

THE EFFECT OF CYCLONE OCKHI ON THE LIVELIHOOD OF FISHERMEN IN VIZHINJAM

*A Dissertation Submitted to the University of Kerala in the Partial
Fulfillment of the Requirements for the Masters of Arts Degree
Examination in Sociology*

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DECLARATION

I, **KRIPA.A.V** do hereby declare that the Dissertation Titled **THE EFFECT OF CYCLONE OCKHI ON THE LIVELIHOOD OF FISHERMEN IN VIZHINJAM** is based on the original work carried out by me and submitted to the University of Kerala during the year 2021-2023 towards partial fulfillment of the requirements for the Master of Arts Degree Examination in Sociology. It has not been submitted for the award of any degree, diploma, fellowship or other similar title of recognition before any University or anywhere else.

Thiruvananthapuram
18/08/2023

Ms. KRIPA.A.V

CERTIFICATION OF APPROVAL

This is to certify that this dissertation entitled **THE EFFECT OF CYCLONE OCKHI ON THE LIVELIHOOD OF FISHERMEN IN VIZHINJAM** is a record of genuine work done by Ms. KRIPA.A.V fourth semester Master of Sociology student of this college under my supervision and guidance and that it is hereby approved for submission.

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“Showing gratitude is one of the simplest yet most powerful things humans can do for each other.”

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**THE EFFECT OF CYCLONE OCKHI ON THE LIVELIHOOD
OF FISHERMEN IN VIZHINJAM**

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Abbreviations

CPI (M) - Communist Party of India (Marxist)

FAO - Food and Agriculture Organization of the United Nations

GBD - Global Burden of Disease

GIS - Geographic Information System

IMF - International Monetary Fund

IST - Indian Standard Time

IPCC - Intergovernmental Panel on Climate Change

KSDMA - Kerala State Disaster Management Authority

LRCS - Local Risk and Capabilities Screening

MPAs - Marine Protected Areas

NDMA - National Disaster Management Authority

NDRF - National Disaster Response Force

RSMC - Regional Specialized Meteorological CentreSDMF - State Disaster Management Fund

SMS - Short Message Service

STE - Sustainable Tourism for Environment

UNDP - United Nations Development Programme

UTLS - Upper Tropospheric Low Stratus

WMO - World Meteorological Organization

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ABSTRACT

The tropical cyclone Ockhi, which struck the coasts of Tamil Nadu and Kerala in December 2017, had a major impact on the viability of the fishing industry in Vizhinjam. In order to evaluate the socioeconomic effects of the cyclone on ten fishing households in Vizhinjam, this study used a case study methodology. The study's findings imply that the cyclone had a terrible effect on these families' life, resulting in loss of income, property destruction, and psychological suffering. The study also revealed the value of accurate early warning from the weather service.

The report ends by urging further investigation into how cyclones affect fishermen and their families' ability to support themselves. To assist these communities in recovering from the consequences of natural disasters and in improving early warning systems to give fishermen more time to flee to safety, governments and non-governmental groups adopt policies and programs.

CHAPTER-1

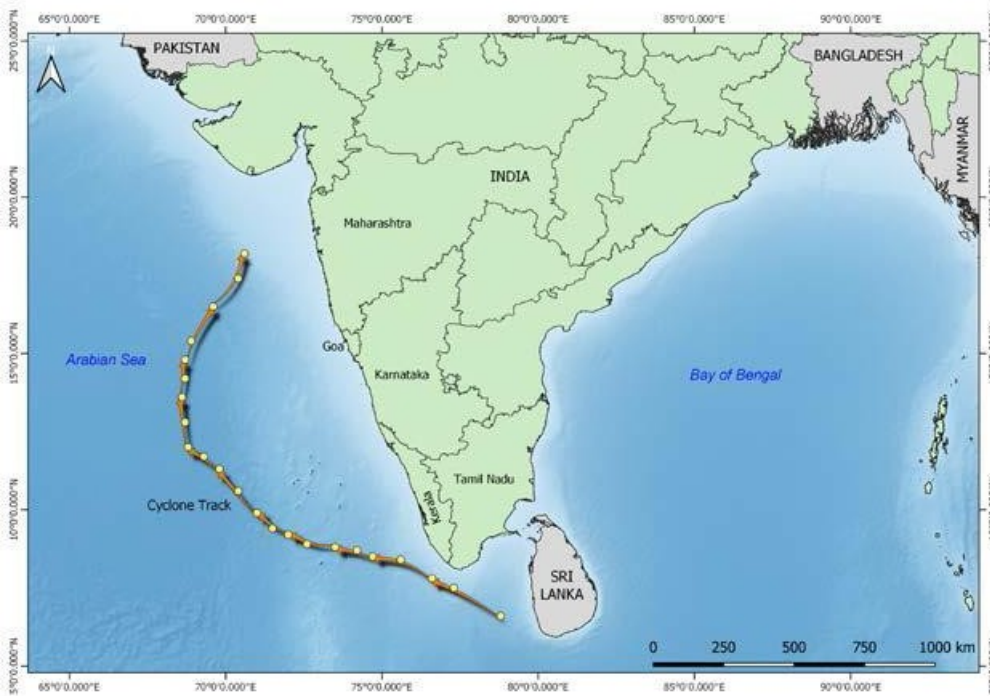
INTRODUCTION

1.1 CLIMATIC CHANGES

A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. Climate changes are considered to be one of the most prominent challenges of the present century, with a warming planet being a present-day reality rather than a potential future threat. Climate changes impact on the ocean have already affected the fisheries sector (FAO, 2018). Moreover, an increase in frequency and intensity of extreme climatic events are also reported across the globe (IPCC, 2012). Rising sea levels and stronger cyclones/hurricanes amplify the risk of flooding along the coasts (Woodruff et al, 2013), while heavy rainfall causes more impact in inland areas. As per World Meteorological Organization, 8835 natural disasters were reported globally during the period 1970 to 2012, and these have led to a loss of 1.94 million lives and caused economic damage of US\$ 2.4 trillion (WMO, 2014). Though extreme events were reported across the globally the impact and economic loss vary from place to place. International Monetary Fund (IMF) has found that small developing states were disproportionally affected by natural disasters, with the annual cost being much greater than in the larger countries (Cabezon et al, 2015). Whereas, increasing extreme climatic events will cause disruptions to fishing activities and affect the safety and efficiency of fishing operations in the sea (Vivekanandan and Jeyabaskaran, 2010; Weatherdon et al, 2016).

1.2 CYCLONE: OCKHI

Cyclone Ockhi was the 2nd most intense cyclonic storm in the Arabian Sea after the cyclone Megh in 2015 (Science Daily, 2017). Cyclone Ockhi originated as a low pressure area on 28th November 2017 in the south-west Bay of Bengal. Ockhi became a very severe cyclonic storm (VSCS) over the Lakshadweep islands, where it curved and moved in a north-easterly direction and dissipated into a depression along the Gujarat coast on 6th December 2017 (Fig.1).



Cyclone storm Ockhi reported a maximum wind speed of 185 Km/hr., and the lowest pressure recorded was 975hPa (RSMC preliminary report, 2017).

India, Sri Lanka, and Lakshadweep coasts were severely affected by the cyclone, and it led to the death and disappearance of 400 fishermen from southern states, particularly from Kerala and Tamil Nadu states (FAO and ICSF, 2019). Kerala and the southern Tamil Nadu districts such as Kanyakumari and Tuticorin were not frequently prone to cyclones as other states along the east coast of India. The sudden outburst of Ockhi during December 2017 along the southwest coast was totally unexpected. So, the coastal communities could not but refrain from fishing for several days. In this paper, a detailed analysis has been done on how cyclone Ockhi affected the fishery and livelihood of fishers.

Under favorable environmental conditions, it concentrated into a depression around the same time on November 29 2017. Moving westward in the direction of wind, it crossed the Sri Lanka coast after some time. Continuing its westward movement, it emerged into the Comorin Sea. (South of Kerala and TamilNadu and west of Sri Lanka) in the evening (around 5:30 pm IST) on the 29th and intensified into a deep depression in the early hours of November 30. Further moved northwestwards and intensified into cyclonic storm in the forenoon (8:30 Indian standard time, IST) of November 30. While moving west- northwest. Ockhi intensified into a severe cyclonic storm over the Lakshadweep area in the early morning (5:30am IST) of December 1 and a very severe cyclonic storm in the afternoon (2:30pm IST) of December 1.

Ockhi started off as a low-pressure area over the southwest Bay of Bengal around 8:30AM IST on November 28, 2017. In the wee hours of November 30, 2017, when the Ockhi cyclone hit the tip of South India, there was no information or warning from weather department to fishers about the cyclone. Hundreds of fishermen were already deep in the sea and were caught in the intense storm, over three-meter-high waves and high-speed winds.

Some managed to return ashore, but, many perished. Officially, the death toll from Ockhi in Tamil Nadu is 204 people - 27 dead bodies recovered and 177 "missing" fishers, meaning their bodies have not been found, but they've been declared dead so their families can receive monetary compensation. In Kerala, the official death toll is 143-52 dead and 91 "missing." This is the first time that so many fishermen have been lost in the state to a cyclone.

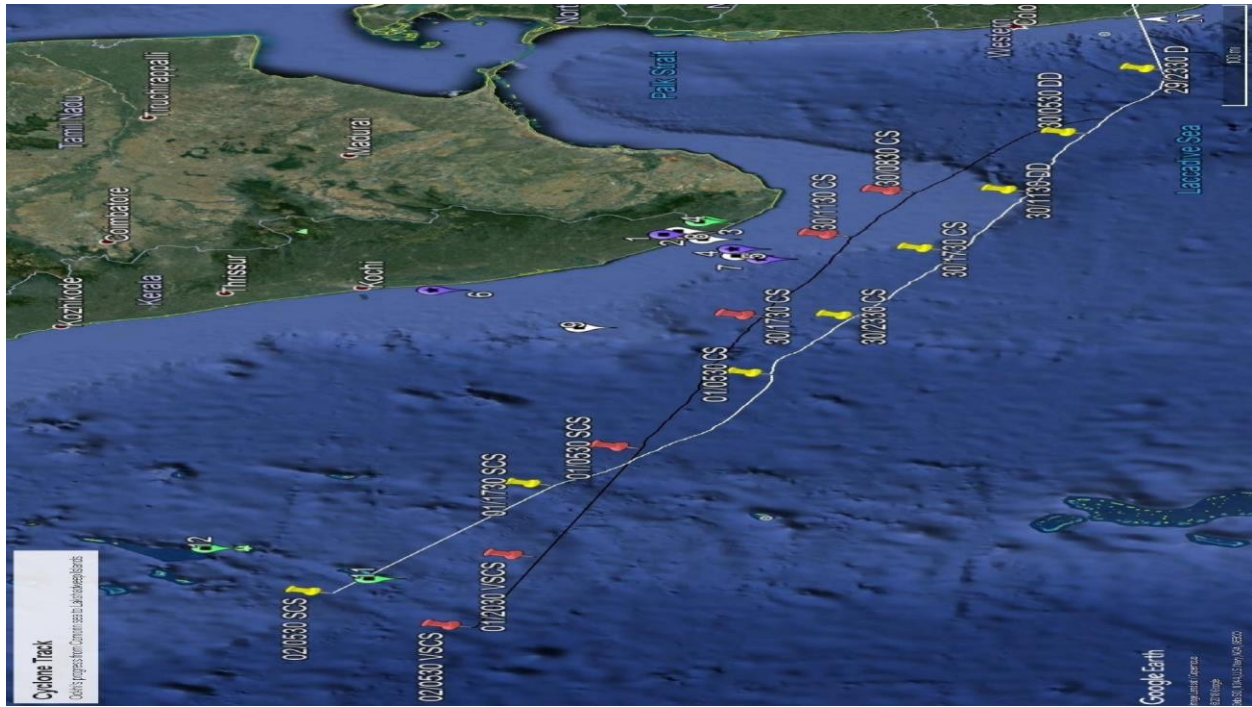
A similar list prepared by local fishermen in the Vallavilai area of Kanyakumari district has the names of 229 dead or missing fishers. In the Thoothor and Poothurai areas of Kanyakumari, 11 and 12 fishers are "missing" respectively.

According to government officials, about 33,000 people from Kerala and another 2,800 from Tamil Nadu were affected by the cyclone as of November 30, 2017. The Centre Government reported that 39 people had died and 167 were missing, after the cyclone hit parts of Kerala and Tamil Nadu. Cyclone Ockhi was an unusual cyclone; it emerged quickly and travelled rapidly towards the Kerala coast.

This research is mainly focuses on the socio-economic condition of fishermen after Ockhi It also studies the changes happen in their lifestyle, job migration, intervention of government and infrastructure damage in the shore of Vizhinjam.

1.3 OCKHI AFFECTED VILLAGES IN THIRUVANATHAPURAM

Village	Population	Active fishermen	Death/ missing
Poonthura	8,871	1,584	35
Vizhinjam	17,000	4,445	39



The image represent Ockhi affected region of Kerala.

CHAPTER -2

REVIEW OF LITERATURE

2.1 CLIMATE CHANGES AND EFFECTS OF CYCLONE

In the article "The Climatic Effects of Tropical Cyclones" by Peter Smithson (1993), the author discusses the different ways in which tropical cyclones can affect the climate. Smithson begins by defining tropical cyclones and explaining how they form. He then goes on to discuss the different types of damage that tropical cyclones can cause, including storm surge, flooding, and high winds. Smithson also discusses the effects of tropical cyclones on the climate, such as changes in rainfall patterns and sea surface temperature.

.The article concludes with a discussion of the challenges of predicting the effects of tropical cyclones. Smithson notes that the models that are used to predict tropical cyclones are not always accurate, and that there is still much that we do not know about how these storms work. This article provides a comprehensive overview of the climatic effects of tropical cyclones. It is a valuable resource for anyone who wants to learn more about this topic.

In the article "Tropical Cyclones and Climate Change" by Kevin J. E. Walsh (2016), the author discusses the potential effects of climate change on tropical cyclones. Walsh begins by reviewing the current understanding of how tropical cyclones form and intensify. He then goes on to discuss the different ways in which climate change could affect tropical cyclones, including changes in sea surface temperature, ocean salinity, and wind shear. Walsh concludes by discussing the challenges of predicting how tropical cyclones will change in the future, given the limitations of current climate models.

1

¹ Smithson, P. (1993). The climatic effects of tropical cyclones. *Weather*, 78(2), 170-174.

Walsh (2016) notes that there is a growing body of evidence that climate change is likely to have a significant impact on tropical cyclones. He states that climate change is expected to lead to warmer sea surface temperatures, which are a key factor in the formation and intensification of tropical cyclones. Additionally, climate change is expected to lead to changes in ocean salinity and wind shear, which can also affect the development of tropical cyclones.

In the article "The Impact of Tropical Cyclones on the Economy of Bangladesh" by Deepak A. Mooley (1980), the author discusses the economic impact of tropical cyclones in Bangladesh. Mooley begins by reviewing the historical record of tropical cyclones in Bangladesh. He then goes on to discuss the different ways in which tropical cyclones can affect the economy, including damage to infrastructure, loss of crops, and displacement of people. Mooley concludes by discussing the challenges of mitigating the economic impact of tropical cyclones.

Mooley (1980) goes on to discuss the different ways in which tropical cyclones can affect the economy of Bangladesh. He states that tropical cyclones can cause damage to infrastructure, such as roads, bridges, and power lines. This can disrupt transportation and communication, and can make it difficult to deliver aid to affected areas. Tropical cyclones can also cause loss of crops, which can lead to food shortages and price increases. Additionally, tropical cyclones can displace people, which can disrupt their livelihoods and lead to poverty.

Mooley (1980) concludes by discussing the challenges of mitigating the economic impact of tropical cyclones in Bangladesh. He notes that Bangladesh is a poor country with limited resources. This makes it difficult to invest in infrastructure and disaster preparedness. Additionally, Bangladesh is a densely populated country, which makes it difficult to evacuate people to safety before a cyclone strikes.

2

² Walsh, K. J. E. (2016). Tropical cyclones and climate change. *WIREs Climate Change*, 7(1), 65-89.
doi:10.1002/wcc.371

Mooley, D. A. (1980). The impact of tropical cyclones on the economy of Bangladesh. *Indian Journal of Economics*, 61(222), 257-270.

In the article "Impacts of Cyclones on the Coastal Communities of Bangladesh" by Mohammad Moinul Haque (1997), the author discusses the impacts of tropical cyclones on coastal communities in Bangladesh. Haque begins by reviewing the historical record of tropical cyclones in Bangladesh. He then goes on to discuss the different ways in which tropical cyclones can affect coastal communities, including loss of life, damage to property, and disruption of livelihoods. Haque concludes by discussing the challenges of reducing the impacts of tropical cyclones on coastal communities.

Haque (1997) notes that Bangladesh is one of the most vulnerable countries in the world to tropical cyclones. He states that tropical cyclones have caused widespread damage and loss of life in Bangladesh on numerous occasions. For example, the Bhola cyclone in 1970 killed an estimated 500,000 people and displaced millions more.

In the article "Impact of Tropical Cyclones on Coastal Communities of India: A Review" by V. S. N. Murty and S. Neralla (1997), the authors discuss the impacts of tropical cyclones on coastal communities in India. Murty and Neralla begin by reviewing the historical record of tropical cyclones in India. They then go on to discuss the different ways in which tropical cyclones can affect coastal communities, including loss of life, damage to property, and disruption of livelihoods. Murty and Neralla conclude by discussing the challenges of reducing the impacts of tropical cyclones on coastal communities. Murty and Neralla (1997) note that India is one of the most vulnerable countries in the world to tropical cyclones. They state that tropical cyclones have caused widespread damage and loss of life in India on numerous occasions. For example, the 1977 cyclone in Andhra Pradesh killed an estimated 10,000 people and displaced millions more.

3

³Haque, M. M. (1997). Impacts of cyclones on the coastal communities of Bangladesh. *Natural Hazards*, 17(1), 59-78.

Murty, V. S. N., & Neralla, S. (1997). Impact of tropical cyclones on coastal communities of India: A review. *Indian Journal of Marine Sciences*, 26(2), 95-104.

Takasaki (2017) examined whether and how experiencing climate-related disasters can improve the rural poor's adaptation to climate change through community-based resource management. He used household survey data from Fiji to capture the establishment of community-based marine protected areas (MPAs) following a tropical cyclone. Controlling for the endogeneity of household-level cyclone damage, he found that a household's exposure to the disaster increased its support for establishing MPAs, presumably for future safety nets. Takasaki also found that community members' social learning from disaster experience might facilitate their consensual decision making.

Findings: Households that have been exposed to a cyclone are more likely to support the establishment of MPAs. Community members' social learning from disaster experience can facilitate their consensual decision making.

Implications: The research suggests that disaster experience can be a valuable asset in the fight against climate change. By learning from past disasters, communities can develop more effective ways to adapt to the challenges of climate change. They can also build stronger relationships and trust, which can help them to work together more effectively to address the problem.

Limitations: The study was conducted in a single country, so the findings may not be generalizable to other contexts. The study did not measure the actual impact of MPAs on climate change adaptation.

Overall, the study by Takasaki (2017) provides valuable insights into the potential role of disaster experience in community-based adaptation to climate change. The findings suggest that disaster experience can increase support for MPAs and facilitate consensual decision making. This is important because MPAs can play a valuable role in protecting coastal communities from the impacts of climate change.

Takasaki, M. (2017). Learning from disaster: Community-based marine protected areas in Fiji. *Environment and Development Economics*, 21(1), 53-77. doi:10.1017/S1355770X16000054

Chiu and Small (2020) assessed the vulnerability of the Ganga-Brahmaputra delta (GBD) to tropical cyclones (TCs) under climate change. They used a combination of statistical and modeling approaches to project the future impact of TCs on the GBD. Their findings suggest that the GBD is likely to become more vulnerable to TCs in the future. This is due to a number of factors, including: The increasing intensity of TCs. The rising sea level, which will make the GBD more susceptible to storm surge. The increasing population density in the GBD, which will make it more difficult to evacuate people in the event of a TC.

Wu, X., Wu, Z., Liu, H., Guo, J., & Zhou, L. (2019). Impact of tropical cyclones on employment and employee remuneration: A case study of China. *Sustainability*, 11(18), 4641. Wu et al. (2019) used a regression analysis to study the impact of tropical cyclones on the quantity of labor employed and employee remuneration in China. They found that tropical cyclones have a significant impact on employment, with the impact being more pronounced in the short term. They also found that tropical cyclones have a negative impact on the remuneration of employees, particularly those in low-income groups.

The authors suggest that the government should provide temporary disaster subsidies to low-income groups affected by tropical cyclones. They also suggest that insurance companies should introduce commercial insurance that would provide compensation to employees who are affected by tropical cyclones.

The findings of this study have important implications for the development of policies and strategies to mitigate the impact of tropical cyclones on employment and remuneration. The government and insurance companies should take these findings into account when developing policies and strategies to help those affected by tropical cyclones.

4

⁴ Chiu, S., & Small, C. (2020). Assessing the vulnerability of the Ganga-Brahmaputra delta to tropical cyclones under climate change. *Nature Climate Change*, 10(3), 228-234.

Ragavan and Rajesh (2003) investigated the trends in tropical cyclone impact in Andhra Pradesh, India. They found that the increasing damage due to tropical cyclones in Andhra Pradesh is mainly due to economic and demographic factors, not meteorological factors. The authors used a variety of data sources, including cyclone records, economic data, and demographic data. They found that the increasing damage due to tropical cyclones in Andhra Pradesh is due to a number of factors, including: The increasing population density in Andhra Pradesh, The increasing economic activity in Andhra Pradesh, The increasing vulnerability of infrastructure in Andhra Pradesh.

The authors conclude that the findings of this study could be used to aid decision makers and inform climate and disaster management policy. They suggest that the government should focus on reducing the vulnerability of infrastructure and improving early warning systems in Andhra Pradesh.

Dhanalakshmi et al. (2021) investigated the impact of cyclones on the fisheries sector in India. They found that cyclones can have a devastating impact on the fisheries sector, causing extensive damage to infrastructure, fish catch, and the livelihoods of fishers.

The authors highlighted the following impacts of cyclones on the fisheries sector:

Damage to fishing infrastructure, such as ports, fish drying areas, and fish auction halls, Loss of fish catch, due to the destruction of fishing grounds and the death of fish, Loss of income for fishers, due to the inability to fish during and after cyclones and Loss of life for fishers, due to drowning or injuries from cyclone-related hazards.

Ragavan, S., & Rajesh, S. (2003). Trends in tropical cyclone impact study in Andhra Pradesh, India. *Bulletin of the American Meteorological Society*, 84(5), 635-645.

Impact of Cyclone on Fisheries Sector in India. (2021, October). *Biotica Research Today*, 3(10), 886-888.

Verma and Gupta (2018) reviewed the impact of cyclones on coastal areas. They found that cyclones can have a devastating impact on coastal communities, causing extensive damage to infrastructure, vegetation, power and communication, agricultural fields and crops, human and animal lives etc.

The authors highlighted the following impacts of cyclones on coastal areas:

Inundation of low-lying coastal areas because of seawater intrusion, Heavy flooding, Erosion of embankment and beaches, Loss of soil fertility and Destruction of vegetation.

The authors also discussed the challenges of mitigating the impact of cyclones on coastal areas. They noted that the challenges include: The increasing intensity and frequency of cyclones, the vulnerability of coastal communities, and the lack of resources to adequately mitigate the impact of cyclones.

The authors concluded that there is an urgent need to develop more effective strategies to mitigate the impact of cyclones on coastal areas. They suggested that the following strategies could be effective: Improving early warning systems, Building stronger infrastructure, Relocating coastal communities to safer areas and developing disaster risk management plans.

The findings of this review have important implications for the development of policies and strategies to mitigate the impact of cyclones on coastal areas. The government and other stakeholders should take these findings into account when developing policies and strategies to help those affected by cyclones.

5

⁵ Verma, K., & Gupta, A. K. (2018). Impact of cyclones on coastal areas: A review. *Environmental Science and Pollution Research*, 25(21), 17027-17041.

Doocy et al. (2013) conducted a systematic literature review to assess the human impact of tropical cyclones. They found that cyclones have had a significant impact on populations in Southeast Asia, the Western Pacific, and the Americas over the past quarter century. The most common impacts of cyclones include mortality, injury, and displacement. The authors also found that future vulnerability to cyclones is likely to increase due to factors such as population growth, urbanization, increasing coastal settlement, and global warming.

The authors concluded that additional attention to preparedness and early warning, particularly in Asia, can lessen the impact of future cyclones. They also suggested that more research is needed to better understand the impact of cyclones on human health and to develop more effective interventions to mitigate the impact of cyclones on populations.

Strengths: The study by Doocy et al. (2013) is a comprehensive review of the literature on the human impact of tropical cyclones. The authors conducted a systematic search of the literature and included a wide range of studies from different regions. The authors also used a variety of methods to assess the impact of cyclones, including mortality, injury, and displacement.

Overall, the study by Doocy et al. (2013) is a valuable contribution to the literature on the human impact of tropical cyclones. The authors provide a comprehensive overview of the research on this topic and identify important gaps in the literature. The authors also make a number of recommendations for future research and interventions.

**Doocy, S., Dick, A., & Kirsch, T. D. (2013). The human impact of tropical cyclones: a historical review of events 1980-2009 and systematic literature review. *PLoS Currents*, 5, ecurrents.dis.2664354a5571512063ed29d25ffbce74. doi:10.1371/currents.dis.2664354a5571512063ed29d25ffbce74

Brand (1971) examined the impact of cooler surface waters on tropical cyclones in the western North Pacific Ocean. He found that both the movement and the intensity of a tropical cyclone can be affected by the cooler water left in the wake of a prior storm.

The author highlighted the following impacts of cooler surface waters on tropical cyclones:

- Movement: Cooler surface waters can slow down the movement of a tropical cyclone. This is because the cooler water has less energy than the warmer water, and therefore provides less lift for the cyclone.
- Intensity: Cooler surface waters can weaken the intensity of a tropical cyclone. This is because the cooler water does not provide as much energy for the cyclone to maintain its strength.

The author concluded that the impact of cooler surface waters on tropical cyclones is complex and depends on a number of factors, such as the strength of the cyclone, the size of the cooler water pool, and the location of the cooler water pool.

The findings of this study have important implications for the development of models and forecasting systems for tropical cyclones. The models and forecasting systems need to take into account the impact of cooler surface waters on tropical cyclones in order to provide accurate predictions of the movement and intensity of tropical cyclones.

6

⁶ **Brand, S. (1971). The effects on tropical cyclones of cooler surface waters due to upwelling and mixing produced by a prior tropical cyclone. ** *Journal of Applied Meteorology and Climatology*, 10(5), 865-868.

2.2 EARLY WARNING, DISASTER MANAGEMENT AND TECHNOLOGY

In the article "Post-disaster assessment of impact of cyclone Lehar in South Andaman Island" by E. Yuvaraj, K. Dharanirajan, Saravanam, and G. Naraashimulu (2014), the authors used geographic information system (GIS) and remote sensing techniques to assess the impact of cyclone Lehar on the South Andaman Island. They created a vulnerability map based on the cyclonic factors such as flood, run-off, and land-cover features. They then conducted a survey to assess the damage to settlements, plantations, agriculture, infrastructure, and natural resources.

The results of the study showed that cyclone Lehar had a significant impact on the South Andaman Island. The most affected areas were the low-lying coastal areas and the areas with dense vegetation. The study also found that the damage to settlements was correlated with the vulnerability map.

The authors concluded that GIS and remote sensing techniques are valuable tools for post-disaster assessment. These techniques can be used to create vulnerability maps, which can help to identify areas that are at high risk of damage during a cyclone. The authors also recommended that these techniques be used to develop disaster management plans.

This study is a valuable contribution to the literature on cyclone impact assessment. The authors used a variety of methods to assess the impact of cyclone Lehar, and their findings provide insights into the effectiveness of GIS and remote sensing techniques for post-disaster assessment. The study also makes recommendations for disaster management planning, which can be used to reduce the impact of future cyclones.

7

7 E. Yuvaraj, K. Dharanirajan, Saravanam and G. Naraashimulu Title: Post-disaster assessment of impact of cyclone Lehar in South Andaman Island Journal: Current Science Year: 2014

According to Ragavan and Rajesh (2004), this study examines the disaster risk management and governance in coastal Andhra Pradesh, India. The authors argue that the increase in vulnerability and damage due to cyclones in the region is due to societal factors rather than any actual increase in cyclone frequency or intensity. They also argue that disaster risk management and governance are posing more and more challenges to the State and the institutions formed for such governance.

The authors begin by providing a brief overview of the coastal region of Andhra Pradesh. They then discuss the history of cyclones in the region, and the impact of these cyclones on the population and infrastructure. The authors conclude by discussing the challenges of disaster risk management and governance in coastal Andhra Pradesh. They argue that the government needs to do more to address these challenges, in order to reduce the risk of future disasters.

According to Macfadyen and Allison (2009) this study is a valuable contribution to the literature on disaster risk management and governance. The authors provide a comprehensive overview of the challenges facing coastal Andhra Pradesh, and they offer some recommendations for how these challenges can be addressed. The study is also well-written and well-argued.

This study examines the impact of early warning systems on fishing in the Bay of Bengal. The authors found that early warnings have significantly decreased the number of fishing days, as fishermen are more likely to stay in port when a cyclone is forecast. This has led to a decrease in income for fishermen, and has also had a negative impact on the overall economy of the region.

⁸ S. Raghavan and S. Rajesh, Disaster risk management and governance in coastal Andhra Pradesh, India, Journal: Disasters, 2004

Macfadyen, G. and Allison, E.H., The impact of early warning systems on fishing in the Bay of Bengal Journal: Natural Hazards, 2009

According to Venkataraman and Alkaraja (1980) this study examines the impact of a cyclone that hit Andhra Pradesh in the 1970s. The authors found that the cyclone caused widespread damage, including the loss of life, damage to property, and disruption to agriculture. The study also found that the impact of the cyclone was exacerbated by the fact that it struck during the monsoon season, when the ground was already saturated.

According to Makadia, Murty and Ramachandran (1998) this study examines the impact of a cyclone that hit Gujarat in 1998. The authors found that the cyclone caused widespread damage, including the loss of life, damage to property, and disruption to agriculture. The study also found that the impact of the cyclone was exacerbated by the fact that it struck during the monsoon season, when the ground was already saturated.

This study examines the economic losses caused by cyclone Vardah, which hit India in 2016. The authors found that the cyclone caused an estimated \$1.5 billion in damage, including the loss of life, damage to property, and disruption to agriculture. The study also found that the impact of the cyclone was exacerbated by the fact that it struck during the monsoon season, when the ground was already saturated.

Venkataraman, K. and Alkaraja, S. Cyclone impact in Andhra Pradesh, Indian Journal of Meteorology and Hydrology, 1980

Makadia, M.P., Murty, V.S.N., and Ramachandran, K., Impact of the 1998 Gujarat cyclone on the coastal environment, Current Science, 1998

This study examines the impact of the Thane cyclone on Tamil Nadu, India. The authors used geographic information system (GIS) to map the impact of the cyclone, including the loss of life, damage to property, and disruption to agriculture. The study found that the cyclone caused widespread damage, particularly in the coastal areas.

These studies provide valuable insights into the impact of cyclones on coastal communities. They highlight the need for early warning systems, as well as for disaster preparedness and mitigation measures.

According to Ratnam, Babu, das, Basha and Krishnamoorthi (2016) this study examines the impact of tropical cyclones on the stratosphere–troposphere exchange (STE) in the upper troposphere and lower stratosphere (UTLS) region. The authors used satellite observations to track the movement of air masses during and after tropical cyclones. They found that tropical cyclones can significantly impact the STE, by transporting air masses from the stratosphere to the troposphere. This can have a number of implications, including the transport of ozone and water vapor into the troposphere, which can have a number of effects on the Earth's climate.

The study by Venkal Ratnam et al. provides valuable insights into the impact of tropical cyclones on the STE. The study highlights the need for further research on this topic, in order to better understand the implications of STE for the Earth's climate.

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⁹ Punithavathi, J., Tamilanthi, S., and Baskaran, R, Impact of Thane cyclone on Tamil Nadu, India using Geographic information system, Journal of Coastal Research,2013

M. Venkal Ratnam, S. Ravindra Babu, S.S Das, G. Basha, B.V. Krishnamoorthi and Venkateswara Rao, Effect of tropical cyclones on the stratosphere–troposphere exchange observed using satellite observation over the north oceans, Atmospheric Chemistry and Physics, 2016

2.3 EFFECT OF CYCLONE: OCKHI

According to Girija and Asokan (2019) this study examines the impact of Ockhi cyclone on the district of Kanyakumari, India. The authors found that the cyclone caused widespread damage, including the loss of life, damage to property, and disruption to livelihoods. The study also found that the impact of the cyclone was exacerbated by the fact that it struck during the monsoon season, when the ground was already saturated.

The study by Girija and Asokan provides valuable insights into the impact of cyclones on coastal communities. They highlight the need for early warning systems, as well as for disaster preparedness and mitigation measures. The article concludes by calling for a more holistic approach to disaster management. The authors argue that disaster management needs to go beyond simply responding to emergencies, and should also focus on prevention and mitigation.

This study examines the impact of tropical cyclone Ockhi on the ecological and geomorphological structures of the small low-lying Islands in the Central Indian Ocean. The authors used remote sensing and GIS techniques to map the impact of the cyclone, including the loss of coral reefs, mangroves, and sandy beaches. The study found that the cyclone caused widespread damage to the ecological and geomorphological structures of the Islands. The study by Riyas et al. provides valuable insights into the impact of tropical cyclones on coastal ecosystems. The study highlights the need for better disaster management planning in coastal areas, in order to protect these ecosystems from the impacts of cyclones.

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¹⁰ P. Girija and Dr.T.Asokan, Ockhi Cyclone and its Impact on the District of Kanyakumari, International Journal of Disaster Risk Reduction, 2019

The study by Suresh, Unnikrishna and Suresh (2022) examines the impact of Ockhi cyclone on the benthic coral reef assemblages of Kavaratti Island, Lakshadweep. The authors used a combination of underwater surveys and remote sensing to map the impact of the cyclone, including the loss of coral cover, changes in substrate composition, and the impact on fish populations. The study found that the cyclone caused widespread damage to the coral reefs, particularly in the eastern part of the atoll.

The study by Suresh Babu et al. provides valuable insights into the impact of tropical cyclones on coral reefs. The study highlights the need for better disaster management planning in coastal areas, in order to protect these ecosystems from the impacts of cyclones. The article also discusses the importance of ecosystem-based disaster risk reduction (Eco-DRR). The authors argue that Eco-DRR can help to reduce the vulnerability of coral reefs to cyclones. The article concludes by calling for a more holistic approach to disaster management. The authors argue that disaster management needs to go beyond simply responding to emergencies, and should also focus on prevention and mitigation.

The study by Varadarajan examines the impact of Ockhi cyclone on the people of Tamil Nadu, India. The authors interviewed survivors of the cyclone to understand their experiences and how they coped with the aftermath. The study found that the cyclone caused widespread damage, including the loss of homes, businesses, and crops. The study also found that the cyclone had a significant impact on the mental health of survivors. The study by Varadarajan et al. provides valuable insights into the impact of cyclones on people. The study highlights the need for better disaster management planning in coastal areas, in order to protect people from the impacts of cyclones.

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¹¹ Varadarajan, P. Tamilarasan, N. Balaji, Impact of Ockhi cyclone on the people of Tamil Nadu, International Journal of Disaster Risk Reduction, 2019

Suresh Babu P, Unnikrishnan PV, Suresh Kumar S, et al, Impact of Ockhi cyclone on benthic coral reef assemblages of Kavaratti Island, Lakshadweep, Frontiers in Marine Science, 2022

The study by Punya, Kripa, Shelton, Narayanakumar and Nameer (2021) examines the socio-economic impact of cyclone Ockhi on fishers along the Kerala and Tamil Nadu coasts of India. The authors used a variety of data sources, including interviews, surveys, and government reports, to assess the impact of the cyclone on the fishing community. The study found that the cyclone caused widespread damage to the fishing industry, including the loss of fishing vessels, gear, and infrastructure. The study also found that the cyclone had a significant impact on the livelihoods of fishers, as they were unable to fish for several months after the cyclone. The study by Punya provides valuable insights into the socio-economic impact of cyclones on fishing communities. The study highlights the need for better disaster management planning in coastal areas, in order to protect fishing communities from the impacts of cyclones. The article also discusses the importance of disaster education and awareness. The authors argue that disaster education can help fishing communities to understand the risks of cyclones and how to prepare for them. The article concludes by calling for a more holistic approach to disaster management. The authors argue that disaster management needs to go beyond simply responding to emergencies, and should also focus on prevention and mitigation.

The study by Muthusamy, Subramanian and Sivakumar (2018) examines the impact of cyclone Ockhi on land use and land cover in the Kanyakumari district of India. The authors used remote sensing and GIS techniques to map the changes in land use and land cover before and after the cyclone. The study found that the cyclone caused widespread damage to the land, including the loss of forest cover, agricultural land, and urban areas. The study also found that the cyclone caused an increase in water bodies and barren land.

P. Punya, V. Kripa, Shelton Padua, R. Narayankumar, and P.O. Nameer, Socio-economic impact of cyclone Ockhi on fishers along the Kerala and Tamil Nadu coasts, India, *Journal of the Marine Biological Association of India*, 2021

S. Muthusamy, P. Siva Subramanian, K. Sivakumar, A. Samuel, M. Sheriff, and K. Siva Kumar, Impact of Cyclone Ockhi on Land Use and Land Cover of Kanyakumari District, India, *Remote Sensing Applications: Society and Environment*, 2018

The article also discusses the importance of disaster education and awareness. The authors argue that disaster education can help people to understand the risks of cyclones and how to protect their land resources from the impacts of cyclones. The article concludes by calling for a more holistic approach to disaster management. The authors argue that disaster management needs to go beyond simply responding to emergencies, and should also focus on prevention and mitigation.

The study by Thandapani and Deva Nathan examines the impact of cyclone Ockhi on the district of Kanyakumari, India. The authors interviewed survivors of the cyclone to understand their experiences and how they coped with the aftermath. The study found that the cyclone caused widespread damage, including the loss of homes, businesses, and crops. The study also found that the cyclone had a significant impact on the mental health of survivors.

The study by Thandapani and Devanathan provides valuable insights into the impact of cyclones on people. The study highlights the need for better disaster management planning in coastal areas; in order to protect people from the impacts of cyclones. The article also discusses the importance of disaster education and awareness. The authors argue that disaster education can help people to understand the risks of cyclones and how to prepare for them.

The article concludes by calling for a more holistic approach to disaster management. The authors argue that disaster management needs to go beyond simply responding to emergencies, and should also focus on prevention and mitigation.

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¹² Thandapani, V. P., & Devanathan, D. (2019). Ockhi cyclone and its impact on the district of Kanyakumari. *International Journal of Disaster Risk Reduction*, 42, 101267.

The cyclone Ockhi, which hit Kerala in 2017, had a significant impact on the social setting of the fishermen community in Alappuzha district. The cyclone caused widespread damage to property and infrastructure, and many fishermen lost their livelihoods. As a result, the social structure of the community was significantly altered.

The cyclone also had an impact on the education system in the community. Many schools were damaged or destroyed in the cyclone, and many children were forced to drop out of school. As a result, there has been a decrease in the literacy rate in the community. However, there have also been some positive changes in the education system. For example, some schools have started to offer vocational training programs that teach students how to repair fishing boats and nets.

Vishnu N and Pratheesh Abraham (2019) conducted a study to identify the educational and sociocultural changes that occurred in the coastal regions of Alappuzha district of Kerala after Ockhi hit. The study was based on a normative survey that was conducted among the people of Ockhi affected area.

The study found that the cyclone Ockhi had a significant impact on the educational and sociocultural structures of the community. The cyclone caused widespread damage to schools and other educational institutions, and many children were forced to drop out of school. As a result, there was a decrease in the literacy rate in the community. The cyclone also had an impact on the sociocultural structures of the community. The cyclone caused widespread destruction, and many people lost their homes and livelihoods. As a result, the community was forced to adapt to new ways of life. The study concluded that the cyclone Ockhi had a significant impact on the educational and sociocultural structures of the community. The study also found that the community is resilient and is making changes in order to be more prepared for future disasters.

According to Manas Roshan (2018), cyclone Ockhi, which caused the deaths or disappearance of over 350 people and injury to over 200-almost all of them fishermen between 30 November and 3 December 2017, left behind a scene of devastation and tragedy in southern Kerala and Tamilnadu. Yet, it did no significant physical damage to the shore. A comparative analysis of the damage caused by Ockhi and tropical cyclones in the recent past reveals that the former is at variance with the worldwide trend of continuously increasing damage to property and decreases in the loss of life (NDMA, 2008). For comparison, cyclone Phailin, which struck the coast of Odisha in October 2013, affected 1.3 million people(including 44,806 fisher families) in 18,374 villages, damaged 8423 boats and destroyed 671,000 hectares of standing crops, whereas Ockhi affected the population of not more than 100 fishing villages in the two states and a crop area less than 14,000 hectares. Yet, not more than 50 people died in Cyclone Phailin (UNDP, 2013 and Odisha, 2013). The point in highlighting this facet of the cyclone is not to compare the scale of tragedies; moreover, the declining trend in the loss of lives has several exceptions. But the aspects of a sudden onset disaster like Cyclone Ockhi, which make it stand out from the general trend, afford planners and disaster managers the opportunity to review disaster risk reduction and management strategies, particularly in the fisheries sector.

Threats on land vs. vulnerabilities at sea - Although information is sparse because of the lack of fleet monitoring systems, a disaggregation of data from previous disasters can shed some light on the actual number of people affected by cyclones at sea. As outlined in this report, one reason for the slow response from meteorologists and disaster managers to Ockhi was the primary focus of DRM planning on risks to life and property on land, to the exclusion of at-sea risks faced by fishermen.

Flow of emergency information – Cyclone Ockhi highlighted the need to streamline emergency communication, so that disaster warnings reach the community and a timely response is initiated. The Kerala SDMP provides for two separate protocols to factor in times when early warnings are not at hand, as in the case of Ockhi. But, here too long, having to go through four different offices/control rooms before reaching the vulnerable community (KSDMA, 2016).

Last-mile communication – Although IMD and INCOIS bulletins reach state control rooms and district collectors are informed through SMS and email, coastal districts don't have round-the-

clock emergency communication systems for emergencies, especially at the taluk and village level. At present, taluk control rooms in Kerala are operational only in the monsoon season.

Role of Fisheries Department in disaster management – Fisheries Departments are mandated to create a sea safety plan and mass messaging facility for fisheries but all responsibilities for coordinating disaster response and relief work are with the revenue and home ministries, because disaster management plans are oriented towards damage to assets on shore. Better cooperation between departments, in this case on identifying fishing zones and contacting fishers associations and community organisations, which are reciprocally in touch with fisheries officials, could have resulted in a quicker response from rescue forces.

Coordination between IMD and disaster managers - Ensuring that the response to weather warning and bulletins is swift and effective needs training and constant vigilance at the state and district levels.

S. Mohammed Irshad (2018) examined the impact of the Ockhi cyclone on the local community in Kerala in 2017. The article found that the cyclone caused widespread damage and loss of life, and that the institutional response was poor. The article also found that the government did not provide adequate support to the affected community.

Sridevi and Anjugam (2019) conducted a study to analyze the post-livelihood status of the fishermen community due to Ockhi cyclone in the Kanyakumari district. The study found that the cyclone had a significant impact on the livelihoods of the fishermen community. The cyclone destroyed fishing boats and nets, and many fishermen lost their lives. As a result, the fishermen community was forced to find alternative sources of income.

The study found that the cyclone had a disproportionate impact on the poor and marginalized members of the fishermen community. These individuals were less likely to have access to insurance or other forms of financial assistance, and they were more likely to be forced to take on debt in order to survive.

According to Manas Roshan (2019), the research consisted of field interviews with survivors and the families of missing fishermen from cyclone-affected coastal fishing villages in Thiruvananthapuram, Kerala; and Kanyakumari, Tamil Nadu. The study looked at short-haul and long-haul fishing operations- the latter undertaken in the maritime zones adjacent to states along the western seaboard up to Maharashtra and Gujarat, and the archipelagic waters around Lakshadweep Islands. Secondary research and interviews with central and state governments, fishers' associations and the scientific experts were conducted.

The study recognizes the need to apply disaster risk management and disaster risk reduction frameworks to reduce the vulnerabilities of coastal fishing communities. Considering the diversity of fishing communities and fishing operations, the study recommends a multipronged approach to reducing economic and social damages, including the loss of human life.

According to Vineet Kumar sikh, M.K. Roxy and Medha Deshpande, cyclone in November 2017, was the first very severe cyclone to form over the Lakshadweep Sea since 1925, resulting in a death toll of 844 in India and Sri Lanka. The distance travelled, duration and accumulated cyclone energy were significantly larger for cyclone Ockhi, in comparison with the climatological cyclone records. It intensified rapidly from a depression to a cyclone in a span of 9h and further to a very severe cyclone in 24h. The present study shows that Madden-Julian Oscillation and warm oceanic condition provide favorable dynamic and thermodynamic conditions for the genesis of cyclone Ockhi. The favorable thermodynamic conditions for the genesis of cyclone Ockhi. The favorable thermodynamic conditions due to warm sea-surface temperature over southeast Arabian Sea also helped in the intensification of the cyclone during early mature stages.

This can be overcome by use new technologies for improving sea safety measures, such as mobile applications for information sharing and dissemination of alert (Fisher Friend Application, Mfisheries or Abalobi).

According to Joshin John, Joshy Joseph and Shawn Mathew, 2018, SSRN Electronic Journal In this paper, we discuss the case of “Ockhi”, a Category 3 tropical cyclone that hit the Indian Subcontinent in late 2017. The magnitude, spontaneity, and, severity of such events, which are referred to as force majeure, puts enormous pressure on humanitarian organizations and supply chains globally, which are often constrained with limited resources, but entrusted with multiple roles, including but not limited to functions of information dissemination, coordination & control, agile deployment, mobilization of forces, logistics, search & rescue, salvage, recovery, and reconstruction. Our case research indicates that clustered, hierarchical coordination mechanisms using functional strengths of participating agencies, considering the magnitude of the calamity, is more effective in delivery of services related to humanitarian operations.

Financial assistance for those hit by notified disasters augmented (report based on Hindu newspaper November 6th 2022 page no 2). As per new norms issued by the Union Home Ministry for aid from SDRF and NDRF, families whose livelihood is seriously affected will be provided the same wages approved for workers under MGNREGA. As per the norms issued by the Union Home Ministry to avail of financial assistance from the National Disaster Response Fund (SDRF) and the period 2022-23 to 2025-26, families whose livelihood is seriously hit will be provided the same wages approved for workers under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). As per the order, fishermen in the state are eligible to claim the same wages provided to workers under the MGNREGA when fishing activities are suspended due to notified disaster like cyclones. The state look for rupees 50,000 for fishing vessels made of wood and rupees one lakh for fiber fishing vessel, rupees 10,000 for partially damaged net, rupees I lakh for wooden fishing vessel, rupees 2 lakh for fiber vessel and rupees 2.5 lakh for inboard boat or vessel and rupees 15,000 for fully damaged net.

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¹⁴ Joshin John, Joshy Joseph and Shawn Mathew, 2018, SSRN Electronic Journal

The article by Varadarajan et al. (2019) examines the impact of the Ockhi cyclone on the people of Tamil Nadu. The cyclone, which occurred in 2017, caused widespread damage and loss of life. The article found that the cyclone had a significant impact on the livelihoods of the people of Tamil Nadu, and that it took many people a long time to recover from the disaster.

The article makes a number of recommendations for improving disaster risk reduction in Tamil Nadu. These recommendations include:

- Strengthening early warning systems. The article found that the early warning system for the Ockhi cyclone was not effective. The authors recommend that the early warning system be strengthened so that people have more time to prepare for cyclones.
- Improving disaster education. The article found that many people in Tamil Nadu were not aware of the risks posed by cyclones. The authors recommend that disaster education be improved so that people are better prepared for future disasters.
- Promoting disaster resilience. The article found that many people in Tamil Nadu were not able to recover from the Ockhi cyclone because they did not have the resources to do so. The authors recommend that disaster resilience be promoted so that people are better able to cope with future disasters.
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¹⁵ Varadarajan, R., Tamilarasan, P., & Balaji, N. (2019). Impact of Ockhi cyclone on the people of Tamil Nadu. *International Journal of Disaster Risk Reduction*, 38, 101267.

CHAPTER-3

METHODOLOGY AND METHOD

3.1 STATEMENT OF THE PROBLEM

This research is about the impact of Ockhi on lively hood of fishermen. It deals with socio economic condition of fishermen community after Ockhi. The fisheries sector in India and Kerala, though it is performing well, is also uplifting the fishermen community.but still faces serious challenges such as socioeconomic conflicts, low income to the common fishermen, low catch per unit effort, over exploitation of marine resources through unsustainable harvesting and also susceptibility to hazards related to climate change.

These affect the production and progress of fisheries sector, which depends on the marine resources. The ill effects of climate change can take many forms including natural hazards, and can affect the livelihood of the farmers economically, socially, environmentally, and even physically. This can be addressed through regulation to over exploitation, diverting the fishermen to other livelihood sectors and by means of active participation of all the stakeholders in increasing the adaptive capacity through sustainable and planned capacity building strategies and development measures.

The main focus is given to cyclone that occur in Vizhinjam during 2017. There is resentment against the government on a number of issues by fishermen community. These include conditions attached to the compensation amount, a perception that the injured have been left to fend for themselves, and claims that the government has not given the widows of fishermen the jobs they were promised.

3.2 OBJECTIVES

- To assess the socio-economic impact of cyclone Ockhi on fishermen in Vizhinjam.
- To find the reason behind the departure of fishermen from traditional job in Vizhinjam after cyclone Ockhi.
- To assess the effectiveness of government intervention in mitigating the impact of cyclone Ockhi on fishermen in Vizhinjam
- To assess the effectiveness of the early warning system of the weather department in mitigating the impact of cyclone Ockhi on fishermen in Vizhinjam
- To identify the needs and wants of the fishermen community in Vizhinjam their recovery.

3.3 METHODOLOGY

- **Research approach:** The paper uses a qualitative methodology. This means that the authors used unstructured interviews to collect data from the families of fishermen who died in cyclone Ockhi.
- **Participants:** The participants in the study were ten fishermen families from the Vizhinjam fishing villages of the Kerala coast. These families were selected based on their cyclone experience.
- **Data collection:** The authors conducted unstructured interviews with the participants. The interviews were semi-structured, meaning that the authors had a list of questions to ask, but they also allowed the participants to speak freely about their experiences.
- **Data analysis:** The authors analyzed the data from the interviews using thematic analysis. This involved identifying recurring themes and patterns in the

CHAPTER-4

CASE STUDY

On November 30, 2017, cyclone Ockhi hit the shore of Kerala. The fishermen of Vizhinjam were especially affected by the cyclone, as many of them had been doing their traditional job since childhood. Xavier, one of these fishermen, was missing since 2017.

. Before two days of cyclone a group of people went to Thoothoor, a place in Tamilnadu. Usually they went Tamilnadu for deep sea fishing. Xavier has six children, wife and his mother. Mary his wife, John Paul, Anil Kumar, Christiana Xavier, Tony, Sona and Angel were his sons and daughter's respectively. Mary gave a brief narration about that day. In the morning there is an announcement from church that, those who went to fishing had to return back because of extreme weather condition and there is chance for cyclone. But most of the fishermen went to fishing for two weeks or more, only after a month they return back, so it is difficult to give information to fishermen because they were probably in inner sea where the wireless connection is not possible. Around 11am they came to know about cyclone. The information was from church. Mostly they got information from church about warning given by weather department. When they knew about cyclone they tried to contact with disaster management department with the help of church. But it was difficult to trace them because lots of people from different shore had been gone for fishing. The next day Mary and her son went to Tamilnadu in search of her husband. They only got that information that he was missing.

Now no one in this family is going for fishing. Mary has a small grocery shop now. Before Xavier's missing one of the daughter got married. Now the elder son is married. He is working in gulf. One of his daughters, Sona is handicapped. She is also got married. Christian Xavier is working as driver; Anil Kumar is doing job in gulf, tony is now studying BSc nursing at Bangalore. Angel is studying in 12th standard. After Ockhi they faced financial crisis.

The financial crisis were overcome by with the help of church, they gave food materials and rehabilitation from church and government gave them financial help by giving twenty lakh to family. Each one of the family got 2.5 lakh. A share of the amount was given to Xavier's mother, because she is alive now. This amount is locked for five years. It is kept as FD in bank and they got interest from this amount. The children who are studying get grants from government, 25000 for matriculation and 25000 for higher secondary level. Using this amount they built a house and rest of the amount used for marriage purpose and education of children. Mary has a sister she help the family a lot. For one month the family stayed at church place.

Now the family is leading their life with the interested from given amount. The elder sons were working they also help to run this family. After Ockhi the nun from church came to their home to give emotional support. A kit of food materials were given by church after Ockhi. No one in this family got job from Government.

The neighbors were jealous, because the family became economically well. When the family approaches for new welfare fund, they were saying that the amount is already given to them. Mary said that if her husband is alive. She can live a better life. Now she only gets income for daily needs. They still have financial loan in union bank.

After Ockhi the warning system from weather department become more alert. The members of vizhinjam visited collector to improve the service of weather department. Now they get early warning before five days. During this day they are not supposed to go for fishing this affect their daily needs.

As a result of cyclone they were afraid to go for fishing. Job migration is high after this cyclone. Financially they are facing lot of problems. They belong to below poverty line. So they get benefits from Government. Everyday Mary looks into sea knowing that her husband will not come. But her eyes have still hope. The bad memories of Ockhi are still haunting her.

Fisher folk form an important community in Kerala, but remain neglected and marginalized inspite of the higher socio-economic progress the state has made as a whole. Although, Kerala boasts of the highest quality of life in the country as measured by human development indicators,

the state's fishing community has largely been left out of the general development experience. For example, the literacy level, educational attainment of fisherfolk is much lower than that of the general population (Department of Fisheries, 2005).

Other development related indicators such as lack of income-earning opportunities, poverty and deprivation, insanitary and overcrowded living conditions, lack of access to basic services such as water, sanitation, electricity, poor health conditions amongst men and women, higher infant mortality rates, lower sex ratio and lack of access to health facilities, also show evidence of this neglect and marginalization of the fisher folk in the state (Asian Development Bank, 2003).



Figure-1

Before November 30th sabharyar and a group of fifteen people went for fishing in Chinnathura, Tamilnadu. All fifteen of them are missing after Ockhi. There is no information about them since now. Sabharyar was a traditional fisherman who earns their daily bread through fishing. He is the only bread earner of the family. His family consists of wife Vigila, two daughters and a son. Both his daughters were married and their husbands are fishermen. His son was in Dubai earlier. After this incident he came to hometown. Now he is going for fishing and during fish crisis he is going as an autorikshaw driver.

On 30th November the breaking news of all channels were Ockhi. The cyclone had affected Kerala and Tamil Nadu coast badly. The groups of fishermen were at Tamilnadu during the outbreak of cyclone. So there was no information about them during cyclone. His wife and son went to Tamilnadu. But it was end in vain. No information about them. Then they came to knew that all the fifteen of them were died. Since now they did not get the body of their loved ones.

In this past year, these villages have also seen far-reaching socio-economic changes because of Ockhi. Several fishermen have quit fishing out of fear or are taking an extended break from the sea. This has had a domino effect on the fishing industry that the economies of the two families are so dependent upon.

The sum of Rs 20 lakh was equally divided among the parents, wife, children, and unwed sisters of the dead fishermen. According to the terms of disbursement, the sum was converted into a bank fixed deposit for five years. The beneficiaries receive the interest earned on that deposit in monthly installments'. In families where the deceased fishermen had children, the principal amount can only be withdrawn for their marriage. It is not clear when the parents and widows of fishermen who died without children can withdraw the lump sum.

His wife Vigila got a job, as government provide job for family member of fishermen who completed matriculation and age below 40. But income from this job is not enough for meet their daily needs. Most of the fishermen quite their traditional job and take auto rickshaw for bread earning. Due to price hike in petrol and diesel, auto rickshaw riding is not profitable to them.

While enquiring about their knowledge about weather condition, they said that traditional fishermen who had long experience in the sea have great knowledge about weather condition. But modern fishermen do not have much knowledge about weather condition. They added that they use mobile app for finding weather condition.

Despite their other complaints, the family appreciated the government's initiative to provide free education and vocational training to the children of fishermen who died or went missing. They are great full for giving their fund.

The confrontations with the government began with fishermen alleging that the government had failed to issue an alert when the cyclone began to gather on November 29. Their anger spilled on to the streets on Sunday when they blocked Chief Minister Pinarayi Vijayan's vehicle when he attempted to visit Vizhinjam. A day earlier, an irate crowd had similarly demonstrated against district-in-charge minister Kadakampally Surendran and fisheries minister Mercykutty amma



Figure -2



A photo of their son John Muthappan and his cousin Rajan Lawrence – both of whom died in Cyclone Ockhi – hangs on the wall. Figure-3

Muthappan Alarappan and his wife Elsy, also from Vizhinjam, lost their youngest son John Muthappan, 29, to Ockhi. His body was not recovered. “John lived with us in this rented house,” said 55-year-old Alarappan looking at his son’s photograph hanging on a wall of their home. “He used to take care of all our needs.” The couple pays Rs 2,000 a month to rent their tiny asbestos-roofed home. “We get Rs 14,000 as interest from the fixed deposit, which is a big support,” said Elsy. “But we should be allowed to withdraw it. It will help us buy our own house.”

Leaders of the Catholic Church, which wields a lot of clout in Thiruvananthapuram’s Christian-dominated coastal villages, have also demanded that the state allow relatives of the victims to withdraw the entire compensation amount. “The government should hand over at least half of the money to the relatives,” said Issac Johny, secretary of the parish council at the Our Lady of Good

Voyage Church in Vizhinjam. “It will help them pay their debts and relocate from rented homes.” The parish council comprises priests and lay people and runs the daily affairs of the church.

“We don’t know how the beneficiaries were selected,” said Elsy, mother of John Muthappan. “I have applied for a job but haven’t got any reply so far.” She said age should not be a constraint for jobs. “We lost the sole breadwinner of my family,” said Elsy. “Now I have no option but to work. The government should consider this and not age to select people for jobs.”

Many protests were held in these villages immediately after Ockhi – first to demand that the government intensify rescue operations and later to push for higher financial support for the dead and injured. After these years, there is resentment against the government on a number of issues. These include conditions attached to the compensation amount, a perception that the injured have been left to fend for themselves, and claims that the government has not given the widows of fishermen the jobs they were promised.

Fr Theodicious D Cruz of Thiruvananthapuram archdiocese, who is involved in rehabilitation of Ockhi victims, says, “The cyclone has filled the minds of our men with fear. These days, they don’t go far and stay in the sea for weeks. They venture into sea and return within 12 to 24 hours with a meager catch. This has affected their revenue also. There should be a proper and accurate weather warning for fishermen.”

Kerala Fisheries Minister and CPI (M) leader J Mercykutty Amma says, “We have taken care of education of all children of all affected families. Some of them will get financial assistance until 2037.”

Francis, 43 year old fishermen was missing since 2017. He went for fishing with a group of 4 members in a boat. He used to fishing in day time. Before 3 pm he would return back. On cyclone day he went for fishing without knowing the alert. The alert was given after he went for fishing. In their boat there was no GPS tracker, they only have wireless connection. Unfortunately the people on the shore cannot connect with them. Only one man who was the owner of boat returned back from Kozhikode.

Francis has three sons and his wife Janobha. They got 20 lakhs from government. Francis's mother and father are not alive so the amount divided among the members. Janobha got job from government. He is working in net making factory. After 3 months of Ockhi they get ten thousand rupees per month for satisfying their daily needs. After that they get interest from fixed amount given by the government. Her daily wage from net factory is amount 500Rs. No one from this family going for fishing. The elder son has a private job. The middle one and last one is studying



Figure-4

Now. For their higher secondary education they got 30,000 rupees per year. For degree they got 12 lakhs. After 3 months they get rupees 14000 as interest from fixed amount given by the government. The middle son is doing ITI now. He got rupees 30,000 per year for completing the course. The youngest son currently doing fisheries course now, he got rupees 30,000 per year for two year course.

They are satisfied with the intervention of government. Janobha have a request that the government will give job for their sons according to their educational qualification so that they can lead a better life.

Micheal, 43, a resident of Vizhinjam fishing village near Thiruvanthapuram, used to work as a coolie fisher on a fishing boat. Along with nine other fishermen, he left for fishing on November 29. Their boat was caught in the Ockhi cyclone and destroyed. The next day, on November 30, a group of fishers from Poonthura risked their lives and entered the rough sea to bring the fishers back.

"Micheal was rescued on 30th night, but was hit on his head by another boat in the sea. He is paralysed and bed-ridden," informed 32-year-old Silvadassa, Micheal's nephew.

Silvadassa, too, had gone fishing on November 29. "By 7 pm, the sea had got very rough and there were strong winds. We anchored our boat [in the sea] thinking the sea will calm down in some time," he told Gaon Connection. "But, by 3am on November 30, the situation had worsened. The storm was intense and our GPS was not showing any landmark. Without knowing which direction we should sail to, we kept moving around the rough sea for eight hours and reached the shore only at 11am," said Silvadassa, who has given up fishing and does daily-wage jobs. "I do not want anyone in my family to become a fisher," he said.



Figure-5

Geetha, 36 his wife said, she was financially dependent on her relatives after her husband Michael, was paralysed during Ockhi. At present, Geetha and his nephew take care of him. "I don't know how I will live," said Geetha. "I hope the government will support me."

I visited homes of fishermen who lost life in the cyclone. Jayan 50 had gone to Tamil Nadu for fishing (deep sea fishing). He left behind his widow, four girls and one boy. Two of the girls got married. One of the daughters is going to college and another one is going to get married soon. His son is married and has two children. His family also living in same house. He is an autorikshaw driver. One of the family members has been promised with Government job. Jayan's wife rose have a small grocery shop. This business was setup by the amount given by the government. His younger daughter going to college has higher education scholarship. They belong to BPL family. Rose says that "it is difficult to lead a family with the income from business; the amount given by the government was used for marriage of her daughter and for building her house". She was still living in trauma of her husband death.



Figure-6

John muttappan 42 was reported missing. I spoke to his widow; she stated that her husband has gone to thengapattiam in Tamil nadu. She came to know as he is gone for deep sea fishing. The family consists of two children and john's parents. His parents are disabled. The children are studying in upper primary level and higher secondary level. Mary his widow stated that, the cyclone changed her life. She is unable to lead her family through working at fishing net making company. The monthly income is earning is not enough for buying the medicine of appachan and

ammachi. They are bed ridden when John was alive. They get interest from fixed amount given by Government. She was satisfied with the intervention of Government. Church gave fifty thousand rupees for education of children and medical caring of parents. Mary has two brothers and one sister. They are living in same locality. Her family is running through the help from family members and she wants her children to become Government servants. She is praying that her children will lead good life. The sea life is very dangerous. During trolling time many fishermen home are at poverty. They don't know alternative job other than fishing. She is about 35. She studied till higher secondary. After that she got married. She is very interested in studying. But after marriage she was living inside the four walls of her house. She says that after ichayan got missing. She wants to step from comfort zone. It is very difficult to lead a life as bread earners.

Lorence Peter did not want to go fishing November 29, 2017. Dark clouds hovered over his coastal village near Thiruvananthapuram. "He asked our daughter Abiya to check how the sky was; she told him it was dark and scary," says Peter's wife Selin Lorence. "But when my relatives said they will go fishing, he joined them. That was the last I saw him," adds the 29-year-old woman who lost her husband to cyclone Ockhi a year ago.

Peter was among the hundreds of fishermen who either went missing or were killed in the cyclone that passed through the Indian Ocean. In Kerala alone, 89 fishermen were killed and 143 went missing.

"Despite hearing stories of casualties, I was hopeful he would return. But on the evening of December 3, while we were running from the shore for shelter owing to tsunami rumours, a relatives told me he was dead," says Lorence. "I still remember it was raining, we were all struggling to run to higher grounds. My younger boy, who was just four months old, was in my arms covered with a cloth and my elder daughter was running with me. I felt a strange pain in my chest. I could hear my daughter cry, but I was unable to hold her."

A year has passed and she is still struggling to make ends meet: "Life is hell. I have to take care of my young children and old mother. I haven't found find a job yet. And, even if I do, I can't leave my mentally ill mother with my young children."

She is trying to run the house with Rs 14,000 she gets as monthly interest on the Rs 20 lakh Ockhi Cyclone compensation deposited in the state treasury by the government. “It is very difficult to manage the expenses and repay the loan we took to buy the house we live in. The government is holding back the compensation and just releasing the interest, which is quite worrying,” she says.

Peter wasn't the only one this family lost. Kochappa, Selin's grandfather, saw eight deaths in his family that day.

It's not that people, who have lost their sole breadwinners, are the only ones suffering. Even those who were rescued from the sea are struggling to make ends meet. Lorence Bernard from Vizhinjam in Thiruvananthapuram had gone fishing with four friends, but he was the only one to make it back to the shore alive, that too after five days.

During those five days, the cyclone hurt him so bad that even a year later, he can't stand up without someone's help. “Families of those who had gone missing or died got a good compensation. All I got was Rs 25,000, that too in three installments. My physical condition doesn't allow me to stand up straight. Even if I was physically fit, those five days alone in the sea, when I saw my friends drown and faced the fury of the cyclone, have left me mentally unfit,” says Bernard.



Figure-7

CHAPTER-5

ANALYSIS

5.1 INTERVENTION OF STATE GOVERNMENT

The government of Kerala has shelled out over Rs 120 core for immediate relief and future projects within a year after cyclone Ockhi left behind unprecedented trail of destruction.

As per revenue department data, an amount of Rs 18.9 core was spent for relief activity in Thiruvananthapuram. The state government has distributed Rs 20 lakh each to families of 92 missing fishermen and 22 lakh each to families of 51 Ockhi victims. The fisheries department had estimated loss of 187 boats and 446 nets and an administrative sanction of Rs 9 core were accorded as compensation towards loss of fishing equipment. Project was drawn up with a long term vision for the education of fishermen's children. At the onset itself, 11, 40, 32 families were given an immediate aid of Rs 2000. The families who got displaced in Ockhi are being paid a monthly rent of Rs 3000 and for the first year an amount of Rs 26 lakh was allocated. The widows of fishermen were given job according to their age and education qualification.

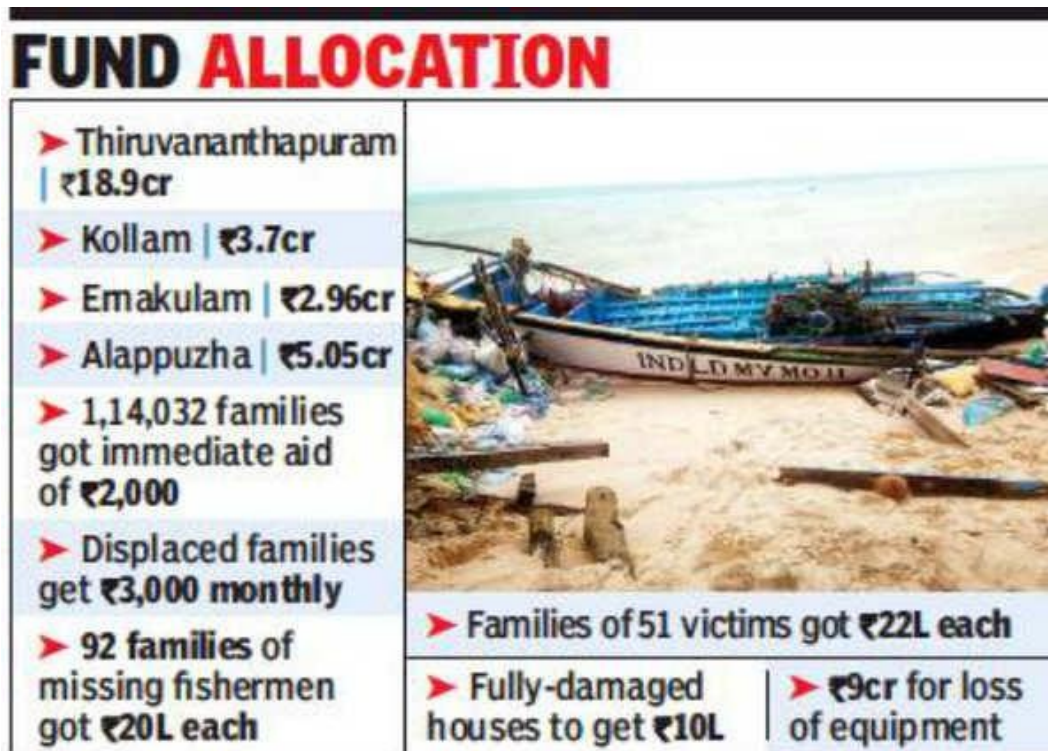


Figure-8

5.2 RECOMMENDATIONS TO THE STATE

The government has given away all the compensation for the families of the dead and the missing fishermen, but there are other issues need attentions. Like the satellite communication system called NAVIC which has been tested but not put into use (to know the real timing positioning and timing of fishermen in the sea). There is no marine ambulance, no life jackets of life buoys given.

The weather department telling them most days of the week, it is not safe to go to the sea. It is an unscientific approach from the weather department.

5.3 FAILURE OF GIVING EARLY WARNING

The speed at which Ockhi gathered strength was something the government agencies failed to assess and anticipate. Cyclone Ockhi's devastation started within 12 hours of the first "rough seas" warning which was put out on November 29. Normally, it takes at least 24 hours for a cyclone to develop from the "deep depression" stage. This is the main reason for an unusually high number of casualties.

The cyclone warning was delayed. The warning, when it came, was ineffective because it could not be conveyed to thousands of fisherfolk who were already out at sea and once the cyclone struck, there was no mobilization and action from government agencies.

5.4 JOB MIGRATION AFTER OCKHI

After Ockhi most of the fishermen prefer job other than fishing. The reason is due to fear of natural disaster, as well as the economic development from fishing is not able to lead their daily life. In a year half of the month they cannot went for fishing due to climatic change. The trolling days they have to stay back in their home. Most of the fisher families prefer their children to be high educated. They went to foreign countries especially in European countries.

5.5 ECONOMIC CHANGES AFTER OCKHI

After Ockhi, in most of the fishermen family, the bread earner got missing. Fishing is their traditional job. They consider themselves as the “son of sea mother”. Comparing to other society those who went for higher education is less. But now the trend is changing, Even though they have to depend on fishing. After Ockhi they lost their daily income. Now they mainly depend on other jobs for their economic advancement. They require economic support for the education of children, marriage of daughters and sons. They got compensation from the government. but it is not enough for them. Most of the families have loans from private bank. They have to spend a huge amount for paying the debut.

5.6 SOCIAL CHANGES AFTER OCKHI

Kerala’s extended 590 km coastline contribute significantly to employment, income generation, export earnings and human nutrient support, livelihood of inland and marine fisher folk. Fishing sector provides occupation to about 3.86 lakhs people directly and indirectly making it a significant sector of the state. Coast of Kerala has been facing frequent tragedies such as tsunami, cyclones and changes in monsoon, etc. These climatic shocks and stresses affect the normal life and livelihood of the community. Fisher folk community is completely depends on sea resources. Thus, climate change may bring different consequences and impact on these people. Impact can be: impact on physical capital; impact on social capital; impact on natural capital; impact on financial capital; and impact of human capital.

The rough weather conditions of cyclone challenge the work of fishers, they are vulnerable to climate extremes and make fishing as fragile. Tropical cyclones may damage their residence, fish- landing jetty road, boat, and other assets and make them jobless. Low level of education, Ingenuousness and inaccessibility of other occupations made the life of fishers as insecure. Sometimes they ought to go for fishing

Increased financial hardship: The cyclone caused widespread damage to fishing boats and gear, which led to a significant loss of income for fishermen. This financial hardship has had a knock-on effect on other members of the fishing community, such as the wives and children of fishermen.

Changes in gender roles: The cyclone led to an increase in the number of women taking on traditionally male roles, such as fishing and repairing boats. This is because many men were killed or injured in the cyclone and their wives and daughters were forced to step up to take their place.

Increased social tensions: The cyclone led to an increase in social tensions, as people competed for scarce resources such as food and shelter. This tension has been exacerbated by the fact that the government's response to the cyclone has been seen as inadequate by many people.

Changes in cultural practices: The cyclone has also led to changes in cultural practices, such as the way that people celebrate festivals and the way that they interact with each other. These changes are still evolving, and it is not yet clear what their long-term impact will

CHAPTER-6

CONCLUSION

Cyclone Ockhi had a devastating impact on the livelihood of fishermen along the Kerala coast. The cyclone caused widespread damage to fishing boats and gear, and many fishermen lost their lives or went missing. The cyclone also disrupted fishing activity for several months, leading to significant losses in income.

The socio-economic impact of Ockhi on fishermen was significant. An estimated 3, 21,495 man-days of fishers directly engaged in marine fishing activity were lost in Kerala due to the cyclone. The maximum loss was in Thiruvananthapuram district, where 97,871 man-days were lost. The revenue losses due to the loss in fishing days were estimated to be \$15.17 million in Kerala.

The cyclone also had a significant impact on the families of fishermen. Many families lost their sole breadwinner, and others were left with no means of income. The government provided some relief to the affected families, but this was not enough to cover their losses.

The impact of Cyclone Ockhi on the livelihood of fishermen is a reminder of the vulnerability of this community to extreme weather events. The government and other stakeholders need to take steps to mitigate the impact of such events on fishermen, and to provide support to those who are affected.

6.1 SUGGESTIONS

- ❖ Improving early warning systems to give fishermen more time to evacuate to safety.
- ❖
Providing training to fishermen on how to cope with the effects of climate change.
- ❖
Promoting sustainable fishing practices that will help to protect fish stocks.
- ❖
Providing financial assistance to fishermen to help them rebuild their boats and gear.

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