	31.52	1050

Source : Primary Data

Appendix 25

Fishing Gears Used by the Respondents												
		Gears Used										
DISTRICT	VILLAGE	Hook & lines		Gill net		Purse Seine		Trawl		Not Applicable		TOTAL (Nos.)
		Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	2	6.67	16	53.33	0	0.00	0	0.00	12	40.00	30
	Poovar	1	3.33	21	70.00	0	0.00	0	0.00	8	26.67	30
	South Kollamkode	6	20.00	15	50.00	0	0.00	0	0.00	9	30.00	30
	Paruthiyoor	2	6.67	13	43.33	0	0.00	0	0.00	15	50.00	30
	Punthura	2	6.67	21	70.00	0	0.00	0	0.00	7	23.33	30
	Kovalam	1	3.33	19	63.33	0	0.00	0	0.00	10	33.33	30
SUB-TOTAL		14	7.78	105	58.33	0	0.00	0	0.00	61	33.89	180
KOLLAM	Sakthikulangara	0		0	0.00	4	13.33	14	46.67	12	40.00	30
	Cheriazheekal	0	0.00	2	6.67	14	46.67	8	26.67	6	20.00	30
	Marathoorkulangara	0	0.00	9	30.00	8	26.67	1	3.33	12	40.00	30
	Mayyanad	1	3.33	9	30.00	2	6.67	4	13.33	14	46.67	30
	Neendakara	0	0.00	5	16.67	6	20.00	9	30.00	10	33.33	30
SUB-TOTAL		1	0.67	25	16.67	34	22.67	36	24.00	54	36.00	150
ALAPPUZHA	Thaikal	5	16.67	19	63.33	0	0.00	0	0.00	6	20.00	30
	Vadakkal	4	13.33	15	50.00	2	6.67	0	0.00	9	30.00	30
	Arattupuzha	8	26.67	17	56.67	1	3.33	0	0.00	4	13.33	30
	Pollethai	7	23.33	11	36.67	0	0.00	0	0.00	12	40.00	30
SUB-TOTAL		24	20.00	62	51.67	3	2.50	0	0.00	31	25.83	120
ERNAKULAM	Cheriyakadavu	3	10.00	14	46.67	2	6.67	0	0.00	11	36.67	30
	Chellanam	1	3.33	0	0.00	9	30.00	7	23.33	13	43.33	30
	Cherai	2	6.67	22	73.33	0	0.00	0	0.00	6	20.00	30
	Kannamli	0	0.00	17	56.67	1	3.33	2	6.67	10	33.33	30
SUB-TOTAL		6	5.00	53	44.17	12	10.00	9	7.50	40	33.33	120
THRISSUR	Vemballur	6	20.00	20	66.67	0	0.00	0	0.00	4	13.33	30
	Kaipamangalam	3	10.00	17	56.67	0	0.00	0	0.00	10	33.33	30
	Azhickode	2	6.67	16	53.33	0	0.00	0	0.00	12	40.00	30
SUB-TOTAL		11	12.22	53	58.89	0	0.00	0	0.00	26.00	28.89	90
MALAPPURAM	Kadalundinagar	8	26.67	15	50.00	0	0.00	0	0.00	7	23.33	30
	Parapanangadi	3	10.00	8	26.67	3	10.00	6	20.00	10	33.33	30
	Arayankadappuram	0	0.00	17	56.67	2	6.67	1	3.33	10	33.33	30
	Ariyalloor	3	10.00	19	63.33	4	13.33	0	0.00	4	13.33	30
SUB-TOTAL		14	11.67	59	49.17	9	7.50	7	5.83	31	25.83	120
KOZHIKKODE	Thopayil	1	3.33	9	30.00	4	13.33	5	16.67	11	36.67	30
	Puthiyangadi	2	6.67	7	23.33	5	16.67	8	26.67	8	26.67	30
	Puthiya kadavu	0	0.00	6	20.00	8	26.67	1	3.33	15	50.00	30
	Kampuram	3	10.00	19	63.33	0	0.00	0	0.00	8	26.67	30
	Puthiyappa	2	6.67	12	40.00	6	20.00	3	10.00	7	23.33	30
SUB-TOTAL		8	5.33	53	35.33	23	15.33	17	11.33	49.00	32.67	150
KANNUR	Palisseri	4	13.33	14	46.67	0	0.00	0	0.00	12	40.00	30
	Chalil Gopalpetta	4	13.33	19	63.33	0	0.00	0	0.00	7	23.33	30
SUB-TOTAL		8	13.33	33	55.00	0	0.00	0	0.00	19	31.67	60
KASARGODE	Kottikulam	6	20.00	16	53.33	0	0.00	0	0.00	8	26.67	30
	Hozdurg	3	10.00	15		0	0.00	0	0.00	12	40.00	30
SUB-TOTAL		9	15.00	31	51.67	0	0.00	0	0.00	20	33.33	60
GRAND-TOTAL		95	9.05	474	45.14	81	7.71	69	6.57	331	31.52	1050
Source : Primary Data												

Appendix 26

Classification of Respondents Based on No. of Days going for Fishing in a Week

DISTRICT	VILLAGE	No of Workdays Per week																TOTAL (Nos.)
		1		2		3		4		5		6		7		Nil		
		Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	2	6.67	3	10.00	3	10.00	3	10.00	5	16.67	1	3.33	0	0.00	13	43.33	30
	Poovar	3	10.00	5	16.67	2	6.67	6	20.00	2	6.67	2	6.67	0	0.00	10	33.33	30
	South Kollamkode	0	0.00	6	20.00	4	13.33	7	23.33	3	10.00	1	3.33	0	0.00	9	30.00	30
	Paruthiyoor	2	6.67	0	0.00	2	6.67	4	13.33	1	3.33	4	13.33	0	0.00	17	56.67	30
	Punthura	0	0.00	3	10.00	6	20.00	8	26.67	2	6.67	3	10.00	0	0.00	8	26.67	30
	Kovalam	1	3.33	8	26.67	3	10.00	3	10.00	1	3.33	2	6.67	0	0.00	12	40.00	30
SUB-TOTAL		**8**	4.44	**25**	13.89	**20**	11.11	**31**	17.22	**14**	7.78	**13**	7.22	**0**	0.00	**69**	**38.33**	**180**
KOLLAM	Sakthikulangara	0	0.00	2	6.67	1	3.33	6	20.00	8	26.67	1	3.33	0	0.00	12	40.00	30
	Cheriazheekal	1	3.33	5	16.67	7	23.33	2	6.67	4	13.33	2	6.67	0	0.00	9	30.00	30
	Marathoorkulangara	1	3.33	0	0.00	6	20.00	5	16.67	2	6.67	4	13.33	0	0.00	12	40.00	30
	Mayyanad	1	3.33	2	6.67	5	16.67	5	16.67	0	0.00	3	10.00	0	0.00	14	46.67	30
	Neendakara	0	0.00	5	16.67	3	10.00	8	26.67	3	10.00	1	3.33	0	0.00	10	33.33	30
SUB-TOTAL		**3**	2.00	**14**	9.33	**22**	14.67	**26**	17.33	**17**	11.33	**11**	7.33	**0**	0.00	**57**	**38.00**	**150**
ALAPPUZHA	Thaikal	1	3.33	5	16.67	7	23.33	3	10.00	3	10.00	2	6.67	0	0.00	9	30.00	30
	Vadakkal	0	0.00	2	6.67	3	10.00	4	13.33	4	13.33	5	16.67	0	0.00	12	40.00	30
	Arattupuzha	0	0.00	2	6.67	5	16.67	9	30.00	5	16.67	2	6.67	0	0.00	7	23.33	30
	Pollethai	2	6.67	6	20.00	1	3.33	3	10.00	2	6.67	0	0.00	0	0.00	16	53.33	30
SUB-TOTAL		**3**	2.50	**15**	12.50	**16**	13.33	**19**	15.83	**14**	11.67	**9**	7.50	**0**	0.00	**44**	**36.67**	**120**
ERNAKULAM	Cheriyakadavu	0	0.00	3	10.00	6	20.00	8	26.67	2	6.67	0	0.00	0	0.00	11	36.67	30
	Chellanam	0	0.00	2	6.67	6	20.00	4	13.33	2	6.67	1	3.33	0	0.00	15	50.00	30
	Cherai	1	3.33	2	6.67	6	20.00	5	16.67	5	16.67	4	13.33	0	0.00	7	23.33	30
	Kannamali	0	0.00	4	13.33	2	6.67	6	20.00	5	16.67	3	10.00	0	0.00	10	33.33	30
SUB-TOTAL		**1**	0.83	**11**	9.17	**20**	16.67	**23**	19.17	**14**	11.67	**8**	6.67	**0**	0.00	**43**	**35.83**	**120**
THRISSUR	Vemballur	1	3.33	2	6.67	8	26.67	9	30.00	3	10.00	0	0.00	0	0.00	7	23.33	30
	Kaipamangalam	0	0.00	4	13.33	5	16.67	3	10.00	2	6.67	2	6.67	0	0.00	14	46.67	30
	Azhickode	0	0.00	4	13.33	6	20.00	3	10.00	2	6.67	1	3.33	0	0.00	14	46.67	30
SUB-TOTAL		**1**	1.11	**10**	11.11	**19**	21.11	**15**	16.67	**7**	7.78	**3**	3.33	**0**	0.00	**35**	**38.89**	**90**
MALAPPURAM	Kadalundinagar	0	0.00	6	20.00	5	16.67	2	6.67	1	3.33	7	23.33	0	0.00	9	30.00	30
	Parapanangadi	0	0.00	3	10.00	2	6.67	2	6.67	5	16.67	8	26.67	0	0.00	10	33.33	30
	Arayankadappuram	0	0.00	4	13.33	2	6.67	5	16.67	7	23.33	2	6.67	0	0.00	10	33.33	30
	Ariyalloor	0	0.00	8	26.67	5	16.67	2	6.67	1	3.33	5	16.67	0	0.00	9	30.00	30
SUB-TOTAL		**0**	0.00	**21**	17.50	**14**	11.67	**11**	9.17	**14**	11.67	**22**	18.33	**0**	0.00	**38**	**31.67**	**120**
KOZHIKKODE	Thopayil	0	0.00	8	26.67	2	6.67	2	6.67	2	6.67	5	16.67	0	0.00	11	36.67	30
	Puthiyangadi	0	0.00	7	23.33	6	20.00	5	16.67	2	6.67	2	6.67	0	0.00	8	26.67	30
	Puthiya kadavu	0	0.00	5	16.67	1	3.33	1	3.33	4	13.33	4	13.33	0	0.00	15	50.00	30
	Kampuram	0	0.00	8	26.67	5	16.67	0	0.00	2	6.67	7	23.33	0	0.00	8	26.67	30
	Puthiyappa	0	0.00	6	20.00	5	16.67	1	3.33	2	6.67	6	20.00	0	0.00	10	33.33	30
SUB-TOTAL		**0**	0.00	**34**	22.67	**19**	12.67	**9**	6.00	**12**	8.00	**24**	16.00	**0**	0.00	**52**	**34.67**	**150**
KANNUR	Palisseri	0	0.00	6	20.00	5	16.67	1	3.33	1	3.33	3	10.00	0	0.00	14	46.67	30
	Chalil Gopalpetta	0	0.00	8	26.67	5	16.67	4	13.33	1	3.33	5	16.67	0	0.00	7	23.33	30
SUB-TOTAL		**0**	0.00	**14**	23.33	**10**	16.67	**5**	8.33	**2**	3.33	**8**	13.33	0	0.00	**21**	**35.00**	**60**
KASARGODE	Kottikulam	0	0.00	6	20.00	8	26.67	3	10.00	2	6.67	3	10.00	0	0.00	8	26.67	30
	Hozdurg	0	0.00	3	10.00	2	6.67	4	13.33	5	16.67	4	13.33	0	0.00	12	40.00	30
SUB-TOTAL		**0**	0.00	**8**	13.33	**6**	10.00	**9**	15.00	**9**	15.00	**7**	11.67	0	0.00	**21**	**35.00**	**60**
GRAND-TOTAL		**16**	1.52	**152**	14.48	**146**	13.90	**148**	14.10	**103**	9.81	**105**	10.00	0	0.00	**380**	**36.19**	**1050**

Source : Primary Data

Appendix 27

Fishing Experience of the Respondents										
Period of Experience in Fishing (Years)										
DISTRICT	VILLAGE	Up to 10		10 to 20		20 & Above		Not Applicable		TOTAL (Nos.)
		Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	6	20.00	9	30.00	6	20.00	9	30.00	30
	Poovar	4	13.33	15	50.00	3	10.00	8	26.67	30
	South Kollamkode	8	26.67	5	16.67	10	33.33	7	23.33	30
	Paruthiyoor	4	13.33	8	26.67	9	30.00	9	30.00	30
	Punthura	6	20.00	12	40.00	5	16.67	7	23.33	30
	Kovalam	5	16.67	15	50.00	0	0.00	10	33.33	30
SUB-TOTAL		33	18.33	64	35.56	33	18.33	50	27.78	180
KOLLAM	Sakthikulangara	0	0.00	8	26.67	16	53.33	6	20.00	30
	Cheriazheekal	2	6.67	10	33.33	12	40.00	6	20.00	30
	Marathoorkulangara	3	10.00	7	23.33	11	36.67	9	30.00	30
	Mayyanad	1	3.33	5	16.67	13	43.33	11	36.67	30
	Neendakara	3	10.00	13	43.33	9	30.00	5	16.67	30
SUB-TOTAL		9	6.00	43	28.67	61	40.67	37	24.67	150
ALAPPUZHA	Thaikal	1	3.33	9	30.00	14	46.67	6	20.00	30
	Vadakkal	1	3.33	5	16.67	19	63.33	5	16.67	30
	Arattupuzha	0	0.00	9	30.00	17	56.67	4	13.33	30
	Pollethai	2	6.67	11	36.67	10	33.33	7	23.33	30
SUB-TOTAL		4	3.33	34	28.33	60	50.00	22	18.33	120
ERNAKULAM	Cheriyakadavu	1	3.33	8	26.67	12	40.00	9	30.00	30
	Chellanam	6	20.00	11	36.67	6	20.00	7	23.33	30
	Cherai	3	10.00	9	30.00	12	40.00	6	20.00	30
	Kannamli	4	13.33	5	16.67	11	36.67	10	33.33	30
SUB-TOTAL		14	11.67	33	27.50	41	34.17	32	26.67	120
THRISSUR	Vemballur	2	6.67	5	16.67	19	63.33	4	13.33	30
	Kaipamangalam	3	10.00	6	20.00	11	36.67	10	33.33	30
	Azhickode	1	3.33	12	40.00	9	30.00	8	26.67	30
SUB-TOTAL		6	6.67	23	25.56	39	43.33	22	24.44	90
MALAPPURAM	Kadalundinagar	6	20.00	7	23.33	10	33.33	7	23.33	30
	Parapanangadi	6	20.00	3	10.00	11	36.67	10	33.33	30
	Arayankadappuram	5	16.67	4	13.33	13	43.33	8	26.67	30
	Ariyalloor	2	6.67	7	23.33	17	56.67	4	13.33	30
SUB-TOTAL		19	15.83	21	17.50	51	42.50	29	24.17	120
KOZHIKKODE	Thopayil	2	6.67	5	16.67	16	53.33	7	23.33	30
	Puthiyangadi	0	0.00	8	26.67	14	46.67	8	26.67	30
	Puthiya kadavu	2	6.67	4	13.33	13	43.33	11	36.67	30
	Kampuram	0	0.00	6	20.00	16	53.33	8	26.67	30
	Puthiyappa	0	0.00	2	6.67	21	70.00	7	23.33	30
SUB-TOTAL		4	2.67	25	16.67	80	53.33	41	27.33	150
KANNUR	Palisseri	2	6.67	2	6.67	16	53.33	10	33.33	30
	Chalil Gopalpetta	1	3.33	3	10.00	19	63.33	7	23.33	30
SUB-TOTAL		3	5.00	5	8.33	35	58.33	17	28.33	60
KASARGODE	Kottikulam	0	0.00	2	6.67	20	66.67	8	26.67	30
	Hozdurg	4	13.33	4	13.33	13	43.33	9	30.00	30
SUB-TOTAL		4	6.67	6	10.00	33	55.00	17	28.33	60
GRAND-TOTAL		96	9.14	254	24.19	433	41.24	267	25.43	1050
Source : Primary Data										

Appendix 28

Fish Finding Device used by the Respondents

Fish Finding Device								
DISTRICT	VILLAGE	GPS		Echo Sounder		Not used		TOTAL(Nos.)
		Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	5.00	16.67	0.00	0.00	25.00	83.33	30.00
	Poovar	9.00	30.00	0.00	0.00	21.00	70.00	30.00
	South Kollamkode	17.00	56.67	3.00	10.00	10.00	33.33	30.00
	Paruthiyoor	15.00	50.00	0.00	0.00	15.00	50.00	30.00
	Punthura	12.00	40.00	0.00	0.00	18.00	60.00	30.00
	Kovalam	10.00	33.33	0.00	0.00	20.00	66.67	30.00
SUB-TOTAL		**68.00**	**37.78**	**3.00**	**1.67**	**109.00**	**60.56**	**180.00**
KOLLAM	Sakthikulangara	10.00	33.33	13.00	43.33	7.00	23.33	30.00
	Cheriazheekal	9.00	30.00	8.00	26.67	13.00	43.33	30.00
	Marathoorkulangara	8.00	26.67	0.00	0.00	22.00	73.33	30.00
	Mayyanad	12.00	40.00	0.00	0.00	18.00	60.00	30.00
	Neendakara	14.00	46.67	5.00	16.67	11.00	36.67	30.00
SUB-TOTAL		**53.00**	**35.33**	**26.00**	**17.33**	**71.00**	**47.33**	**150.00**
ALAPPUZHA	Thaikal	9.00	30.00	2.00	6.67	19.00	63.33	30.00
	Vadakkal	11.00	36.67	1.00	3.33	18.00	60.00	30.00
	Arattupuzha	9.00	30.00	0.00	0.00	21.00	70.00	30.00
	Pollethai	8.00	26.67	0.00	0.00	22.00	73.33	30.00
SUB-TOTAL		**37.00**	**30.83**	**3.00**	**2.50**	**80.00**	**66.67**	**120.00**
ERNAKULAM	Cheriyakadavu	13.00	43.33	5.00	16.67	12.00	40.00	30.00
	Chellanam	6.00	20.00	0.00	0.00	24.00	80.00	30.00
	Cherai	12.00	40.00	0.00	0.00	18.00	60.00	30.00
	Kannamli	15.00	50.00	5.00	16.67	10.00	33.33	30.00
SUB-TOTAL		**46.00**	**38.33**	**10.00**	**8.33**	**64.00**	**53.33**	**120.00**
THRISSUR	Vemballur	6.00	20.00	0.00	0.00	24.00	80.00	30.00
	Kaipamangalam	7.00	23.33	0.00	0.00	23.00	76.67	30.00
	Azhickode	12.00	40.00	0.00	0.00	18.00	60.00	30.00
SUB-TOTAL		**25.00**	**27.78**	**0.00**	**0.00**	**65.00**	**72.22**	**90.00**
MALAPPURAM	Kadalundinagar	12.00	40.00	2.00	6.67	16.00	53.33	30.00
	Parapanangadi	7.00	23.33	0.00	0.00	23.00	76.67	30.00
	Arayankadappuram	4.00	13.33	0.00	0.00	26.00	86.67	30.00
	Ariyalloor	8.00	26.67	2.00	6.67	20.00	66.67	30.00
SUB-TOTAL		**31.00**	**25.83**	**4.00**	**3.33**	**85.00**	**70.83**	**120.00**
KOZHIKKODE	Thopayil	7.00	23.33	0.00	0.00	23.00	76.67	30.00
	Puthiyangadi	14.00	46.67	2.00	6.67	14.00	46.67	30.00
	Puthiya kadavu	7.00	23.33	0.00	0.00	23.00	76.67	30.00
	Kampuram	6.00	20.00	0.00	0.00	24.00	80.00	30.00
	Puthiyappa	12.00	40.00	2.00	6.67	16.00	53.33	30.00
SUB-TOTAL		**46.00**	**30.67**	**4.00**	**2.67**	**100.00**	**66.67**	**150.00**
KANNUR	Palisseri	6.00	20.00	0.00	0.00	24.00	80.00	30.00
	Chalil Gopalpetta	8.00	26.67	0.00	0.00	22.00	73.33	30.00
SUB-TOTAL		**5.00**	**8.33**	**11.00**	**18.33**	**44.00**	**73.33**	**60.00**
KASARGODE	Kottikulam	5.00	16.67	0.00	0.00	25.00	83.33	30.00
	Hozdurg	7.00	23.33	0.00	0.00	23.00	76.67	30.00
SUB-TOTAL		**12.00**	20.00	**0.00**	0.00	**48.00**	80.00	60.00
GRAND-TOTAL		**323.00**	**30.76**	**61.00**	**5.81**	**666.00**	**63.43**	**1050.00**

Source : Primary Data

Appendix 29

Communication Devices used by the Respondents

Communication Devices						
DISTRICT	VILLAGE	Mobile Phone		Others		TOTAL (Nos.)
		Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	30	100.00	0	0.00	30
	Poovar	26	86.67	4	13.33	30
	South Kollamkode	27	90.00	3	10.00	30
	Paruthiyoor	28	93.33	2	6.67	30
	Punthura	26	86.67	4	13.33	30
	Kovalam	30	100.00	0	0.00	30
SUB-TOTAL		**167**	**92.78**	**13**	**7.22**	**180**
KOLLAM	Sakthikulangara	30	100.00	0	0.00	30
	Cheriazheekal	28	93.33	2	6.67	30
	Marathoorkulangara	27	90.00	3	10.00	30
	Mayyanad	29	96.67	1	3.33	30
	Neendakara	27	86.67	3	10.00	30
SUB-TOTAL		**141**	**94.00**	**9**	**6.00**	**150**
ALAPPUZHA	Thaikal	30	100.00	0	0.00	30
	Vadakkal	26	86.67	4	13.33	30
	Arattupuzha	27	90.00	3	10.00	30
	Pollethai	24	80.00	6	20.00	30
SUB-TOTAL		**107**	**89.17**	**13**	**10.83**	**120**
ERNAKULAM	Cheriyakadavu	30	100.00	0	0.00	30
	Chellanam	26	86.67	4	13.33	30
	Cherai	29	96.67	1	3.33	30
	Kannamli	26	86.67	4	13.33	30
SUB-TOTAL		**111**	**92.50**	**9**	7.50	**120**
THRISSUR	Vemballur	29	96.67	1	3.33	30
	Kaipamangalam	24	80.00	6	20.00	30
	Azhickode	27	90.00	3	10.00	30
SUB-TOTAL		**80**	**88.89**	**10**	**11.11**	**90**
MALAPPURAM	Kadalundinagar	30	100.00	0	0.00	30
	Parapanangadi	26	86.67	4	13.33	30
	Arayankadappuram	27	90.00	3	10.00	30
	Ariyalloor	30	100.00	0	0.00	30
SUB-TOTAL		**113**	**94.17**	**7**	5.83	120
KOZHIKKODE	Thopayil	25	83.33	5	16.67	30
	Puthiyangadi	27	90.00	3	10.00	30
	Puthiya kadavu	23	76.67	7	23.33	30
	Kampuram	29	96.67	1	3.33	30
	Puthiyappa	30	100.00	0	0.00	30
SUB-TOTAL		**134**	**89.33**	**16**	10.67	150
KANNUR	Palisseri	28	93.33	2	6.67	30
	Chalil Gopalpetta	29	96.67	1	3.33	30
SUB-TOTAL		**57**	**95.00**	**3**	5.00	60
KASARGODE	Kottikulam	26	86.67	4	13.33	30
	Hozdurg	27	90.00	3	10.00	30
SUB-TOTAL		**53**	**88.33**	**7**	11.67	60
GRAND-TOTAL		**963**	**91.71**	**87**	**8.29**	1050

Source : Primary Data

Appendix 30

Purpose of Field Communication used by the Respondents

DISTRICT	VILLAGE	Purpose										
		Shoals		Market		Climate		Personal		Not Applicable		
		Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos	%	Total (Nos.)
TRIVANDRUM	Shankumugham	10	33.33	6	20.00	1	3.33	13	43.33	0	0.00	30
	Poovar	14	46.67	6	20.00	0	0.00	6	20.00	4	13.33	30
	South Kollamkode	9	30.00	11	36.67	1	3.33	6	20.00	3	10.00	30
	Paruthiyoor	7	23.33	12	40.00	1	3.33	8	26.67	2	6.67	30
	Punthura	10	33.33	13	43.33	1	3.33	2	6.67	4	13.33	30
	Kovalam	8	26.67	15	50.00	2	6.67	5	16.67	0	0.00	30
SUB-TOTAL		**58**	**32.22**	**63**	**35.00**	**6**	**3.33**	**40**	**22.22**	**13**	**7.22**	**180**
KOLLAM	Sakthikulangara	12	40.00	11	36.67	1	3.33	6	20.00	0	0.00	30
	Cheriazheekal	9	30.00	14	46.67	3	10.00	2	6.67	2	6.67	30
	Marathoorkulangara	10	33.33	11	36.67	2	6.67	4	13.33	3	10.00	30
	Mayyanad	6	20.00	15	50.00	1	3.33	7	23.33	1	3.33	30
	Neendakara	9	30.00	13	43.33	0	0.00	5	16.67	3	10.00	30
SUB-TOTAL		**46**	**30.67**	**64**	**42.67**	**7**	**4.67**	**24**	**16.00**	**9**	**6.00**	**150**
ALAPPUZHA	**Thaikal**	8	26.67	16	53.33	1	3.33	5	16.67	0	0.00	30
	Vadakkal	5	16.67	12	40.00	1	3.33	8	26.67	4	13.33	30
	Arattupuzha	9	30.00	14	46.67	2	6.67	2	6.67	3	10.00	30
	Pollethai	11	36.67	9	30.00	1	3.33	3	10.00	6	20.00	30
SUB-TOTAL		**33**	**27.50**	**51**	**42.50**	**5**	**4.17**	**18**	**15.00**	**13**	**10.83**	**120**
ERNAKULAM	**Cheriyakadavu**	6	20.00	17	56.67	0	0.00	7	23.33	0	0.00	30
	Chellanam	8	26.67	7	23.33	1	3.33	10	33.33	4	13.33	30
	Cherai	5	16.67	14	46.67	4	13.33	6	20.00	1	3.33	30
	Kannamli	11	36.67	13	43.33	1	3.33	1	3.33	4	13.33	30
SUB-TOTAL		**30**	**25.00**	**51**	**42.50**	**6**	**5.00**	**24**	**20.00**	**9**	**7.50**	**120**
TRISSUR	**Vemballur**	11	36.67	13	43.33	1	3.33	4	13.33	1	3.33	30
	Kaipamangalam	8	26.67	10	33.33	0	0.00	6	20.00	6	20.00	30
	Azhickode	6	20.00	11	36.67	1	3.33	9	30.00	3	10.00	30
SUB-TOTAL		**25**	**27.78**	**34**	**37.78**	**2**	**2.22**	**19**	**21.11**	**10**	**11.11**	**90**
MALAPPURAM	**Kadalundinagar**	4	13.33	16	53.33	1	3.33	9	30.00	0	0.00	30
	Parapanangadi	8	26.67	9	30.00	0	0.00	9	30.00	4	13.33	30
	Arayankadappuran	9	30.00	8	26.67	2	6.67	8	26.67	3	10.00	30
	Ariyalloor	3	10.00	14	46.67	1	3.33	12	40.00	0	0.00	30
SUB-TOTAL		**24**	**20.00**	**47**	**39.17**	**4**	**3.33**	**38**	**31.67**	**7**	**5.83**	**120**
KOZHICKODE	**Thopayil**	7	23.33	9	30.00	1	3.33	8	26.67	5	16.67	30
	Puthiyangadi	9	30.00	9	30.00	1	3.33	8	26.67	3	10.00	30
	Puthiya kadavu	8	26.67	7	23.33	2	6.67	6	20.00	7	23.33	30
	Kampuram	10	33.33	12	40.00	0	0.00	7	23.33	1	3.33	30
	Puthiyappa	6	20.00	11	36.67	1	3.33	12	40.00	0	0.00	30
SUB-TOTAL		**40**	**26.67**	**48**	**32.00**	**5**	**3.33**	**41**	**27.33**	**16**	**10.67**	**150**
KANNUR	**Palisseri**	4	13.33	10	33.33	1	3.33	13	43.33	2	6.67	30
	Chalil Gopalpetta	2	6.67	13	43.33	0	0.00	14	46.67	1	3.33	30
SUB-TOTAL		**6**	**10.00**	**23**	**38.33**	**1**	**1.67**	**27**	**45.00**	**3**	**5.00**	**60**
KASARGODE	**Kottikulam**	2	6.67	16	53.33	2	6.67	6	20.00	4	13.33	30
	Hozdurg	1	3.33	16	53.33	1	3.33	9	30.00	3	10.00	30
SUB-TOTAL		**3**	**5.00**	**32**	**53.33**	**3**	**5.00**	**15**	**25.00**	**7**	**11.67**	**60**
GRAND-TOTAL		**265**	**25.24**	**413**	**39.33**	**39**	**3.71**	**246**	**23.43**	**87**	**8.29**	**1050**

Source : Primary Data

Appendix 31

Marketing Methodes Used by the Respondents

DISTRICT	VILLAGE	Marketing Methods								TOTAL (Nos.)
		Direct		Intermediaries		Co-operatives		Not Applicable		
		Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	5	16.67	13	43.33	0	0.00	12	40.00	30
	Poovar	3	10.00	17	56.67	2	6.67	8	26.67	30
	South Kollamkode	4	13.33	15	50.00	2	6.67	9	30.00	30
	Paruthiyoor	3	10.00	12	40.00	0	0.00	15	50.00	30
	Punthura	0	0.00	23	76.67	0	0.00	7	23.33	30
	Kovalam	3	10.00	17	56.67	0	0.00	10	33.33	30
SUB-TOTAL		**18**	**10.00**	**97**	**53.89**	**4**	**2.22**	**61**	**33.89**	**180**
KOLLAM	Sakthikulangara	0	0.00	16	53.33	2	6.67	12	40.00	30
	Cheriazheekal	10	33.33	14	46.67	0	0.00	6	20.00	30
	Marathoorkulangara	3	10.00	15	50.00	0	0.00	12	40.00	30
	Mayyanad	2	6.67	14	46.67	0	0.00	14	46.67	30
	Neendakara	0	0.00	14	46.67	6	20.00	10	33.33	30
SUB-TOTAL		**15**	**10.00**	**73**	**48.67**	**8**	**5.33**	**54**	**36.00**	**150**
ALAPPUZHA	Thaikal	4	13.33	20	66.67	0	0.00	6	20.00	30
	Vadakkal	6	20.00	11	36.67	4	13.33	9	30.00	30
	Arattupuzha	2	6.67	24	80.00	0	0.00	4	13.33	30
	Pollethai	11	36.67	7	23.33	0	0.00	12	40.00	30
SUB-TOTAL		**23**	**19.17**	**62**	**51.67**	**4**	**3.33**	**31**	**25.83**	**120**
ERNAKULAM	Cheriyakadavu	2	6.67	17	56.67	0	0.00	11	36.67	30
	Chellanam	3	10.00	14	46.67	0	0.00	13	43.33	30
	Cherai	1	3.33	23	76.67	0	0.00	6	20.00	30
	Kannamli	4	13.33	16	53.33	0	0.00	10	33.33	30
SUB-TOTAL		**10**	**8.33**	**70**	**58.33**	**0**	**0.00**	**40**	**33.33**	**120**
THRISSUR	Vemballur	5	16.67	14	46.67	7	23.33	4	13.33	30
	Kaipamangalam	3	10.00	17	56.67	0	0.00	10	33.33	30
	Azhickode	2	6.67	16	53.33	0	0.00	12	40.00	30
SUB-TOTAL		**10**	**11.11**	**47**	**52.22**	**7**	**7.78**	**26**	**28.89**	**90**
MALAPPURAM	Kadalundinagar	9	30.00	14	46.67	0	0.00	7	23.33	30
	Parapanangadi	8	26.67	12	40.00	0	0.00	10	33.33	30
	Arayankadappuram	3	10.00	17	56.67	0	0.00	10	33.33	30
	Ariyalloor	0	0.00	26	86.67	0	0.00	4	13.33	30
SUB-TOTAL		**20**	**16.67**	**69**	**57.50**	**0**	**0.00**	**31**	**25.83**	**120**
KOZHIKKODE	Thopayil	4	13.33	15	50.00	0	0.00	11	36.67	30
	Puthiyangadi	3	10.00	15	50.00	4	13.33	8	26.67	30
	Puthiya kadavu	3	10.00	11	36.67	1	3.33	15	50.00	30
	Kampuram	8	26.67	14	46.67	0	0.00	8	26.67	30
	Puthiyappa	7	23.33	11	36.67	5	16.67	7	23.33	30
SUB-TOTAL		**25**	**16.67**	**66**	**44.00**	**10**	**6.67**	**49**	**32.67**	**150**
KANNUR	Palisseri	7	23.33	8	26.67	3	0.00	12	40.00	30
	Chalil Gopalpetta	0	0.00	23	76.67	0	0.00	7	23.33	30
SUB-TOTAL		**7**	**11.67**	**31**	**51.67**	**3**	**5.00**	**19**	**31.67**	**60**
KASARGODE	Kottikulam	6	20.00	16	53.33	0	0.00	8	26.67	30
	Hozdurg	6	20.00	12	40.00	0	0.00	12	40.00	30
SUB-TOTAL		**12**	20.00	**28**	46.67	**0**	0.00	**20**	33.33	60
GRAND-TOTAL		**140**	**13.33**	**543**	**51.71**	**36**	**3.43**	**331**	**31.52**	**1050**

Source : Primary Data

Appendix 32

Average Quantity of Fish Caught per Month						
Average Quantity of Fish caught per respondent per month						
DISTRICT	VILLAGE	Quantity per month	Annual	Pre-Monsoon	Monsoon	Post Monsoon
		KGs.	KGs.	KGs.	KGs.	KGs.
TRIVANDRUM	Shankumugham	5316.00	177.20	28.8	82.1	66.3
	Poovar	5838.00	194.60	38.2	87.4	69
	South Kollamkode	6052.80	201.76	23.1	95.76	82.9
	Paruthiyoor	6060.00	202.00	29	90.1	82.9
	Punthura	6444.00	214.80	40	97.68	77.12
	Kovalam	2754.00	91.80	18	42	31.8
District Average		**5410.80**	**180.36**	**29.52**	**82.51**	**68.34**
KOLLAM	Sakthikulangara	12385.50	412.85	64.4	185.65	162.8
	Cheriazheekal	8278.50	275.95	41.1	132.55	102.3
	Marathoorkulangara	7983.60	266.12	34.5	122.12	109.5
	Mayyanad	8199.90	273.33	54.81	112.65	105.87
	Neendakara	11478.00	382.60	77.5	162.8	142.3
District Average		**9665.10**	**322.17**	**54.46**	**143.15**	**124.55**
ALAPPUZHA	Thaikal	5711.70	190.39	28.59	89.7	72.1
	Vadakkal	7352.40	245.08	39.58	113.4	92.1
	Arattupuzha	6940.20	231.34	31	98.5	101.84
	Pollethai	5700.00	190.00	21	94.2	74.8
District Average		**6426.08**	**214.20**	**30.04**	**98.95**	**85.21**
ERNAKULAM	Cheriyakadavu	5889.00	196.30	28.5	92.7	75.1
	Chellanam	8744.70	291.49	44.95	142.54	104
	Cherai	7106.40	236.88	32.76	112.8	91.32
	Kannamli	6540.00	220.12	25.44	105.56	89.12
District Average		7085.93	236.20	**32.91**	**113.4**	**89.89**
THRISSUR	Vemballur	6593.10	219.77	29.77	101	89
	Kaipamangalam	8748.90	291.63	41.25	133.12	117.26
	Azhickode	5012.40	167.08	22.78	83.3	61
District Average		**6784.80**	**226.16**	**31.27**	**105.81**	**89.09**
MALAPPURAM	Kadalundinagar	5106.00	170.20	29	73.2	68
	Parapanangadi	6790.50	226.35	32	101.45	92.9
	Arayankadappuram	7350.00	245.00	39.1	114.2	91.7
	Ariyalloor	6320.00	217.23	29.02	95.56	92.65
District Average		**6440.85**	**214.70**	**32.28**	**96.10**	**86.31**
KOZHIKKODE	Thopayil	7467.00	248.90	29.8	118.3	100.8
	Puthiyangadi	8942.10	298.07	43	132.75	122.32
	Puthiya kadavu	9827.10	327.57	48.36	145.21	134
	Kampuram	3770.10	125.67	26.7	53.97	45
	Puthiyappa	11683.80	389.46	49.69	186.56	153.21
District Average		**8338.02**	**277.93**	**39.51**	**127.36**	**111.07**
KANNUR	Palisseri	4995.90	166.53	24.93	80.5	61.1
	Chalil Gopalpetta	4605.00	153.50	26.6	67.9	59
District Average		**4800.45**	**160.02**	**25.765**	**74.2**	**60.05**
KASARGODE	Kottikulam	5450.40	181.68	30.55	79.23	71.9
	Hozdurg	4323.00	144.10	28.9	62.8	52.4
District Average		**4886.70**	**162.89**	**29.725**	**71.015**	**62.15**
State Average		**6105.78**	**221.62**	**33.94**	**101.39**	**86.29**

Source : Primary Data

Appendix 33

Variety of Fishes Caught by the Respondents

DISTRICT	VILLAGE	Variety of fishes caught																		TOTAL (Nos.)
		Mackeral		Nemiptorus		Pomfret		Ribbon fish		Sardine		Seer Fish		Shrimp		Squid		Tuna		
		Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	30	100.00	12	40.00	6	20.00	5	16.67	30	100.00	9	30.00	15	50.00	8	26.67	8	26.67	30.00
	Poovar	12	40.00	0	0.00	0	0.00	0	0.00	15	50.00	0	0.00	0	0.00	8	26.67	1	3.33	30.00
	South Kollamkode	3	10.00	0	0.00	1	3.33	0	0.00	10	33.33	3	10.00	7	23.33	7	23.33	5	16.67	30.00
	Paruthiyoor	2	6.67	0	0.00	0	0.00	3	10.00	3	10.00	0	0.00	10	33.33	11	36.67	9	30.00	30.00
	Punthura	12	40.00	1	3.33	0	0.00	4	13.33	4	13.33	4	13.33	2	6.67	6	20.00	2	6.67	30.00
	Kovalam	15	50.00	0	0.00	0	0.00	0	0.00	12	40.00	0	0.00	0	0.00	3	10.00	0	0.00	30.00
SUB-TOTAL		**74**	**41.11**	**13**	**7.22**	**7**	**3.89**	**12**	**6.67**	**74**	**41.11**	**16**	8.89	**34**	18.89	**43**	23.89	**17**	9.44	**180.00**
KOLLAM	Sakthikulangara	6	20.00	5	16.67	1	3.33	1	3.33	22	73.33	1	3.33	10	33.33	12	40.00	0	0.00	30.00
	Cheriazheekal	28	93.33	20	66.67	1	3.33	21	70.00	27	90.00	0	0.00	22	73.33	0	0.00	0	0.00	30.00
	Marathoorkulangara	27	90.00	18	60.00	0	0.00	17	56.67	27	90.00	3	10.00	7	23.33	1	3.33	0	0.00	30.00
	Mayyanad	8	26.67	3	10.00	2	6.67	3	10.00	26	86.67	0	0.00	5	16.67	4	13.33	0	0.00	30.00
	Neendakara	12	40.00	8	26.67	4	13.33	5	16.67	28	93.33	5	16.67	8	26.67	14	46.67	6	20.00	30.00
SUB-TOTAL		**81**	**54.00**	**54**	**36.00**	**8**	**5.33**	**47**	**31.33**	**130**	**86.67**	**9**	6.00	**52**	34.67	**31**	20.67	**6**	4.00	**150.00**
ALAPPUZHA	Thaikal	23	76.67	0	0.00	0	0.00	0	0.00	20	66.67	1	3.33	12	40.00	2	6.67	0	0.00	30.00
	Vadakkal	30	100.00	2	6.67	7	23.33	6	0.00	21	70.00	0	0.00	27	90.00	6	20.00	1	3.33	30.00
	Arattupuzha	31	103.33	8	26.67	1	3.33	7	23.33	28	93.33	8	26.67	19	63.33	7	23.33	6	20.00	30.00
	Pollethai	0	0.00	0	0.00	0	0.00	1	3.33	21	70.00	2	6.67	7	23.33	1	3.33	9	30.00	30.00
SUB-TOTAL		**84**	**70.00**	**10**	**8.33**	**8**	**6.67**	**14**	**11.67**	**90**	**75.00**	**11**	9.17	**65**	54.17	**16**	13.33	**16**	13.33	**120.00**
ERNAKULAM	Cheriyakadavu	26	86.67	3	10.00	4	13.33	0	0.00	30	100.00	3	10.00	4	13.33	1	3.33	6	20.00	30.00
	Chellanam	30	100.00	5	16.67	2	6.67	0	0.00	30	100.00	7	23.33	12	40.00	5	16.67	9	30.00	30.00
	Cherai	19	63.33	0	0.00	1	3.33	0	0.00	24	80.00	9	30.00	8	26.67	1	3.33	10	33.33	30.00
	Kannamali	13	43.33	0	0.00	0	0.00	14	46.67	18	60.00	1	3.33	9	30.00	8	26.67	5	16.67	30.00
SUB-TOTAL		**88**	**73.33**	**8**	**6.67**	**7**	**5.83**	**14**	**11.67**	**102**	**85.00**	**20**	16.67	**33**	27.50	**15**	12.50	**30**	25.00	**120.00**
THRISSUR	Vemballur	24	80.00	5	16.67	12	40.00	0	0.00	30	100.00	0	0.00	17	56.67	7	23.33	8	26.67	30.00
	Kaipamangalam	30	100.00	2	6.67	4	13.33	2	0.00	29	96.67	2	6.67	6	20.00	2	6.67	0	0.00	30.00
	Azhickode	11	36.67	0	0.00	0	0.00	0	0.00	29	96.67	4	13.33	4	13.33	0	0.00	0	0.00	30.00
SUB-TOTAL		**65**	**72.22**	**7**	**7.78**	**16**	**17.78**	**2**	**0.00**	**88**	**97.78**	**6**	6.67	**27**	30.00	**9**	10.00	**8**	8.89	**90.00**
MALAPPURAM	Kadalundinagar	27	90.00	5	16.67	0	0.00	0	0.00	30	100.00	3	10.00	7	23.33	1	3.33	0	0.00	30.00
	Parapanangadi	30	100.00	3	10.00	7	23.33	0	0.00	30	100.00	0	0.00	30	100.00	0	0.00	5	16.67	30.00
	Arayankadappuram	16	53.33	1	3.33	3	10.00	4	13.33	28	93.33	2	6.67	2	6.67	0	0.00	7	23.33	30.00
	Ariyalloor	12	40.00	3	10.00	8	26.67	0	0.00	17	56.67	0	0.00	7	23.33	1	3.33	9	30.00	30.00
SUB-TOTAL		**85**	**70.83**	**12**	**10.00**	**18**	**15.00**	**4**	**3.33**	**105**	**87.50**	**5**	4.17	**46**	38.33	**2**	1.67	**21**	17.50	**120.00**
KOZHIKKODE	Thopayil	30	100.00	0	0.00	0	0.00	0	0.00	30	100.00	0	0.00	5	16.67	0	0.00	0	0.00	30.00
	Puthiyangadi	22	73.33	14	46.67	0	0.00	2	6.67	23	76.67	3	10.00	4	13.33	6	20.00	6	20.00	30.00
	Puthiya kadavu	12	40.00	0	0.00	1	3.33	1	3.33	26	86.67	7	23.33	8	26.67	0	0.00	0	0.00	30.00
	Kampuram	8	26.67	2	6.67	3	10.00	0	0.00	17	56.67	4	13.33	4	13.33	4	13.33	0	0.00	30.00
	Puthiyappa	16	53.33	0	0.00	0	0.00	0	0.00	30	100.00	0	0.00	12	40.00	0	0.00	0	0.00	30.00
SUB-TOTAL		**88**	**58.67**	**16**	**10.67**	**4**	**2.67**	**3**	**2.00**	**126**	**84.00**	**14**	9.33	**33**	22.00	**10**	6.67	**6**	4.00	**150.00**
KANNUR	Palisseri	23	76.67	3	10.00	5	16.67	1	3.33	24	80.00	0	0.00	3	10.00	4	13.33	16	53.33	30.00
	Chalil Gopalpetta	18	60.00	6	20.00	1	3.33	0	0.00	28	93.33	1	3.33	6	20.00	7	23.33	13	43.33	30.00
SUB-TOTAL		**41**	**68.33**	**9**	**15.00**	**6**	**10.00**	**1**	**0.83**	**52**	**86.67**	**1**	1.67	**9**	15.00	**11**	18.33	**29**	48.33	**60.00**
KASARGODE	Kottikulam	30	100.00	4	13.33	0	0.00	0	0.00	30	100.00	0	0.00	1	3.33	8	26.67	3	10.00	30.00
	Hozdurg	30	100.00	0	0.00	1	3.33	9	30.00	28	93.33	3	10.00	1	3.33	0	0.00	1	3.33	30.00
SUB-TOTAL		**60**	**100.00**	**4**	**6.67**	**1**	**1.67**	**9**	**15.00**	**58**	**96.67**	**3**	5.00	**2**	3.33	**8**	13.33	**4**	6.67	**60.00**
GRAND-TOTAL		**666**	**63.43**	**133**	**12.67**	**75**	**7.14**	**106**	**10.10**	**825**	**78.57**	**85**	8.10	**301**	28.67	**145**	13.81	**137**	13.05	**1050**

Source : Primary Data

Appendix 34

Prime Season of Fishing According to the Respondents										
Prime season										
DISTRICT	VILLAGE	Pre-monsoon		Monsoon		Post-monsoon		Not Responded		TOTAL (Nos.)
		Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	2	6.67	1	3.33	26	86.67	1	3.33	30
	Poovar	0	0.00	26	86.67	0	0.00	4	13.33	30
	South Kollamkode	0	0.00	20	66.67	2	6.67	8	26.67	30
	Paruthiyoor	0	0.00	30	100.00	0	0.00	0	0.00	30
	Punthura	0	0.00	21	70.00	8	26.67	1	3.33	30
	Kovalam	0	0.00	20	66.67	9	30.00	1	3.33	30
SUB-TOTAL		2	1.11	118	65.56	45	25.00	15	8.33	180
KOLLAM	Sakthikulangara	0	0.00	26	86.67	1	3.33	3	10.00	30
	Cheriazheekal	0	0.00	25	83.33	3	10.00	2	6.67	30
	Marathoorkulangara	0	0.00	22	73.33	8	26.67	0	0.00	30
	Mayyanad	0	0.00	17	56.67	13	43.33	0	0.00	30
	Neendakara	2	6.67	17	56.67	8	26.67	3	10.00	30
SUB-TOTAL		2	1.33	107	71.33	33	22.00	8	5.33	150
ALAPPUZHA	Thaikal	3	10.00	16	53.33	5	16.67	6	20.00	30
	Vadakkal	8	26.67	18	60.00	2	6.67	2	6.67	30
	Arattupuzha	1	3.33	25	83.33	0	0.00	4	13.33	30
	Pollethai	0	0.00	26	86.67	2	6.67	2	6.67	30
SUB-TOTAL		12	10.00	85	70.83	9	7.50	14	11.67	120
ERNAKULAM	Cheriyakadavu	3	10.00	27	90.00	0	0.00	0	0.00	30
	Chellanam	0	0.00	3	10.00	22	73.33	5	16.67	30
	Cherai	11	36.67	18	60.00	0	0.00	1	3.33	30
	Kannamli	0	0.00	30	100.00	0	0.00	0	0.00	30
SUB-TOTAL		14	11.67	78	65.00	22	18.33	6	5.00	120
THRISSUR	Vemballur	0	0.00	28	93.33	0	0.00	2	6.67	30
	Kaipamangalam	1	3.33	27	90.00	1	3.33	1	3.33	30
	Azhickode	0	0.00	30	100.00	0	0.00	0	0.00	30
SUB-TOTAL		1	1.11	85	94.44	1	1.11	3	3.33	90
MALAPPURAM	Kadalundinagar	0	0.00	22	73.33	4	13.33	4	13.33	30
	Parapanangadi	0	0.00	0	0.00	30	100.00	0	0.00	30
	Arayankadappuram	0	0.00	1	3.33	25	83.33	4	13.33	30
	Ariyalloor	1	3.33	29	96.67	0	0.00	0	0.00	30
SUB-TOTAL		1	0.83	52	43.33	59	49.17	8	6.67	120
KOZHIKKODE	Thopayil	0	0.00	26	86.67	1	3.33	3	10.00	30
	Puthiyangadi	0	0.00	25	83.33	3	10.00	2	6.67	30
	Puthiya kadavu	0	0.00	22	73.33	8	26.67	0	0.00	30
	Kampuram	0	0.00	17	56.67	13	43.33	0	0.00	30
	Puthiyappa	2	6.67	17	56.67	8	26.67	3	10.00	30
SUB-TOTAL		2	1.33	107	71.33	33	22.00	8	5.33	150
KANNUR	Palisseri	3	10.00	24	80.00	1	3.33	2	6.67	30
	Chalil Gopalpetta	1	3.33	28	93.33	1	3.33	0	0.00	30
SUB-TOTAL		4	6.67	52	86.67	2	3.33	2	3.33	60
KASARGODE	Kottikulam	0	0.00	27	90.00	1	3.33	2	6.67	30
	Hozdurg	0	0.00	25	83.33	1	3.33	4	13.33	30
SUB-TOTAL		0	0.00	52	86.67	2	3.33	6	10.00	60
GRAND-TOTAL		38	3.62	736	70.10	206	19.62	70	6.67	1050
Source : Primary Data										

Appendix 35

Influence of Climate Change as Observed by the Respondents						
DISTRICT	Influence of Climate Change					TOTAL (Nos.)
	Indicators	No. of Respondants				
		Agreed		Not Agreed		
		Nos.	%	Nos.	%	
TRIVANDRUM	Change in Species Landed	156	86.67	24	13.33	180
	Occurance of New Species	33	18.33	147	81.67	180
	Disappearence of Traditional Species	115	63.89	65	36.11	180
	Change in Roaring Sea	114	63.33	66	36.67	180
	Change in Water level	77	42.78	103	57.22	180
	Change in Water colour	68	37.78	112	62.22	180
	Change in Water Temparature	108	60.00	72	40.00	180
KOLLAM	Change in Species Landed	86	57.33	64	42.67	150
	Occurance of New Species	21	14.00	129	86.00	150
	Disappearence of Traditional Species	119	79.33	31	20.67	150
	Change in Roaring Sea	112	74.67	38	25.33	150
	Change in Water level	87	58.00	63	42.00	150
	Change in Water colour	77	51.33	73	4.87	150
	Change in Water Temparature	76	50.67	74	49.33	150
ALAPPUZHA	Change in Species Landed	60	50.00	60	50.00	120
	Occurance of New Species	3	2.50	117	97.50	120
	Disappearence of Traditional Species	92	76.67	28	23.33	120
	Change in Roaring Sea	60	50.00	60	50.00	120
	Change in Water level	80	66.67	40	33.33	120
	Change in Water colour	50	41.67	70	58.33	120
	Change in Water Temparature	69	57.50	51	42.50	120
ERNAKULAM	Change in Species Landed	2	1.67	118	98.33	120
	Occurance of New Species	8	6.67	112	93.33	120
	Disappearence of Traditional Species	16	13.33	104	86.67	120
	Change in Roaring Sea	31	25.83	89	74.17	120
	Change in Water level	94	78.33	26	21.67	120
	Change in Water colour	90	75.00	30	25.00	120
	Change in Water Temparature	50	41.67	70	58.33	120
THRISSUR	Change in Species Landed	11	12.22	79	87.78	90
	Occurance of New Species	8	8.89	82	91.11	90
	Disappearence of Traditional Species	67	74.44	23	25.56	90
	Change in Roaring Sea	23	25.56	67	74.44	90
	Change in Water level	63	70.00	27	30.00	90
	Change in Water colour	68	75.56	22	24.44	90
	Change in Water Temparature	80	88.89	10	11.11	90
MALAPPURAM	Change in Species Landed	110	91.67	10	8.33	120
	Occurance of New Species	55	45.83	65	54.17	120
	Disappearence of Traditional Species	35	29.17	85	70.83	120
	Change in Roaring Sea	54	45.00	66	55.00	120
	Change in Water level	7	5.83	113	94.17	120
	Change in Water colour	32	26.67	88	73.33	120
	Change in Water Temparature	31	25.83	89	74.17	120
KOZHIKKODE	Change in Species Landed	39	26.00	111	74.00	150
	Occurance of New Species	9	6.00	141	94.00	150
	Disappearence of Traditional Species	85	56.67	65	43.33	150
	Change in Roaring Sea	44	29.33	106	70.67	150
	Change in Water level	73	48.67	77	51.33	150
	Change in Water colour	84	56.00	66	44.00	150
	Change in Water Temparature	99	66.00	51	34.00	150
KANNUR	Change in Species Landed	0	0.00	60	100.00	60
	Occurance of New Species	0	0.00	60	100.00	60
	Disappearence of Traditional Species	7	11.67	53	88.33	60
	Change in Roaring Sea	11	18.33	49	81.67	60
	Change in Water level	52	86.67	8	13.33	60
	Change in Water colour	53	88.33	7	11.67	60
	Change in Water Temparature	48	80.00	12	20.00	60
KASARGODE	Change in Species Landed	11	18.33	49	81.67	60
	Occurance of New Species	7	11.67	53	88.33	60
	Disappearence of Traditional Species	29	48.33	31	51.67	60
	Change in Roaring Sea	32	53.33	28	46.67	60
	Change in Water level	38	63.33	22	36.67	60
	Change in Water colour	29	48.33	31	51.67	60
	Change in Water Temparature	4	6.67	56	93.33	60

Source : Primary Data

Appendix 36

Water colour during May-Aug as Reported by the Respondents										
Colour noted										
DISTRICT	VILLAGE	Red		Dark		Green		Blue		TOTAL (Nos.)
		Nos	%	Nos	%	Nos	%	Nos	%	
TRIVANDRUM	Shankumugham	0	0.00	27	90.00	3	10.00	0	0.00	30
	Poovar	0	0.00	17	56.67	8	26.67	5	16.67	30
	South Kollamkode	0	0.00	23	76.67	5	16.67	2	6.67	30
	Paruthiyoor	0	0.00	16	53.33	7	23.33	7	23.33	30
	Punthura	0	0.00	18	60.00	8	26.67	4	13.33	30
	Kovalam	0	0.00	19	63.33	2	6.67	9	30.00	30
SUB-TOTAL		**0**	**0.00**	**120**	**66.67**	**33**	**18.33**	**27**	**15.00**	**180**
KOLLAM	Sakthikulangara	21	70.00	0	0.00	9	30.00	0	0.00	30
	Cheriazheekal	23	76.67	0	0.00	2	6.67	5	16.67	30
	Marathoorkulangara	25	83.33	0	0.00	3	10.00	2	6.67	30
	Mayyanad	19	63.33	2	6.67	3	10.00	6	20.00	30
	Neendakara	18	60.00	2	6.67	10	33.33	0	0.00	30
SUB-TOTAL		**106**	**70.67**	**4**	**2.67**	**27**	**18.00**	**13**	**8.67**	**150**
ALAPPUZHA	Thaikal	16	53.33	0	0.00	0	0.00	14	46.67	30
	Vadakkal	17	56.67	1	3.33	0	0.00	12	40.00	30
	Arattupuzha	20	66.67	0	0.00	1	3.33	9	30.00	30
	Pollethai	21	70.00	0	0.00	0	0.00	9	30.00	30
SUB-TOTAL		**74**	**61.67**	**1**	**0.83**	**1**	**0.83**	**44**	**36.67**	**120**
ERNAKULAM	Cheriyakadavu	0	0.00	0	0.00	22	73.33	8	26.67	30
	Chellanam	1	3.33	0	0.00	18	60.00	11	36.67	30
	Cherai	0	0.00	0	0.00	26	86.67	4	13.33	30
	Kannamli	3	10.00	0	0.00	24	80.00	3	10.00	30
SUB-TOTAL		**4**	**3.33**	**0**	**0.00**	**90**	**75.00**	**26**	**21.67**	**120**
THRISSUR	Vemballur	0	0.00	0	0.00	26	86.67	4	13.33	30
	Kaipamangalam	0	0.00	0	0.00	23	76.67	7	23.33	30
	Azhickode	0	0.00	0	0.00	28	93.33	2	6.67	30
SUB-TOTAL		**0**	**0.00**	**0**	**0.00**	**77**	**85.56**	**13**	**14.44**	**90**
MALAPPURAM	Kadalundinagar	0	0.00	1	3.33	18	60.00	11	36.67	30
	Parapanangadi	0	0.00	0	0.00	21	70.00	9	30.00	30
	Arayankadappuram	0	0.00	0	0.00	26	86.67	4	13.33	30
	Ariyalloor	0	0.00	0	0.00	20	66.67	10	33.33	30
SUB-TOTAL		**0**	**0.00**	**1**	**0.83**	**85**	**70.83**	**34**	**28.33**	**120**
KOZHIKKODE	Thopayil	0	0.00	0	0.00	23	76.67	7	23.33	30
	Puthiyangadi	3	10.00	0	0.00	24	80.00	3	10.00	30
	Puthiya kadavu	0	0.00	0	0.00	22	73.33	8	26.67	30
	Kampuram	0	0.00	0	0.00	27	90.00	3	10.00	30
	Puthiyappa	0	0.00	0	0.00	19	63.33	11	36.67	30
SUB-TOTAL		**3**	**2.00**	**0**	**0.00**	**115**	**76.67**	**32**	**21.33**	**150**
KANNUR	Palisseri	2	6.67	1	3.33	20	66.67	7	23.33	30
	Chalil Gopalpetta	1	3.33	7	23.33	18	60.00	4	13.33	30
SUB-TOTAL		**3**	**5.00**	**8**	**13.33**	**38**	**63.33**	**11**	**18.33**	**60**
KASARGODE	Kottikulam	0	0.00	0	0.00	26	86.67	4	13.33	30
	Hozdurg	0	0.00	0	0.00	23	76.67	7	23.33	30
SUB-TOTAL		**0**	**0.00**	**0**	**0.00**	**49**	**81.67**	**11**	**18.33**	**60**
GRAND-TOTAL		**190**	**18.10**	**134**	**12.76**	**515**	**49.05**	**211**	**20.10**	**1050**

Source : Primary Data

Appendix 37

Presence of Algal Bloom

	Observation of Respondents		
District	**Noted**	**Not noted**	Not Responded
TRIVANDRUM	27.78	38.33	33.89
KOLLAM	39.33	24.67	36.00
ALAPPUZHA	21.67	52.50	25.83
ERNAKULAM	11.67	55.00	33.33
THRISSUR	25.56	45.56	28.89
MALAPPURAM	13.33	60.83	25.83
KOZHIKKODE	10.00	57.33	32.67
KANNUR	10.00	58.33	31.67
KASARGODE	11.67	55.00	33.33

Source: Primary Data

Appendix 38

Problems in the Marine Fisheries Sector of Kerala												
DISTRICT	VILLAGE	Fish famine		Pollution		Conflict		Others		Nil		Total (Nos.)
		Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%	
TRIVANDRUM	Shankumugham	14	46.67	5	16.67	1	3.33	2	6.67	8	26.67	30
	Poovar	16	53.33	6	20.00	0	0.00	4	13.33	4	13.33	30
	South Kollamkode	3	10.00	4	13.33	0	0.00	8	26.67	15	50.00	30
	Paruthiyoor	17	56.67	7	23.33	0	0.00	3	10.00	3	10.00	30
	Punthura	8	26.67	20	66.67	2	6.67	0	0.00	0	0.00	30
	Kovalam	21	70.00	5	16.67	2	6.67	2	6.67	0	0.00	30
SUB-TOTAL		79	43.89	47	26.11	5	2.78	19	10.56	30	16.67	180
KOLLAM	Sakthikulangara	16	53.33	6	20.00	0	0.00	4	13.33	4	13.33	30
	Cheriazheekal	3	10.00	4	13.33	0	0.00	8	26.67	15	50.00	30
	Marathoorkulangara	17	56.67	7	23.33	0	0.00	3	10.00	3	10.00	30
	Mayyanad	8	26.67	20	66.67	2	6.67	0	0.00	0	0.00	30
	Neendakara	21	70.00	5	16.67	2	6.67	2	6.67	0	0.00	30
SUB-TOTAL		65	43.33	42	28.00	4	2.67	17	11.33	22	14.67	150
ALAPPUZHA	Thaikal	28	93.33	1	3.33	0	0.00	0	0.00	1	3.33	30
	Vadakkal	12	40.00	7	23.33	6	20.00	2	6.67	3	10.00	30
	Arattupuzha	9	30.00	11	36.67	2	6.67	0	0.00	8	26.67	30
	Pollethai	10	33.33	6	20.00	4	13.33	3	10.00	7	23.33	30
SUB-TOTAL		59	49.17	25	20.83	12	10.00	5	4.17	19	15.83	120
ERNAKULAM	Cheriyakadavu	3	10.00	13	43.33	2	6.67	3	10.00	9	30.00	30
	Chellanam	25	83.33	1	3.33	1	3.33	1	3.33	2	6.67	30
	Cherai	17	56.67	0	0.00	3	10.00	8	26.67	2	6.67	30
	Kannamli	0	0.00	18	60.00	3	10.00	2	6.67	7	23.33	30
SUB-TOTAL		45	37.50	32	26.67	9	7.50	14	11.67	20	16.67	120
TRISSUR	Vemballur	15	50.00	5	16.67	6	20.00	3	10.00	1	3.33	30
	Kaipamangalam	15	50.00	15	50.00	0	0.00	0	0.00	0	0.00	30
	Azhickode	27	90.00	3	10.00	0	0.00	0	0.00	0	0.00	30
SUB-TOTAL		57	63.33	23	25.56	6	6.67	3	3.33	1	1.11	90
MALAPPURAM	Kadalundinagar	1	3.33	4	13.33	1	3.33	0	0.00	24	80.00	30
	Parapanangadi	21	70.00	1	3.33	0	0.00	6	20.00	2	6.67	30
	Arayankadappuram	25	83.33	0	0.00	0	0.00	1	3.33	4	13.33	30
	Ariyalloor	28	93.33	0	0.00	0	0.00	2	6.67	0	0.00	30
SUB-TOTAL		75	62.50	5	4.17	1	0.83	9	7.50	30	25.00	120
KOZHICKODE	Thopayil	3	10.00	5	16.67	2	6.67	0	0.00	20	66.67	30
	Puthiyangadi	4	13.33	19	63.33	7	23.33	0	0.00	0	0.00	30
	Puthiya kadavu	3	10.00	7	23.33	5	16.67	8	26.67	7	23.33	30
	Kampuram	12	40.00	5	16.67	9	30.00	3	10.00	1	3.33	30
	Puthiyappa	2	6.67	27	90.00	0	0.00	0	0.00	1	3.33	30
SUB-TOTAL		24	16.00	63	42.00	23	15.33	11	7.33	29	19.33	150
KANNUR	Palisseri	3	10.00	5	16.67	0	0.00	4	13.33	18	60.00	30
	Chalil Gopalpetta	1	3.33	23	76.67	0	0.00	0	0.00	6	20.00	30
SUB-TOTAL		4	6.67	28	46.67	0	0.00	4	6.67	24	40.00	60
KASARGODE	Kottikulam	26	86.67	1	3.33	0	0.00	2	6.67	1	3.33	30
	Hozdurg	11	36.67	1	3.33	0	0.00	14	46.67	4	13.33	30
SUB-TOTAL		37	61.67	2	3.33	0	0.00	16	26.67	5	8.33	60
GRAND-TOTAL		445	42.38	267	25.43	60	5.71	98	9.33	180	17.14	1050

Source : Primary Data

Appendix 39

Infrastructure Facilities in the Fishing Villages Covered under the Study

Facilities	Distance in KMs.					
TRIVANDRUM	Shankumugham	Poovar	South Kollamkode	Paruthiyoor	Punthura	Kovalam
	Kms.	Kms.	Kms.	Kms.	Kms.	Kms.
Landing Centre	1.00	1.00	1.00	1.00	1.00	1.00
Ice Plant	6.00	1.00	1.00	1.00	1.00	1.00
Fish Marketing Co-ops.	2.00	1.00	1.00	1.00	1.00	1.00
Market Place	6.00	1.00	1.00	1.00	2.00	1.00
Cold Storage	6.00	1.00	1.00	1.00	1.00	1.00
Freezing Plant	1.00	1.00	1.00	1.00	1.00	1.00
Potable water	1.00	1.00	1.00	1.00	1.00	2.00
All weather Road	1.00	1.00	1.00	1.00	1.00	1.00
Railway Station	7.00	5.00	5.00	2.00	7.00	2.00
Telephone Booth	1.00	1.00	1.00	1.00	1.00	1.00
Post Office	1.00	1.00	5.00	2.00	1.00	1.00
Commercial Bank	1.00	3.00	4.00	2.00	1.00	1.00
Office of Matsyafed	1.00	3.00	3.00	2.00	1.00	1.00
Office of Fisheries dept.	1.00	3.00	3.00	2.00	1.00	1.00
Police Station	1.00	4.00	4.00	2.00	5.00	1.00
Hospital	6.00	4.00	4.00	2.00	5.00	4.00
Primary School	2.00	5.00	5.00	2.00	1.00	5.00
High School	2.00	1.00	5.00	2.00	1.00	1.00
College	7.00	4.00	5.00	10.00	8.00	1.00
Technical Institute	8.00	4.00	4.00	10.00	8.00	7.00
Library	8.00	1.00	4.00	1.00	5.00	9.00
Community Hall	1.00	1.00	2.00	1.00	1.00	8.00
KOLLAM	Sakthikulangara	herlazheek	Maruthoorkulangara	Mayannad	Neendakara	
	Kms.	Kms.	Kms.	Kms.	Kms.	
Landing Centre	1.00	8.00	8.00	1.00	1.00	
Ice Plant	1.00	8.00	8.00	2.00	1.00	
Fish Marketing Co-ops.	1.00	1.00	1.00	2.00	1.00	
Market Place	1.00	8.00	8.00	2.00	1.00	
Cold Storage	1.00	14.00	14.00	2.00	1.00	
Freezing Plant	1.00	14.00	14.00	2.00	1.00	
Potable water	1.00	2.00	3.00	1.00	2.00	
All weather Road	1.00	2.00	5.00	2.00	1.00	
Railway Station	7.00	5.00	5.00	2.00	7.00	
Telephone Booth	1.00	1.00	1.00	1.00	1.00	
Post Office	1.00	1.00	5.00	2.00	1.00	
Commercial Bank	1.00	3.00	4.00	2.00	1.00	
Office of Matsyafed	1.00	3.00	3.00	2.00	1.00	
Office of Fisheries dept.	1.00	3.00	3.00	2.00	1.00	
Police Station	1.00	4.00	4.00	2.00	5.00	
Hospital	6.00	4.00	4.00	2.00	5.00	
Primary School	2.00	5.00	5.00	2.00	1.00	
High School	2.00	1.00	5.00	2.00	1.00	
College	7.00	4.00	5.00	10.00	8.00	
Technical Institute	8.00	4.00	4.00	10.00	8.00	
Library	8.00	1.00	4.00	1.00	5.00	
Community Hall	1.00	1.00	2.00	1.00	1.00	

Source: Primary Data

Appendix 40

Infrastructure Facilities in the Fishing Villages Covered under the Study

Facilities	Distance in KMs.			
ALAPPUZHA	Thalkai	Vadakkal	Arattupuzha	Pollethai
	Kms.	Kms.	Kms.	Kms.
Landing Centre	2.00	10.00	10.00	1.00
Ice Plant	10.00	5.00	1.00	3.00
Fish Marketing Co-ops.	10.00	1.00	1.00	1.00
Market Place	3.00	1.00	2.00	1.00
Cold Storage	10.00	5.00	1.00	1.00
Freezing Plant	10.00	5.00	1.00	1.00
Potable water	1.00	1.00	1.00	1.00
All weather Road	1.00	1.00	1.00	1.00
Railway Station	5.00	3.00	10.00	7.00
Telephone Booth	1.00	1.00	1.00	1.00
Post Office	5.00	3.00	1.00	2.00
Commercial Bank	5.00	3.00	4.00	5.00
Office of Matsyafed	10.00	4.00	1.00	5.00
Office of Fisheries dept.	10.00	5.00	1.00	7.00
Police Station	5.00	3.00	4.00	6.00
Hospital	5.00	3.00	4.00	2.00
Primary School	2.00	1.00	2.00	2.00
High School	2.00	3.00	5.00	2.00
College	15.00	3.00	10.00	13.00
Technical Institute	15.00	3.00	2.00	10.00
Library	10.00	2.00	1.00	1.00
Community Hall	10.00	3.00	1.00	1.00
	Cheriyakadavu	Chellanam	Cheral	Kannamli
ERNAKULAM	Kms.	Kms.	Kms.	Kms.
Landing Centre	8.00	3.00	1.00	8.00
Ice Plant	4.00	10.00	3.00	3.00
Fish Marketing Co-ops.	3.00	10.00	2.00	2.00
Market Place	3.00	2.00	3.00	2.00
Cold Storage	5.00	10.00	1.00	3.00
Freezing Plant	4.00	10.00	1.00	3.00
Potable water	1.00	1.00	1.00	1.00
All weather Road	1.00	2.00	1.00	1.00
Railway Station	10.00	10.00	3.00	8.00
Telephone Booth	1.00	1.00	3.00	1.00
Post Office	1.00	2.00	2.00	1.00
Commercial Bank	2.00	3.00	3.00	2.00
Office of Matsyafed	5.00	2.00	2.00	2.00
Office of Fisheries dept.	5.00	1.00	3.00	5.00
Police Station	1.00	1.00	2.00	1.00
Hospital	2.00	2.00	3.00	2.00
Primary School	1.00	1.00	2.00	1.00
High School	1.00	5.00	3.00	1.00
College	2.00	10.00	4.00	2.00
Technical Institute	3.00	10.00	1.00	2.00
Library	1.00	10.00	3.00	1.00
Community Hall	2.00	10.00	2.00	1.00

Source: Primary Data

Appendix 41

Infrastructure Facilities in the Fishing Villages Covered under the Study

Facilities	Distance in KMs.			
	Kadalundinagar	Parapanangadi	Arayankadappuram	Ariyalloor
MALAPPURAM	Kms.	Kms.	Kms.	Kms.
Landing Centre	2.00	1.00	1.00	1.00
Ice Plant	5.00	2.00	1.00	2.00
Fish Marketing Co-ops.	5.00	4.00	1.00	1.00
Market Place	10.00	3.00	2.00	1.00
Cold Storage	4.00	1.00	2.00	3.00
Freezing Plant	10.00	1.00	1.00	1.00
Potable water	2.00	1.00	1.00	1.00
All weather Road	2.00	2.00	2.00	1.00
Railway Station	5.00	6.00	8.00	1.00
Telephone Booth	1.00	1.00	2.00	1.00
Post Office	3.00	5.00	5.00	2.00
Commercial Bank	4.00	8.00	2.00	2.00
Office of Matsyafed	4.00	1.00	2.00	2.00
Office of Fisheries dept.	1.00	2.00	2.00	1.00
Police Station	6.00	8.00	6.00	1.00
Hospital	6.00	8.00	3.00	1.00
Primary School	5.00	1.00	1.00	1.00
High School	7.00	1.00	3.00	1.00
College	8.00	8.00	6.00	2.00
Technical Institute	2.00	1.00	2.00	1.00
Library	2.00	5.00	3.00	2.00
Community Hall	1.00	1.00	3.00	2.00
	Vemballur	Kaipamangalam	Azhickode	
THRISSUR	Kms.	Kms.	Kms.	
Landing Centre	9.00	1.00	3.00	
Ice Plant	1.00	4.00	1.00	
Fish Marketing Co-ops.	1.00	1.00	1.00	
Market Place	1.00	4.00	3.00	
Cold Storage	2.00	1.00	3.00	
Freezing Plant	9.00	1.00	1.00	
Potable water	2.00	1.00	1.00	
All weather Road	2.00	10.00	2.00	
Railway Station	1.00	10.00	10.00	
Telephone Booth	9.00	1.00	1.00	
Post Office	7.00	1.00	2.00	
Commercial Bank	9.00	1.00	2.00	
Office of Matsyafed	10.00	12.00	3.00	
Office of Fisheries dept.	9.00	10.00	3.00	
Police Station	9.00	7.00	3.00	
Hospital	9.00	8.00	10.00	
Primary School	2.00	1.00	2.00	
High School	9.00	1.00	3.00	
College	9.00	8.00	11.00	
Technical Institute	13.00	8.00	2.00	
Library	9.00	1.00	3.00	
Community Hall	9.00	1.00	3.00	

Source: Primary Data

Appendix 42

Infrastructure Facilities in the Fishing Villages Covered under the Study					
Facilities	Distance in KMs.				
KOZHIKKODE	Thopayil	Puthiyangadi	Puthiya kadavu	Kampuram	Puthiyappa
Landing Centre	Kms.	Kms.	Kms.	Kms.	Kms.
Ice Plant	2.00	7.00	5.00	1.00	5.00
Fish Marketing Co-ops.	2.00	1.00	1.00	2.00	5.00
Market Place	3.00	4.00	2.00	3.00	4.00
Cold Storage	3.00	1.00	1.00	5.00	6.00
Freezing Plant	10.00	1.00	5.00	2.00	5.00
Potable water	5.00	9.00	2.00	3.00	3.00
All weather Road	3.00	1.00	3.00	3.00	2.00
Railway Station	3.00	1.00	6.00	2.00	7.00
Telephone Booth	2.00	2.00	1.00	1.00	1.00
Post Office	3.00	1.00	5.00	1.00	2.00
Commercial Bank	2.00	4.00	2.00	5.00	6.00
Office of Matsyafed	2.00	5.00	3.00	5.00	1.00
Office of Fisheries dept.	2.00	1.00	1.00	1.00	4.00
Police Station	2.00	1.00	3.00	1.00	5.00
Hospital	2.00	1.00	1.00	1.00	2.00
Primary School	2.00	5.00	1.00	1.00	2.00
High School	2.00	1.00	1.00	1.00	4.00
College	2.00	1.00	2.00	1.00	8.00
Technical Institute	3.00	1.00	2.00	1.00	6.00
Library	3.00	1.00	5.00	1.00	1.00
Community Hall	2.00	1.00	1.00	1.00	1.00

Source: Primary Data

Appendix 43

Infrastructure Facilities in the Fishing Villages Covered under the Study		
Facilities	**Distance in KMs.**	
	Palisseri	**Chalil Gopalpetta**
KANNUR	**Kms.**	**Kms.**
Landing Centre	4.00	2.00
Ice Plant	4.00	2.00
Fish Marketing Co-ops.	3.00	2.00
Market Place	4.00	5.00
Cold Storage	4.00	5.00
Freezing Plant	4.00	4.00
Potable water	4.00	1.00
All weather Road	1.00	3.00
Railway Station	2.00	3.00
Telephone Booth	4.00	1.00
Post Office	2.00	5.00
Commercial Bank	4.00	3.00
Office of Matsyafed	1.00	1.00
Office of Fisheries dept.	1.00	2.00
Police Station	1.00	4.00
Hospital	5.00	4.00
Primary School	5.00	4.00
High School	5.00	7.00
College	5.00	4.00
Technical Institute	2.00	3.00
Library	4.00	2.00
Community Hall	1.00	1.00
	Kottikulam	**Hozdurg**
KASARGOD	**Kms.**	**Kms.**
Landing Centre	1.00	1.00
Ice Plant	4.00	1.00
Fish Marketing Co-ops.	1.00	1.00
Market Place	1.00	2.00
Cold Storage	1.00	1.00
Freezing Plant	5.00	1.00
Potable water	1.00	1.00
All weather Road	4.00	1.00
Railway Station	7.00	2.00
Telephone Booth	1.00	1.00
Post Office	2.00	3.00
Commercial Bank	1.00	2.00
Office of Matsyafed	1.00	1.00
Office of Fisheries dept.	1.00	1.00
Police Station	1.00	2.00
Hospital	3.00	2.00
Primary School	1.00	2.00
High School	1.00	2.00
College	8.00	10.00
Technical Institute	5.00	1.00
Library	1.00	1.00
Community Hall	5.00	1.00

Source : Primary Data

QUESTIONNAIRE

Interview Schedule

Socio-economic status

Date: ……..

District: …….. Fishing Village: ……... Ward: ……

1. General details

   Name and Address of Head of Family with Mobile Number : ……
   ……
   ……
   ……
   ……
   ……

2. Landed property details

   i. Area of land (cent) : …….

   ii. House : Own □ Rented□

   iii. Type of House : Hut □ Thatched □ Tiled □ Concrete □

   iv. Plinth/ (Sq.ft.) area : …….

   v. Type of flooring : Mud □ Cement □ Mosaic □ Tiled□ Marble □ Granite □

   vi. Whether electrified : Yes □ No □

   vii. Drinking water facility : pond □ Well □ Bore well □ Potable water □ Public tap □ Purchased water □

   viii. Type of fuel used for cooking : Firewood □ Kerosene □ Gas □ Biogas □ Electricity □ Induction Cooker □ Others □

   ix. Lavatory type : Open air □Hung latrine □ Pit □ Ring □ Septic tank □

   x. Do you own : TV □ Furniture □ News Paper □ Radio □

[if yes, please '✓'] Fridge □ Computer □

xi. Whether the furniture is sufficient
for decent living : Yes □No □

xii. Any subsidy/ grant obtained
from Government. : Yes □ No □
if so, Amount received(Rs.)

Educational Stipend	**Fishing Implements**	**Land purchasing**	**Housing**	**Heritage**	**Others ……**

-

xiii. Details of bank account : Nationalized Bank □ Scheduled Bank □
Co-operative Bank □Post Office □ No bank A/c □

xiv. Do you operate ATM? : Yes □ No □

xv. Do you visit your bank frequently : Yes □ No □

xvi. Have you availed any
Loan from : Co-operative bank □ Co-operative Society □
Nationalized bank □ NDFC □ Money lenders □
Others: ……□

3. Family details

i. Nature of family : Nuclear □ Joint □

ii. Family details:-

Sl. No.	**Name**	**Relation-ship**	**Gender (M/F)**	**Age**	**Marital Status**	**❖Education (No. of years of Schooling)**	**Occupation**	**Income (monthly)**

❖ Education: Primary up to Std. 8; Secondary up to Std.9 to +2; Degree; professional; Technical

4. Distance to the school/ Technical/ Other Educational Institutions: ……

5. Fishing category : Traditional □ Acquired □ Migrant □
   Type of fishermen : i) Active □ Supporting □ Ancillary fisherman □
   ii) Lonely fisherman □ Partner of a group □
6. Membership with : Fishermen Welfare Fund Board □
   Fishermen Co-operative Society □
   Others: ……□

Fishing practices and marketing

7. Fishing gears used : Scooping net □ Cast net □ Stake net □ Dip net □
   Drift net □ Hook & lines □ Gill net □ Seine □Trawl □ others □

8. Type of fishing implements/
   Units possessed/ Owned : Thermocol□ Canoe □Vallam□
   Motorized Craft(IB&OB) □Mechanized Craft □
   Others: ……□
9. No. of work days/week : …….
10. Prime season & month for fishing : Pre-monsoon □ Monsoon □ Post-monsoon □
    (Jan/Feb/Mar/Apr)(May/Jun/Jul/Aug) (Sep/Oct/Nov/Dec)
11. Dry spell season & month : …….
12. Average catch per week (Kg)

Variety of fish catch	**Quantity (Kg)**	**Monsoon Season** (Use ✓ mark)	**Post-Monsoon Season** (Use ✓ mark)	**Pre-Monsoon Season** (Use ✓ mark)
i)				
ii)				
iii)				
iv)				
v)				

13. Marketing method : Direct □ Sold through intermediaries□ co-ops □
14. Have you noted Seasonal variation
    in catch? : Yes □ No □
    if yes, give details : ……
    ……
15. Distance between house and

place of operation/ ground : …….

16. Duration of fishing experience : ……..(years)
17. Influence of Climate change on fish catch, if any : (a) Change in species landed □
    (b) Occurrence of new species □
    (c) Disappearance of traditional species □
    (d) Change in roaring sea□
    (e) Change in water level □
    (f) Change in water colour□
    (g) Change in water temperature □
18. Has quantity of fish availability shrunken over the years : Yes □ No □
    If yes, reasons : ……
19. If species change over the years give details : ……
20. Coastal Zone Management activities in your fishing zone, if any : (a) Afforestation □
    (b) Sea Wall/ Sea water Drainage construction □
    (c) Tourism □ (d) Agri.Activities□
    (e) Fishing activities □ (f) Landing centre/Harbours□
21. Responsible Fishing practices followed by fisher folk, if any : ……

Ecological changes

22. Have you ever noted coastal upwelling: Yes □ No □
23. If yes, the period and month when it is seen : Pre-Monsoon □ Monsoon □ Post-Monsoon□
    (Jan/Feb/Mar/Apr)(May/Jun/Jul/Aug) (Sep/Oct/Nov/Dec)
24. Do you get more fishes during this period: Yes □ No □
25. If yes, what are the species available : ……..
    ……..
    ……..
26. When do you get more volume of fish (season and month) : Pre-monsoon □ Monsoon □ Post-monsoon □
    (Jan/Feb/Mar/Apr)(May/Jun/Jul/Aug) (Sep/Oct/Nov/Dec)
28. Species available during : June-July: …….
    Aug-Sep: ……..

29. Have you noted any change
in the colour of the water? : Yes □ No □

30. if yes, what colour and the period
of occurence : …….

31. Have you noted the presence
of Phytoplankton : Yes □ No □

32. if yes, specify the period : Pre-Monsoon □ Monsoon □ Post-Monsoon□
(Jan/Feb/Mar/Apr)(May/Jun/Jul/Aug) (Sep/Oct/Nov/Dec)

33. Relationship between Climate and availability of fish:

Sl. No.	Climatic Factors	Intensity	Availability of Fish Please state: I=Increased, D=Decreased, N=No change
1	Chlorophyll	High	
		Low	
2	Salinity	High	
		Low	
3	Sea surface temperature	High	
		Low	
4	Humidity	High	
		Low	
5	Sunshine Hours	High	
		Low	
6	Rainfall	High	
		Low	
7	Flooding/Sea level rise	High	
		Low	
8	Drought	High	
		Low	
9	Storms	High	
		Low	
10	Coastal erosion	High	
		Low	
11	Others, namely; …… ……..	High	
		Low	

34. Major Changes in:

Sl. No.	Factors	Increased	Decreased	No change	Year in which the change is noticed
1	Migration				
2	Jobs				
3	Conflicts				
4	Financial Position				

35. What are the main causes for these changes: …….

……

……

……

36. What have been the effects of these changes on your livelihood?

[please give examples, if applicable]

…….

…….

…….

…….

……

37.What measures do your family take to cope with the impacts of the climate conditions listed above and were these measures effective? [Please fill in the table below]

Climate Condition	**Coping measures**	**Effectiveness of measures** Yes=effective; No=Not effective	**Reason** Please give brief reason as to how/why the measures was effective
Monsoon pattern			
Flooding			
Drought			
Stroms			
Coastal erosion			
Salinity			
Others, namely:…….. ……..			

38.Alternative jobs resorted : …….

39.Monthly family expenditure (Rs.) : …….

40.Major items of household expenditure & share of each(Rs.) Monthly/Annual :

Household Expenditure (Monthly)	Amount (Rs.)	Household Expenditure (Annually)	Amount (Rs.)
Rice/Wheat		Clothing	
Grocery		Education	
Fish		Housing	
Milk		Entertainment	
Meat		Rituals	
Vegetables		Others……. ……	
Fruits			
Others ……..			

41.Monthly savings (Rs.) : …….

42.(a)Whether earnings are sufficient to meet livelihood : Yes □ No □

(b)If no, what are the other sources of income : ……

43. Leisure time utilized meaningfully : Net mending □ Net Setting □ Net Repair □ Others □

44.Hobbies, if any : Playing cards □ Watching cinemas □ Reading □ Sports □ Swimming □ Singing Songs □ Others: …….□

45.Habits, if any and amount of income daily spent for the same :Liquor(Rs)…….. Other intoxicative (Rs)…..… Gambling (Rs)…….

46.(a)Health problems if any : Yes □ No □

(b) if yes, type of illness : ……

47.Details of indebtness:

(a)Amount (Rs.) …… (b)Source: ……..

(c)Purpose: …….. (d)Interest Payable (%):……..

48.Problems confronting the sector : Fish famine □ Pollution □ Reclamation □ Conflict □ Others □

49.Agency with which life is insured : (a)Matsya Board □ LIC □GP □ Others □……..

: (b) Not Insured □

50.Current Govt. Programmeor Schemes

for a sustainable fishing environment
in your area : ……

51.Level of involvement in fishing avocation and approach
towards alternative source of income : ……..

52.No. of Youngsters (age 16-30) inthe
family engaged in fishing : ……..

53. Infrastructure facilities available (distance in Km):

1. Landing centre: …… 2. Ice plant: …… 3. Fish marketing Co-ops: ……
4. Market place: …… 5. Cold storage: …… 6. Freezing plant: ……
7. Potable water: …… 8. All weather road: ……9. Railway station: ……
10. Telephone booth: …… 11. Freight trucks: …… 12. Post office: ……

13. Commercial bank: …… 14. Office of Matsyafed: ……

15. Office of fisheries dept.: …… 16. Police station: …… 17. Hospital: ……
18. Primary School: …… 19. High School: …… 20. College: ……
21. Technical Institutions: …… 22. Library/ reading room:……
23. Community hall: …… 24. Others: ……

54. What community-based organizations exist (i.e. fishers groups, fisher-led cooperatives, credit associations, social/religious organizations) within your community?

…….
…….
…….
…….
…….

55. Has the status of women changed in your community over the past five or ten years? (i.e. more women that are heads of households than before and/ or activities that women do now that they did not usually do before) : Yes □ No □

if yes please give the type of changes and when this occurred

Type:

- …… Year: ……/……/……
- …… Year: ……/……/……
- …… Year: ……/……/……

- …… Year: ……/……/……
- …… Year: ……/……/……

56. What do you think are the main causes or reason for the observed change(s)?

…….
…….
…….
…….
…….

57. Expected Govt. intervention to revive
the fishing sector, suggestions : ……

58.Opinion on future of fishing sector: …….

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COMMUNITY BASED COASTAL TOURISM: A CASE STUDY OF KADALUNDI VALLIKUNNU COMMUNITY RESERVE

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"Tourism is like a fire; you can cook your soup in it; but you can also burn down your house with it." (Asian proverb)

Keywords: Tourism, Community based Tourism, Community based eco-tourism, Sustainable Tourism, Responsible Tourism

JEL Classifications: Q01, L83

INTRODUCTION

Tourism is a rapidly growing phenomenon and has become one of the largest industries in the world. The impact of tourism is extremely varied. On one hand it plays an important and certainly positive role in the socio economic and political development in destination countries and offering new employment opportunities. Also, in certain instances, it may contribute to a broader cultural understanding by creating awareness and respect for the diversities and ways of life.

But in recent years there have been increasing warnings, the deterioration of some destinations, the overwhelming of some cultures, bottlenecks in transport facilities and growing hostility of residents in some destinations. Therefore, the overriding concern for the industry must be to seek out ways to enhance rather than degrade its core products: the environment, upon which all of the humanity must depend for survival. In other words, the environment is tourisms resources. The close relationship between tourism and the environment and the importance of environmental planning are becoming increasingly recognized.

DEVELOPMENT POTENTIAL OF TOURISM

As one enters into the next millennium and the birth of a new global era, one is confronting the urgent need for local/regional/national/international peace and security more than in the past. This may be broadly ascribed to the increasing conflicts arising out of social, economic, religious and political factors. The widening of gap between the haves and have-nots, have further accelerated these conflicts.

Hence, one is seeking universal human rights and universal human progress and prosperity One powerful indicator of such a development is the fact that more people are traveling from more countries than ever before, making travel and tourism the world's largest industry.

The unprecedented growth in international tourism began in the post Second World War period. The main reason behind such a paradigm development was the socio economic paradigm development was the socio economic changes in the more developed countries like higher income, better income distribution, longer paid holidays, improvements in transportation, technology, low travel costs, etc. Another trigger was the positive image of tourism development conveyed by the advocacy platform and the willingness of World Bank and other institutions to fund tourism projects. Thus tourism has emerged as a sector with immense potential for economic development and employment generation across the globe.

Its growth continue with globalization and as people everywhere seem determined to exercise their right to travel and to make their world a more familiar place in the spirit of peace and friendship. Tourism itself has always been a peace-based industry and may be considered as a Global Peace Industry. In the face of current human population increases and worldwide ecological degradation; intact and healthy ecosystems are becoming the world's most sought-after tourism destinations. Culture and Heritage besides peace and harmony in such areas attract special groups of tourists, who demand quality products.

Across the globe particularly among the developing nations like India, tourism is fast picking up as a tool for economic development and employment generation. International agencies like W.T.O have pointed out the vast developmental potential of tourism. Now tourism sector is the fastest growing sectors in the World economy. In 1991 itself the World Travel and Tourism Council declared tourism as the World's largest industry.

FROM TOURISM TO ECOTOURISM: THE TRANSITION

Though tourism is traveling for predominantly recreational or leisure purposes, the contemporary phenomenon of mass tourism aims at generating incomes by providing pleasure to millions. As already stated, the above philosophy raises a number of problems to the environment and the biological diversity in the destinations like loss of wild life, habitat, deforestation, and pollution etc., given the low level of environmental awareness and irresponsible behavior in general. Alternative forms of tourism such as 'ecotourism' seek to avoid such outcomes by pursuing tourism in a sustainable way. Here, the concept is almost that of following a middle path between

tourism promotion and environmental conservation with a trade-off calling for careful choice detrimental to neither.

The term 'ecotourism' is derived from two words, viz. 'Ecosystem' (Ecology) and 'Tourism'. Ecosystem is the system in which one lives, the system which include the earth, the water, the sky and of course the living and the non-living objects in all these systems. It is a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. Thus, ecotourism means, tourism involving travel to areas of natural or ecological interest, typically under the guidance of a naturalist, for the purpose of observing wildlife and learning about the environment and at the same time focus on wildlife and promotion of understanding and conservation of the environment. Ecotourism is often used interchangeably with other terms such as soft tourism, alternative tourism, responsible tourism and nature tourism. It is experimented as an efficient tool for sustainable tourism development since the 1990s.

Ecotourism has achieved institutional legitimacy in the early 1990s, when the *Journal of Sustainable Tourism* commenced publication, along with the organization now called The International Ecotourism Society (TIES) – a combination of advocacy group and trade organization. Ecotourism has gained good popularity in the recent past; the year 2002 being declared as the International Year for Ecotourism (IYE) by the United Nations. This year saw the founding of the *Journal of Ecotourism* also.

There are various definitions for Ecotourism, most of which are concerned with environmental conservation and preservation. It is directed towards responsible travel that conserves ecosystem, preserves the local culture and benefits the local people. It is an enlightening, participatory travel experience to natural environment. Ecotourism ensures the sustainable use of environmental resources while producing viable economic opportunities for the host communities.

The World Wildlife Fund, an organization of U.N, which is interested in the ecotourism industry in terms of wilderness protection for habitats and various species, stated "the term ecotourism refers to any travel to or through wilderness areas that has minimal impact on the natural environment and in wildlife while providing some economic benefits to local communities and the areas indigenous stewards"

Ecotourism can be a sustainable form of tourism. The aim of it should be to manage ecotourism so that it is an enlightening nature travel experience that contributes to the conservation of the ecosystem while respecting the integrity of the host community. Ecotourism or sustainable tourism primarily focuses on Indigenous peoples, lands ecosystems and cultures. However, ecotourism should not only look at protecting the environment, or the biodiversity, it must also take into account protection of the cultural diversity, and other important views of the Indigenous and local communities, operating in the cultural context of the community.

The International Ecotourism Society (TIES) defines ecotourism as "*responsible travel to natural areas that conserves the environment and improves the welfare of local people*".The Green Globe 21 International Ecotourism Standard has adopted Australia's definition of ecotourism and the same reads as follows: "*Ecologically sustainable tourism with a*

primary focus on experiencing natural areas that fosters environmental and cultural understanding, appreciation and conservation."

SUSTAINABILITY OF TOURISM AND COCERNS ON PRESERVING THE NATURE

The vast developmental potential of tourism is recognized globally. However the long term sustainability of tourism as a means of development is increasingly being questioned, mainly because of its adverse effects on the environment, fast depletion of natural resources etc .There is a well-accepted consensus for applying the principles and objectives of sustainable development to tourism.

Sustainable tourism development represents two basic schools of thought. These are (1) concern with the promotion of sustainable development, despite its challenges and (2) concern with the condemnation of the industry. The former admits that tourism is potentially destructive, however acknowledges that tourism will continue to be a significant global phenomenon. On the other hand the latter school of thought straight away argues that sustainable tourism development is a myth and it is impossible to promote tourism whilst at the same time maintaining a good quality environment.

Accordingly whichever may be the perspective, there needs to be some way of developing tourism in uniform with broader environment. (Niles 1991).

For want of a well-accepted and sustainable model for tourism development, initiatives economic development cannot be put on hold as no single type of tourism is more inherently sustainable than another. In this context the observation of Butler (1998) appears relevant "inevitably any form of tourism development can only be judged sustainable or unsustainable after a long period of operation, when it can be ascertained if the demand of activity have not prejudiced the needs of what, where the future generations when development begun".

Community Based Tourism

Community based tourism is tourism in which local residents, often rural poor and economically marginalized, invite tourists to visit their communities with the provision of overnight accommodation.

Community based tourism enables tourists to discover local habitats and wildlife, and celebrates and respects traditional cultures, rituals and wisdom. The community will be aware of the commercial and social value placed on their natural and cultural heritage through tourism and this will foster community based conservation of these resources.

Thanks to responsible tourism and CBT, nature lovers can visit wild areas accompanied by a local guide who explains the traditional uses of the plants and local forest resources, transmitting experience rather than mere information.

Community-based tourism affords travelers with rare opportunities to experience local communities first hand. It's distinctive in that it provides an alternative to development that's not sustainable, giving rural and poor communities an additional source of income.

In supporting community-based tourism, you can immerse yourself in the day-to-day lives of local and indigenous people while helping them to preserve their environment and cultural heritage.

The residents earn income as land managers, entrepreneurs, service and produce providers, and employees. At least part of the tourist income is set aside for projects which provide benefits to the community as a whole.

Tourists will spend time near areas that are rich in culture and biodiversity and at the same time, will get to know the locals at the grassroots level.

Many successful experiences in development countries prove that tourism can become a leading sector for the people who conserve natural resources and live on it. Local people of these countries jointly cooperate in Community Based Tourism and this gives not only economic benefits for them but also becomes an example of community involved decision making. A community by definition implies individuals with some kind of collective responsibility, and the ability to make decisions by representative bodies.

Locals' participation, traditional culture, cross-cultural issues and raise of local income are basic principles of tourism and it is fundamental to get more in depth for development countries where tourism is dominantly operate by great foreign companies.

Usually families' interviews make obvious that locals are interested to take part in tourism activities but they don't know how. Often the creation of Community Based Tourism is the best solution for local people or at least a great help for them for example in these countries where the main income is from livestock and the desertification, the spread of unproductive land deprived of vegetation, is one of the main concerns (like in Mongolia).Community Based Tourism is the jointly planned and managed tourism activities of local group: this new business never can be the main or only income source of the communities and cooperatives but can be additional income possibility. Issues like generating additional incomes for locals and reducing impacts on environment are included in the government policy about tourism as

- Develop tourism as a stimulus of the economy to generate income through sustainable use of natural resources by organizing local people and joint implementation;
- Develop new travel products that are efficient for locals and friendly for the environment, society and civilization;
- Develop an integrated network of local cooperatives that act independently to preserve geographic and cultural features of various ethnicity

Outputs

- Local would be able to generate additional income other than animal husbandry through participating in the travel activities
- Locals' interests to conserve their living environment will be increased;
- A system to sell geographically and culturally different groups' and cooperatives' products as one integrated product will be established (This website is one way)

- Cooperation of rural development and sustainable natural resource management projects of the international organizations and donors countries can provide these travel products future stability

The six characteristics that define rural community tourism are that it:

1. Integrates natural beauty and the daily life of rural communities
2. Promotes productive sustainable practices within its tourism offerings
3. Adapts itself to the dynamics of rural life and preserves the welcoming, relaxed, rustic atmosphere that characterizes the rural areas of the country.
4. Is maintained by local initiative and participation, and strengthens local organizations, which are made up of various families or of the community as a whole.
5. Integrates the locals in this economic activity, distributes the benefits evenhandedly, and supplements farming income.
6. Promotes land ownership by the local population.

STATEMENT OF THE RESEARCH PROBLEM

Sustainable tourism has taken off in a big way in the state of Kerala because it has many tourist destinations known for their natural beauty and exquisite landscape, and it is one of the greenest destinations in the whole country. It is widely recognized that the state is a perfect hub for promoting tourism thereby increasing the living standards of the people.

In view of the unique status of Kerala "the Gods own country- in respect of an enviably attractive natural beauty as well as its rich culture and tradition, the state is the perfect location for all forms of tourism. In spite of all the achievements in the recent years the state is yet to pick up in tourism development in general and sustainable tourism in particular.

In the above context, it is relevant to look into the problems and prospects of community based tourism in Kerala by making a special reference to a typical community based tourist destination Kadalundi Vallikkunnu Community Reserve (KVCR).

"To analyze the problems and prospects of community based tourism with special reference to KVCR, a typical destination in Kerala, based on the feedback from local residents, feedback from the officials of tourism and forest departments; to identify the significant positive and negative factors affecting local community and tourism in general, and hence to offer suitable suggestions for enhanced performance of tourism that can foster economic development in the region"

Research Questions

1. What are the biological – physical and economic impacts of KVCR on the local community?
2. Is there any association between the socio economic profile of local community at KVCR and their attitude and satisfaction level?

3. What could be the pragmatic suggestions to enhance the performance of the KVCR based on the feedback from stake holders?
4. What are the suggestions of the major stake holders via local community regarding improving the facilities available at KVCR: including the opinion of the official staff associated with in the destination.

OBJECTIVES OF THE STUDY

1. To assess the biological- physical and economic impact of KVCR project on local community.
2. To study the problems faced by local inhabitants of KVCR.
3. To suggest pragmatic solution for the development of KVCR.

METHODOLOGY

The study is based on both primary and secondary data. The primary data have been collected by using a sample survey method. The sample consists of the response of the hundred local inhabitants of KVCR. Sampling has been done by simple random sampling.

Secondary data are also used in this study. Reports published by Kerala Tourism Development Corporation (KTDC) and Government Departments like the Department of Forest and the Department of Tourism are used. Besides, publications of Kerala State Planning Board, World Tourism Organization (WTO) and research publications in authentic research journals are also used.

Statistical Tools: Popular statistical tools including various scaling and indexing method are used for analysis and interpretation.

PROFILE OF THE STUDY AREA

Kadalundi Vallikkunnu Community Reserve

It was one among the first three community reserves in India declared on 18th October 2007. Being community reserve 150 hectares of estuary area will be protected. The specialty of this Community Reserve is the participation of people to protect the rare forests and birds. The movement is a very good step for Bio-conservation

The Kadalundi Vallikkunnu Community Reserve (KVCR) is located on the western side of the northern Kerala in Kozhikode and Malappuram districts on the river mouth of Kadalundi River spreading in the estuary. It extends in Kadalundi of Kozhikode Taluk of Kozhikode district and in Vallikkunnu of Tirurangadi Taluk of Malappuram district. Area of KVCR extends up to 153.84 Ha. Kadalundi Panchayat has an important place in the tourism map of our country. It is estuarine land caressed by coastal tides. The area is winter haven to numerous migratory birds. The natural beauty of Kadalundi estuary, mangrove vegetation and the water splendid areas which reflect the coconut palms and nearby trees, are really splendid and matchless.

The mangrove vegetation seen on these coastal lands are one of the rich repositories of the country's mega biodiversity. The mangrove vegetation seen in Kadalundi area

supports the species like Acanthus ilicifolius,Avicenniaofficinalis, Excoecariaagallocha, Rhizophoraapiculata, Rhizophoramucronata, Sonneratia alba etc. which attracts botanists and nature enthusiasts across the nation.

The mangroves play an important role as a nursery ground in the early stages of fish, shellfish and other crustaceans making this an important area for fishing. In addition to crabs, prawns and mussels, fish species like Mangrove red snapper (chembally), Large scale mullet (Malan), Grey mullet (Thirutha), Brown shrimp (chudanchemmen),Tiger Prawn and solea are so common here.

One of the main attractions of Kadalundi estuary and mangrove vegetation is the numerous migratory birds visiting seasonally from faraway places. The important birds are different species of gull and herons. Gulls, Reef herons, Pond herons, Terns, Plovers, Sandpipers, Sunbirds, Bee eaters, Mynas, Pigeons, Parakeets etc can be sighted at close vicinity. This is an ideal place for the public to enjoy their leisure time in the lap of the pristine green nature and to observe them at close vicinity

SIGNIFICANCE OF THE AREA

- Kadalundi is an estuary with unique mangrove vegetation and associated fauna. A large portion of the shallow wetland is exposed with intertidal fluctuations which attributes to the unique characteristics of this wetland. The upriver margins contiguous to the estuary are perhaps the best abodes of mangroves.
- The estuarine marshland areas display the functional characteristics and role of a mangrove wetland system. The tidal flood waters recede during the low tides, exposing the open area of the estuary up to the eastern end, delimited a little westward, creating the vast forage ground of mudflats for innumerable number of living organisms including migratory birds.
- The diversity in resource utilization is great phenomenon of this area. This ranges from sand mining to shell mining, fishing oyster catching, mussel farming, peat collection, coir retting etc. Now a day the boundless possibilities of tourism are also being tapped by inhabitants. The area provides immense opportunities for research and education, recreation and livelihood support.

Beneficiaries

The distributions of number of sample beneficiaries are given from the various LRDCs of the panchayat.

CASTE WISE DISTRIBUTION OF LOCAL INHABITANTS

Table 1
Caste Distribution

Category	*Male*	*Female*	*Total*
FC	1	4	5
OBC	2	64	66
SC	4	25	29
Total	7	93	100

Source: primary data

The need to deal with the caste factor is to get an idea about the degree of participation from different castes and awareness. Under this section caste are categorized as SC/STs and others. The reason for such categorization is to analyze whether at least half of the SC/ST communities were beneficiaries of the schemes an envisaged in it.

It would be seen from the table that out of 100 beneficiaries 29% belongs to SC/ST and 71%belongs to other castes.

Table 2
Classification on the Basis of APL/BPL

Category	*Total*
APL	31
BPL	69
Total	100

Source: primary data

Out of 100 samples selected BPL forms 69% and APL forms 31%. So one can figure out that the families belong to BPL are the major inhabitants.

EDUCATIONAL BACKGROUND OF LOCAL PEOPLE

The given table deals with the distribution of the sample on the basis of education.

Table 3
Educational Status

Category	*Total*
Graduate and Above	2
Under Graduate	11
Below SSLC	70
Illiterate	17
Total	100

Source: primary data

The table shows that majority up to SSLC (70%) only. Illiterate forms 17% which is higher than the state level. The financial constraints are the main reason

Table 4
Source of Drinking Water

Category	*Total*
Own well	28
House connection	5
Public well	49
Neighbours well	18
Total	100

Source: primary data

Majority of the inhabitants depend on public well, only 28% have their own well. Only few have house connection. All Respondents are living in coastal area. So they do not have access to fresh water.

INCOME DISTRIBUTION OF LOCAL INHABITANTS

Income distribution being the primary concern of the measurement of standard of living.

Table 5
Distribution of Income

Category	*Total*
Below 10000	29
10000-20000	38
20000-30000	22
30000-40000	7
40000 Above	4
Total	100

Source: Primary data.

Income distribution facets shows that majority (38%) stays far ahead than the state average. Even though only a minority earns more than Rs 40,0000.

Table 6
Attitudes of Local People Towards Service Facilities

SI. No.	*Service Facilities*	*No. of local people answered positive*
1	Incentive from tourists	12
2	Government Support	32
3	Infrastructure development	34
4	Revenue from accommodation	10
5	Environmental awareness	78
6	Self-employment opportunities	43
7	Initiatives of LSGD	38
8	Attitude of project officials	49
9	Demand for local products	53
10	Conservation of resources	78

Source: Primary data

Environmental awareness, attitude of project officials, demand for local products, conservation of natural resources etc are accepted at high ratings by local people in KVCR.

Table 7
NEGATIVE Biological and Physical Impacts

SI. No.	*Biological and Physical impacts*	*No. of local people answered positive*
1	Destruction of natural habitats	23
2	Decrease in airQuality	22
3	Decrease inwater quality	28
4	Decrease in land scape characteristics and quality	24
5	Decrease in sensitizing of ecosystem	38
6	Decrease in abundance and diversity of flora and fauna	53
7	Sand mining and soil erosion	66
8	Problems due to coir retting	57
9	Decrease in theaesthetics of the area	55

Source: Primary data

INDEX OF NEGATIVE IMPACTS

Negative impacts are of different types-biological, physical, socio economic and cultural impacts. They are destruction of natural habitats, decrease in air quality, decrease in water quality, decrease in land scape characteristics and quality, decrease in sensitivity of eco systems, decrease in abundance and diversity of flora and fauna, soil erosion and sand mining, displacement and change of migration patterns of fauna, decrease in the aesthetics of the area, degradation of the environment ,disruption to local peoples life style living culture ,loss of cultural values and heritage, local authorities have less control over development activities, lack of sufficient infrastructure, economic leakages to outside business owners, poor profitability from tourism business, high incoming out migration of local people etc.

Table 8
POSITIVEBiological and Physical Impacts

SI. No.	*Biological and Physical impacts*	*No. of local people answered positive*
1	Increase in conservation awareness	68
2	Reduction in environmental efforts	54
3	Increase in the aesthetics of area	76
4	Increase in abundance and diversity of flora and fauna	79
5	Increased conservation and preservation of natural resources	75
6	Increase in water, air and other environmental qualities	65

Source: Primary data

INDEX OF POSITIVE IMPACTS

Positive impacts are of different types, increase in conservation and awareness among local community, increase in aesthetics of area, increase in abundance and diversity of flora and fauna, increased conservation and preservation of natural resources, increase in water, air and other environmental qualities, increase in collaboration with all the stake holders, better communication, transportation and infrastructure facilities, better social or public services in the areas, prevention of people's out migration, increase in employment opportunity, increase in education level of students, stimulation of local

Table 9
NEGATIVE Socio Economic Impacts

SI. No.	*Socio economic impacts*	*No. of local people answered positive*
1	Local authorities have less control over development activities	69
2	Lack of sufficient infrastructure	66
3	Disruption to local peoples life style and living culture	64
4	High incoming out migration of local people	70
5	Loss of income and employment causes unstable local economy	79
6	Poor profitability of tourism business	73
7	Economic leakages to people outside the reserve	70

Source: primary data 4.91

livelihood approach, local empowerment and control over resources and development in areas, establishing sustainable livelihood alternative for local communities, increase in level of people's participation, increase in economic benefit for the livelihood improvement of local household, change in employment opportunities, increase in wealth in local communities and also the increase in funds for local development

The overall negative socio economic impact is 4.91.The negative socio economic impact indexed from 80 is remarked as "stress areas". Here stress areas are from SE1 to SE7, representing local authorities have less control over development activities, lack of sufficient infrastructure, disruption to local people's life style and living culture, high incoming out migration of local people, loss of income and employment causes unstable local economy, poor profitability of tourism business, economic leakages to people outside the reserve etc.

Table 10
Positive Socio Economic Impacts

Sl. No.	*Socio Economic impacts*	*No. of local people answered positive*
1	Increase in collaboration between all the concerned stake holders	29
2	Better transportation and infrastructure facilities	28
3	Increase in money for local development	30
4	Increase in money in local economy	32
5	Better Social or public services in the areas	27
6	Prevention of people's out migration	20
7	Increase in employment opportunities	22
8	Encouragement to higher education	38
9	Stimulation of local livelihood approach	36
10	Local empowerment and control over resources and development in areas	39
11	Established sustainable livelihood alternative for local communities	17
12	Increased people's participation	25
13	Change in employment opportunities	28
14	Increase in economic benefits for the livelihood improvement of local community	30
15	Improved environmental education	41
Source:	primary data	4.42

The overall positive socio economic impact is 4.42.The positive socio economic impact indexed up to 80 is remarked as stress areas ie SE1 to SE7 and SE11 to SE14 representing increase in collaboration between all the concerned stake holders, transportation and infrastructure facilities, increase in money for local development, increase in money in local economy, better social or public services in the areas, prevention of peoples out migration, increase in employment opportunities, established sustainable livelihood alternative for local communities, increased people's participation, increase in economic benefits for the livelihood improvement of local community, change in employment opportunities etc

The negative socio economic impact was very high when compared to positive socio economic impacts. It can be inferred that negative impact was high in the case of socio economic conditions at KVCR area after the implementation of this project.

The services which are poorly rated are in the beginning which provides clear insight in to the policy makers to develop appropriate strategies to alleviate it. The services which are indexed low can be called "stress areas". Governments with the participation of private sectors and local community should undertake new strategies to make the services more acceptable for tourism.

AWARENESS

Awareness is the prominent factor helps to work efficiently the KVCR Scheme. The surveys are being covered with adequate information of the awareness.

Table 11
Awareness of the Programme

Source	*Respondents (%)*
Local political leaders	26
Friends and relatives	32
Panchayat leaders	12
Voluntary organization	20

Source: Primary data.

The table 4.11 highlights the role of voluntary organizations like Kudumbasree, Ayalkoottam, etc. in making the people well aware about project.

FINDINGS, PROBLEMS, STRATEGIES AND CONCLUSIONS

KVCR is an upcoming tourist destination in the Malabar region. It is an estuarine land caressed by coastal tides was the green mangroves adjoin mud flats during low tide. It is an abode of diverse flora and fauna across the final laps of Kadalundi river forming a beautiful estuary. The implementation of KVCR is a great step towards the protection of this ecosystem. But what left to the local community is a great matter of concern. Their income level diminishes, employment opportunities dwindled, standard of living fall down and there is no much improvement in education or health. Local communities are not benefitted in such a situation. The development of Kadalundi in to an important community based eco-tourism destination is the one and only solution to this problem. This leads to a development in the infrastructure, earning from tourism, good and better employment opportunities to local people.

FINDINGS

- The major portion of the population in the area belongs to socially disadvantaged groups.
- More than 50 per cent of the population studied only up to plus two and almost 100 per cent of the population have ability to read and write.

- It has been noted that younger generation especially male students are increasingly inclined to acquire technical education. The study also indicates that the literacy rate among women is also increasing.
- Considering the economic and employment situation in the area ,it was observed that nearly 52 percent of the households have annual income below 20000 and the earning members of these households are mostly unskilled casual labourers. Only a small portion (7 per cent) of the earning population has secure government employers.
- It was noted that the local population depend on the financial institutions both private and state sponsored from time to time. Their utilization of the financial aid thus obtained points to the fact that loans are availed for non-subsistence purpose i.e. not for employment generation or for improvement of the income earning opportunities.
- The employment profile points to another important pattern as the traditional, natural resource depended Subsistence is minimal in the area particularly after the implementation of KVCR
- Lack of proper management system is an important obstacle for the implementation of KVCR. Community Reserve Management Committee (CRMC) with members nominated from Panchayaths are not able to manage such a big project funded by central and state governments.
- In the past mangroves were used for green manure, and the reserve land was also used for extensive fishing, coir retting, sand mining, primary needs, as a route of transportation and for shell mining. The reserve land is now used for the purposes like tourism, irrigation, water transportation, and with some restrictions activities like sand mining, fishing and mussel culture which leads to loss of income and employment to local people causing an unstable local economy.
- Unavailability of drinking water caused by saline water during tidal fluctuations is a major problem in the community reserve. Even people with own wells were not able to get pure water
- Unscientific coir retting and sand mining practices are still undergoing in some parts of KVCR which is a great threat to the ecosystem of the reserve.
- Strict rules and laws were implemented for the conservation of the reserve which are very important as far as the reserve is concerned but in turn it effects the livelihood of the local people very badly.
- The low earnings for the local community clearly depicts that the tourism potential of KVCR is still under utilized.
- Environmental awareness, self-employment opportunities, positive attitude of project officials, demand for local products, conservation of natural resources etc are accepted at high ratings by local people in KVCR.
- The stress areas in the biological and physical negative impacts are decrease in sensitivity of the ecosystem, decrease in abundance and diversity of flora and fauna,

soil erosion and sand mining, problems due to coir retting and decrease in aesthetics of the area.

- When compared with the negative biological and physical impacts, positive biological and physical impact was high. There are no stress areas in positive biological and physical impacts.
- There are too many stress areas both in positive and negative socio economic impacts. But the negative impact was very high in the case of socio economic conditions at KVCR

Problems of KVCR

- The first and foremost problem to be addressed is that of drinking water. KVCR is situated in one of the estuaries of Lakshadweep Sea, by name Kadalundi estuary .This again is sandwiched by the Beypore and Ponnani estuaries. Saline infiltration is the major drawback in this area. Several projects were implemented for drinking water here. Many proposals are in the anvil. Unless and until this major problem is addressed, people will not be patient enough to co operate with the conservation efforts in the locality. The objectives for empowerment, development and quality living can only are realized after finding a permanent solution for drinking water facilities in the society.

The study conducted in the five localities of the community reserve caused identification of several problems in the locality which are listed below

- Scarcity of drinking water caused by saline water during tidal fluctuations
- Pollution due to coir retting
- Flooding of the land during rainy season
- Disposal of wastes including butchery items causing land and water pollution
- Shortage of transport and communication facilities
- Disposal of sewage , sullage and faecal materials in to the river
- Disposal of waste materials on shores during high tide period, including organic wastes, hazardous wastes and plastic wastes.
- Abundance of stray dogs due to constant presence of butchery and other organic wastes
- Attack on livestock by stray dogs
- Loss of employment due to stoppage of retting and other traditional practices
- Loss of revenue due to depletion in fish population and mussel growths
- Disaster experience from tsunami
- Fear and anxiety on loss of employment and revenue
- Hurdles and problems faced in vegetable farming
- Disturbance due to wild animals in mangrove forests
- Lack of facilities to tourists for food and accommodation

- Lack of primary healthcare facilities and primary education centers
- Problems due to mosquitoes and contagious disease
- Unstable river banks and erosion problems
- Unemployment and lack of job orientation facilities and vocational centers
- Problems due to expansion of mangrove forests to private settlements and common properties
- Disruptions in power supply due to interruptions inside mangrove forests
- Nuisance from anti-social elements due to absence of street lights
- Loss of revenue due to non- extension of lease area by Gram Panchayaths
- Depletion growth of mat making grass(chelli) and lack of revenue due to this

ECO DEVELOPMENT AND STATEGIES

Eco Development Plan

Increasing biotic pressure from the local communities is always a threat to management of the ecosystem and protected areas. At the same time, the people living in and around the protected areas also suffer on account of denial of access to the bio resources the area, as well as damage to crops to and live stock from wild animals .Eco development is a strategy to overcome unsustainable and incompatible resource use practices by the dependent communities for their livelihood in and around the protected area through regulated, sustainable and compatible use and alternative through participation of various stakeholders. In other words it is ecologically sustainable economic development of the local people based on sustainable utilization of local renewable resources by adoption of site specific conservation friendly packages of measures. Mangrove ecosystem is very fragile and people's sustenance in the area, mainly depends on the maintenance and sustainable use of the ecosystem. At the same time this eco system is the most productive ecosystem on the planet guiding the benefit of the nutrient cycling of both terrestrial as well as marine system. Therefore understanding of the system and its importance is very useful to people and awareness building among the people around the mangrove forest is necessary. Educating people around the reserve about the importance of conservation of mangrove ecosystem and its natural resources as well as launching of programme of training and demonstration of improvised technology for bringing socio economic development in the region will certainly help in the conservation of this unique ecosystem.

OBJECTIVES

Provide the alternate income generating activities to the inhabitant and thus reduce their dependency on natural resources like sand and mangroves

Specific Issues

The community reserve management focus on the conservation of the existing mangrove ecosystem, sustainable and wise use of the wetland, the socio economic

development of the stakeholders and the protection of community reserve. The socio economic upliftment of the people based on the natural resource of the reserve. The local people participation in the protective aspects of community reserve should ensure through educating and creating awareness among people. Other specific issues are

1. Scarcity of drinking water
2. Educational upliftment
3. Pollution from upstream inhabitants
4. Sand mining
5. Coir retting

Strategies

The eco development activities should focus on the overall livelihood of the community

Plan for Drinking Water Management

The scarcity of drinking water due to salt water intrusion is the key issue prevalent in the community reserve. In order to address this issue, the rain water harvesting systems can be initiated at household and community level. Financial assistance has to be rendered for the installation of rain harvesting systems and awareness camps are to be conducted. The maintenance and protection of ponds in the community reserve has to be carried out.

Plan for Educational Upliftment

Educated public plays a key role in success of eco development programmes.Hence the educational profile of the people in the Community Reserve has to be elevated. Financial assistance should be provided for the nurseries and anganwadi's already established in the area. Assistance can be provided for financially backward students for higher education.

Plan for Product Diversification

Coir making is one of the traditional occupations of inhabitants of the community reserve. But most of the people are now engaged in other sectors due to non profitability of coir making. The traditional coir retting practices has so many limitations and requires a large water body for the purpose. The unscientific coir retting is prevalent in the locality and the modern technology has to be promoted in the area

The product diversification and value addition can be introduced in coconut to attract the traditional coir workers. Trainings on value addition of coconut like oil extraction, coir and mat making, handicrafts from coconut shell, coir pith etc can be conducted. The coir pith generated from mechanical deliberators can be composted which will provide very good manure and can generate employment.

Plan for Employment and Income Generation

- Apiculture can be introduced in the area to promote the livelihood of the local people

- Training on fish processing and value addition and aquaculture can be conducted in the area
- The duck, quail, rabbit farming and mushroom culture can also be introduced

Plan for Waste Management

- The area is affected by pollution from domestic waste and sewages which create numerous health problems. Pollution due to degradable and non degradable wastes poses serious threat to the mangrove ecosystem. The solid waste generated from various sources can be managed through the implementation of the solid waste management facilities such as composting recycling etc
- The plastic waste processing unit has to be established in the area which can act as an additional source of income to the reserve through the collection and processing of wastes from other areas
- Biogas plants have to be established in the area to reduce the pollutants.
- Hanging latrines with outlets directly to the water body has to be changed in to sanitary latrines.

Plan for Sand Mining

Protective staffs should be deployed in the reserve area to protect the river beds from illegal sand mining. These riverbeds are the halting station of migratory birds. The unscientific extraction will disturb the mangrove system and this has to be regulated. The extraction is carried out by inhabitants of the community reserve as well as people outside. Limited degree of extraction can be allowed to inhabitants of the reserve and others should be regulated.

Plan for Mangrove Management

- The first and foremost important activity to be done is the survey and demarcation of the mangrove reserve area.
- Activities should be carried out for restoration of mangroves in the degraded areas.
- Lopping of mangroves in the area where it creates problem to public people and vista clearance has to be carried out every year.
- If any area is degraded .the natural regeneration can be assisted with the help of local communities.
- Some of the inhabitants depend on mangroves for fire wood. The dependency of local people on mangroves has to be reduced
- A germ plasma collection of the different mangrove species occurring in Kerala has to be established in the area. Similarly a nursery of different mangrove species can be maintained in the reserve area with the help of local community.
- Remuneration should be given to inhabitants who support mangrove cultivation on their own land.

- Similarly retrofitting has to be done if any of the inhabitant wishes to relocate from KVCR area

CONCLUDING REMARKS

In view of the foregoing, it may be stated that promotion of tourism in India is an imperative rather an option. This is more relevant in a state like Kerala – "the God's own country", one of the most promising states in India for tourism development. While the steps already stated by the Governments of India and Kerala appear to be in the right direction, there needs to be focused efforts in the direction of tourism. There is the need for ensuring the full participation and participation by the local community. This is essential to ensure the long-term prospects of the sector. Furthermore, there is the urgent need to limit the number of visitors in each tourism destination so that the natural environment can withstand the pressures. Once the various measures as above are implemented in letter and spirit the prospects of Community Based Coastal Tourism in India and particularly in Kerala appear to be quite bright.

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Assessment of Coastal Vulnerability to Climate Change:

A Case Study of Ernakulam District, Kerala

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Abstract: **The vulnerability of fishing community towards the climate change, being a subject of great concern all over the world, takes the form of social, economic and even geographical and biological issues.This paper addresses the relationship between vulnerability of fishing communities to climate change in Kerala.The study indicated that fishers' response to climate changes was in consonance with real time changes in the environment, with regard to temperature rise, rate of pollution, the change in wind pattern as well other ocean parameters. It was also noted that the long term effects of climate change weren't felt much among the fisher household.**

IndexTerms - **Vulnerability, Sustainable development, Climate Change, Natural Degradation, Fishing Community, Vulnerability assessment**

I. INTRODUCTION

Climate change being the buzzing word of the hour, have gained a lot of attention from all over the world, from all stakeholders, administrators, politicians, environmentalists, scientists, scholars and even the technocrats. For centuries, atmospheric carbon dioxide had never been above about 300 parts per million. However, the current level being 400 ppm, owing to the escalation in integration of technology in almost every aspects of human life. i.e., the harsh impact of the industrial development and the resultant fast urbanisation of the world. Global warming, being the rise in the average temperature of the Earth's surface and its atmosphere, is the most closely related aspect of climate change, being both its cause and result. The greenhouse gases, emission, aerosols and soot, solar activity all being the causes of it. The outcomes of this phenomenon being sea level rise, sudden and extreme weather fluctuations, climate changes, ecological imbalance, and other long and abrupt impacts. All of these, being the repercussions of one another, often creating imbalance in the vulnerable ecology and even human lives, like inundation from sea level rise disturbing the infrastructure and human settlements.

Fishing communities being the most vulnerable in this category, faces a lot of harmful backwash effects of the same. Fisheries, being the important contributor to food security and livelihoods are responsible for providing essential nutrition for 3 billion people and about 50% of animal protein for people in the poor countries.The fishing sector in third world countries are more vulnerable when compared to that of developed nations who have better tools and means to exploit the resources. The climate change can have the impact on changes in various aspects affecting the fishing activities, namely, the availability, stability, accessibility and utilization. India, being a peninsular country, and fishing, being a major industry of the coastal states which employs over 14 million people, the fishing communities here, are undeniably susceptible to after effects of climate variations. Riding on a robust demand for its frozen shrimp and frozen fish in international markets, India exported 11,34,948 MT of seafood worth an all time high of US$ 5.78 billion (Rs 37, 870.90 crore) in 2016-17 as against 9,45,892 tons and 4.69 billion dollars a year earlier, with USA and South East Asia continuing to be the major importers while the demand from the European Union (EU) grew substantially during the period.(MPEDA 2017)

The vulnerability of fishing community towards the climate change, being a subject of great concern all over the world, takes the form of social, economic and even geographical problems. "A coastal area profile presents a variety of information required for effective decision-making and planning, including environmental and socio-economic information and the analysis of problems and opportunities for sustainable coastal development" (FAO). Fishing has been considered as a primary livelihood option since time immemorial, for the occupants of the coastal belt in India, stretching along 8129 km.

Fisheries sector play an important role in the economic activity of the nation, through its contribution to national income, foreign exchange, food and employment. About 12.49 lakh fisher folk operate using diverse types of craft-gear combinations with regional and seasonal variations all along the Indian coastline. The secondary sector provides employment to more than 15 lakh people and another two lakh people is employed in the tertiary sector. It is estimated that fishery and allied activities provide livelihood security to about 30 million people (Sathiadhas et al, 2007). The density of population is very high all along the coastline as compared to the midlands and the highlands (Asia Development Bank, 2003). Kerala was made a leading producer and consumer of fish, due to the presence of a very rich marine wealth with a large variety of fish and a highly skilled population of (Aerthayil, 2000). Kerala, being an important exporter of marine products and host of various fishing communities is also facing a crunch due to both uncontrolled fishing activity, the resultant over exploitation of resources,environmental pollution as well as the effects of climate change.

II. VULNERABILITY ASPECTS AND FRAMEWORK

The conditions, situations and indicators related to the vulnerability framework and concepts takes the following aspects and dimensions, including geographical, social, environmental, technical, sectorial, equity related, policy related , gender specific, and so on.

Along the coastal areas, coastal erosion and the measures taken to control it have together led to the loss of several beaches. The barrier beaches & backwater islands of Kerala are very sensitive environmentally, socially and economically as a large population depends on the system. The communities in most of such island systems are ecosystem people who depend on the natural island system for their survival. Degradation of resources, uncertain employment and earnings, limited livelihood assets and subsistence almost entirely from fishing impacts these community's livelihood options. Rao et al., (2005) and, Beck and Nesmith (2001) argue that there is a need to give greater attention to the role of Common Property Resources (CPR) in poor people's livelihoods. Non-motorised boats with low mobility for comparatively poor fishermen also adds to the problem of catch fluctuations.The sole dependence of people on marine fishery for their livelihood itself is a major challenge. The stock of resources is reported as depleting and the resulting conflict prevails between the traditional fishermen and the capitalists. The policy connected with deep sea fishing is allegedly making distress to fishermen. Most of the fishermen are severely indebted, addicted to alcohol & drugs, under educated and lacking skills for alternate employment. It helps occasionally in mushrooming of the illegal activities and attracts more and more unemployed youth. Darkened expectation in life, illiteracy, lack of awareness & counselling support, rising influence of alcohol and drugs, rise in communalism and criminal tendencies, etc. are some of the reasons for such social issues. On a whole, backwardness becomes the hallmark of fisherman. This vicious circle of poverty needs to be broken so that a virtuous circle of prosperity is set in motion by 2030. (John Joseph, 2015). Consequently schooling on one hand result in putting the out of their traditional occupation and also the dropout rate is higher in fisher folk. (John Kurien, 1981).So, the people have limited alternative skills other than the traditional fishing activities.

"Increased incidence of extreme events such as storms, floods and drought will affect the safety and efficiency of fishing operations, flow of rivers; area covered by wetlands and water availability and will have severe impacts on fisheries. Sea level rise will have effects on the coastal profile and livelihoods of communities. The potential outcome for fisheries may be decrease in production and value of fisheries, and decline in the economic returns from fishing operations". (E. Vivekanandan). Inter-governmental Panel on Climate Change 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).

It is the open-access or common property nature of the sea that attracts large numbers of poor people to find their livelihoods there, and they are badly affected when the terms of access to the resource change. Open access allows the entry of bigger players into the sector, which come to dominate or even monopolize access to resources – often with the facilitation of the state – and marginalize traditional stakeholders. Development efforts have given rise to a hierarchy based on economic criteria in the villages. The diffusion of new technologies has benefited a few people, with the large majority becoming wage earners and several others becoming redundant. Changes in marketing patterns brought about a change in sharing patterns, transforming fishing crew from shareholders to employees, although they still retain a share in the catches. (Venkateshsalagrama).

About the societal issue faced by the fishing communities due to climatic change, the primary challenge to the fisheries and aquaculture sector will be to ensure food supply, enhance nutritional security, improve livelihood and economic output, and ensure ecosystem safety. These objectives call for addressing the concerns arising out of climate change, and evolve adaptive mechanisms and implement action across all stakeholders at national, regional and international levels (Allison et al., 2004; Handisyde et al., 2005; Leary et al., 2006; World Fish Center, 2006; FAO, 2008). In response to shifting fish population and species, the sector may have to respond with the right types of craft and gear combinations, on-board processing equipments etc. Governments should consider establishing Weather Watch Groups and decision support systems on a regional basis. Allocating research funds to analyze the impacts and establishing institutional mechanisms to enable the sector are also important.(E.Vivekanandan). For instance, Coastal Regulation Zone notification is perceived as being partially effective, trawl ban is considered to be effective.

Trade policy tools like tariffs, subsidies and standards, can also affect the fishers. Likewise, a major problem of competition with more powerful forces, coupled with the community based governance systems and the absence of institutional mechanism among the fishers, can be addressed by promoting cohesion within the fishing communities, imparting awareness about new laws and schemes that which restrict or promote the fishing activities and to encourage capacity building. On a different note, adaptive capacity can be increased through equal distribution of resources. It is related to the resource conservation and participation in management, which are in turn linked to the aspect of technology of harvesting, certain historical rights and even certain value premises. Within each zone of Kerala coastline, geography, fishery resources, infrastructural and mechanical facilities and market access are relatively same. Thus, the fishing community can have greater involvement in the development and conservative management of fishery resources with the united efforts of active fishermen, social workers, social and physical scientists and voluntary associations concerned with socio-economic and ecological issues. However, artisanal fishermen are more affected, leading to poverty. Open and regulated access to new technologies can be emphasised.

On the gender perspective, the fisherwomen in Kerala play an important role in the fisheries sector in terms of their involvement in fishery related activities viz., fish vending, fish drying, prawn peeling, sorting, grading, fish packing, and net making. However, they are more vulnerable than men in receiving the after effects of the impacts. The highest level of gender discrimination faced by all the respondents across the four different occupational groups were in handling, transporting and storing bulk quantities of fish resources. "Micro enterprises and SHGs linked to any financial institution in order to obtain credit facilities, like RashtriyaMahilaKosh, NABARD, banks; can be assisted technically or financially by local self-government or NGOs, GramaPanchayat, Municipalities, Corporation, or resource departments. The flagship programmes of SAF, and the Theeramythri mainly aims at the social and economic emancipation through encouraging employment. This can act as a great relief for BPL fisherwomen, who does jobs like vending and trading of fish, apart from household support, as it helps to achieve a financial stability;

and non SHG members, can organise occupational ones to start micro enterprises. In Kerala, 80% of the income generating groups were formed by the women beneficiaries. Similarly, Mahatma Gandhi National Rural Employment Guarantee Act was implemented, with over 91% beneficiaries as women in Kerala. Regarding political empowerment, after the implementation of Panchayati Raj in early 90s and the decentralisation of power in the local self-government department bringing a reservation for women first up to 33% and then to 50%, women empowerment has increased on a great sense. But, violence and sexual harassment against fisherwomen are on an increasing trend. Still they face several social and economic barriers. So gender specific strategies are to be initiated and implemented, like establishment of self-help groups, etc., thereby creating additional livelihood opportunities for them.With education, awareness, active participation and employment generation by implementing inter-disciplinary models through SHGs and welfare schemes, they can drive the development process in a faster pace. So, it should be a strong focus on involving and empowering women in particular because income earned by this group is more likely to benefit the entire household. Gender sensitive research helps in attaining the inclusive growth through finite strategies of development, so the sustainable goals can be met for uplifting the vulnerable groups in the context of aspects like climate change and development".(Pavithran.A.P, Sachin; Devi.D,Sarada, 2017).

So, altogether, for the betterment of the condition of the fishing communities, development of regional adaptation networks is a necessity. According Sunil Santha, "formal adaptation strategies are highly techno-centric, costly, and do not take into account the vulnerabilities of the fishing community. Instead, they have contributed to ecological, livelihood, and knowledge uncertainties. The adaptation strategies of the fishing community are a response to these uncertainties." So, evidences are to be generated, gathered and documented. Linkages between scienctific aspects, policies and practice should be strengthened. Establishment of the network between the members and identifying the location's priority needs helps in addressing the problems more systematically and efficiently.

III. MAJOR HAZARDS THAT AFFECT THE COASTAL FISHING COMMUNITIES IN ERNAKULAM

1.Cyclone, which hinders the fishing activity for a definite period of time, even affecting the marine lives also. The recent occurance of the cyclone, Okhi along the Kerala coast is a relevant example of how the livelihood of the fishing community were affected.

2.Storm surges , which curbs the boats from going in the offshore areas, thus curbing the prospects of a better catch. Fishing is mainly dependent on seasons and a poor or delayed monsoon, which affects the indigenous and seasonal fishes and thereby, the seasonal harvests also.

3.Floods, can hamper the livelihoods of the fishing community, affecting the poor infrastructure and fishing activities.

4.Sea level rise, can cause the various outcomes of variation in currents and bottom pressure in the near shore regions, variation in tidal activities, changes in wave patterns, and so on.

5.Coastal erosion, is reported to affect about 23% of the shoreline along the Indian mainland. (Vivekanandan,2011)

6.Fish availability can change with respect to tabulations in the weather pattern and it manifests in the forms of changes in the migration and breeding seasons of fish varieties , or even endangering some of the fish varieties eventually.

IV. MATERIALS AND METHODOLOGY

Selection of coastal villages Coastal villages from Ernakulam District for the study were selected based on different parameters viz., socio-economic factors, number of families below poverty line, job migration, infant mortality, adult-child ratio, average family size, gender ratio, literacy rate, dependence on fishing activities, craft and gear inventories, participation in cooperatives and ancillary activities. The study was conducted for a period of one year from May to November 2015 .

V. SOCIO-ECONOMIC PROFILE

The socio economic profile collected include ages of the fishers, educational standards of the fishers , experience in fishing(years) and distance of houses from coastline (m). The study on the age distribution of respondents revealed that the majority of them belonged to the mid age group of 36 to 55 years.This was followed by older age group, i.e.; people belonging to over 55 years and finally the young age group. The younger group being in minority can probably be attributed to change from traditional fishing to other means of livelihood.

VI. RESEARCH METHODOLOGY

Vulnerability studies are being conducted on an increasing basis, due to growing concerns and discussions regarding the various effects and implications of climate change as well as the socio-economic resources. So the various potential drivers that helpsin adding the frame to the vulnerability study of fishing community were to be considered.

Vulnerability to climate change is defined by IPCC (20007:883) as "the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, indicating climate variability and extremes" and is a "function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity".

The vulnerability indices were constructed using parameter, attribute, resilient indicator and score (PARS) methodology, a conceptual framework developed for assessing the climate change vulnerability of coastal livelihoods. PARS provides prioritisation and ranking of different impacts as perceived by the fishers and the frame work allows adequate distribution between fishing. The fishers were asked to rank between 1 – 5 indicating the severity of the vulnerability: 5 indicates very high, 4 - high, 3 - medium, 2 - low and 1- negligible/marginal. Each and every parameter will lead to different attributes and the attributes will lead to different statements or resilient indicators which will be based on different scores. The rank based quotient technique was used to analyse the scores and the ranks were in such a way the most affected attribute will get the highest ranking. PARS methodology was analysed using rank based quotient (RBQ) formula of Sabarathnam (1988).

The formula has the following form:

$$RankBasedQuotient = \sum_{i=1}^{n} (Fi)(n + 1 - i)X\frac{100}{Nn},$$

where, Fi = number of farmers reporting a particular problem under ith rank, n = number of problems identified and N = number of fishers.This methodology is very much useful to find out which parameter or which attribute of the parameter is the most vulnerable factor of the area in terms of climate change.

VII. RESULTS AND DISCUSSION

7.1. Analysis of Vulnerability Parameters

Table 7.1: Rank wise analysis of various vulnerability parameters

Parameters	Chellanam	Rank	Cheriyakadavu	Rank	Kannamali	Rank	Composite data	Rank
Environmental	60.23	2	59.31	1	58.30	3	59.28	2
Fishery	62.45	1	58.43	2	61.30	1	60.72	1
Social	57.43	4	57.50	3	60.40	2	58.43	3
Economic	58.32	3	53.43	5	59.45	4	57.06	4
Development Drivers	52.45	5	56.45	4	58.40	5	55.76	5

Source: Primary data

PARS methodology was applied in an effort to understand the indicator factors of coastal vulnerability in the selected fishing villages of Ernakulam district and scale up the impacts, adaptations and mitigation plans of coastal livelihoods to the district level. The application of PARS methodology in this study helped to assess impact of climate change on the five different parameters considered.

Among the three fishing villages studies, the analysis of environmental parameters showed that Chellanam was the most vulnerable area (60.23%) towards the climate change; followed by Cheriyakadavu (59.31%) and Kannamali (58.30%). While analysing fishery indicators also Chellanam was found to receive major part of the impact (62.45%), and Cheriyakadavu was the least affected with (58.43%) and Kannamali being 61.30% susceptible to the impact. When considering the third indicator, i.e., the social parameters, it was found that Kannamali faced 60.40% of impacts of the social indicators, and Cheriyakadavu and Chellanam remained somewhat similar with 57.50% and 57.43% respectively.The same pattern was seen upon analysing the impact of development drivers with Kannamali having 58.40% ,Cheriyakadavu with 56.45% and Chellanam having 52.45%. In the case of economic parameters, Kannamali had the most impact among the three fishing villages, with 59.45 %, followed by Chellanam (58.32%) and Cheriyakadavu (53.43).

Upon considering the composite data of all the three villages, it was found that the fishery indicators affected the villages the most with 60.72%. This was followed by environmental parameters (59.28%) and social parameters (58.43%). The villages were affected by economic indicators by 57.06% and lastly by development drivers by 55.76%. Several selected aspects were considered upon selecting the various indicators which were clubbed together under various parameters.

The study in the selected fisher households in all the three villages indicated that climate change has mostly impacted fishery based on the fishers' perception on different attributes followed by other attributes. In Chellanam fishing village , fishery parameters(62.45%) had severe impacts, which were followed by environmental impacts (60.23%) and economic impacts(58.32%); whereas in Kannamali, fishery attributes had the greatest impact (61.30%), which were followed by social impacts(60.40%) and economic attributes(59.45%).

The data on the composite villages indicated that on a wider level also, fishery is the most impacted parameter, owing to the heavy felt effects of the climate change followed by the effects and impacts of environmental and social parameters. Here, development drivers is the least impacted parameters as perceived by the fishers.

7.2. Fishers' perception on the causal factors of climate change

An analysis was carried out to assess the fishers' response to what could possibly be the causal factors for climate change. The perception of the fishers towards the casual factors of climate change indicated that temperature, sea level rise, ocean currents, landslides, urbanisation, cyclones, industrialization, habitat destruction, pollution and wind can be considered as the causative agents of climate change.

The potential causes for the various impacts can be related to anthropogenic (pollution and overexploitation) and climatic factors. Upon considering the views of the community level actors, both pollution and rising fishing pressure that leads to increased exploitation of the marine resources, are also considered as major stressors on fisheries resources. (Vivekanandan, 2011). The fishers responded that temperature (85.9%) followed by pollution (75.2%) and sea level rise (63.1%) as the significant causal factors for climate change.

VII. CONCLUSION

The study indicated that fishers' response to climate changes was in consonance with real time changes in the environment, with regard to temperature rise, rate of pollution, the change in wind pattern as well other ocean parameters. It was also noted that the long term effects of climate change weren't felt much among the fisher household. The fishers could only realize immediate issues such as loss in fishing days and erratic monsoon resultant which in turn leads to economic losses. Relatively poor technology,

infrastructure, economical factors of cost and revenue, barriers and laws, along with the equity issues related to the accessibility , poor linkages and gender related social and economic barriers adds up the crisis. This can be effectively addressed through sustainable management andensuring equitable resource distribution, capacity building, promoting adaptive capacity, spreading awareness on various laws and schemes, establishment of institutions, taking measures to protect the environment and by emphasizing the gender sensitive strategies.

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