

**MULTI-LAYERED
VULNERABILITIES IN A COASTAL
COMMUNITY: PUTHUVYPE,
KERALA**

MSW DISASTER MANAGEMENT

2024-26

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ABSTRACT

Coastal communities often experience multiple and interconnected forms of vulnerability resulting from environmental change, livelihood insecurity, and uneven development. Puthuvype, a coastal village in the Ernakulam district of Kerala, reflects these challenges, where environmental, social, and economic issues intersect to shape everyday life. This study examines how residents of Puthuvype experience and navigate these multi-layered vulnerabilities and the coping strategies they adopt. The study employed a qualitative case study design. Primary data were collected through semi-structured interviews using purposive sampling, while secondary data were drawn from academic literature, government reports, and policy documents. The data were analysed using thematic analysis.

The findings indicate that environmental degradation, industrial pollution, coastal erosion, and waste accumulation have adversely affected both the local ecosystem and community well-being. Livelihood insecurity, particularly among fishing households; rising living costs; inadequate infrastructure, and limited access to essential services further intensify vulnerability. The study also found that women, older adults, and economically disadvantaged households experience these challenges differently. Although government schemes and institutional support provide some relief, gaps in accessibility and implementation reduce their effectiveness. To manage these challenges, residents rely on livelihood diversification, household-level adjustments, community solidarity, and informal support networks.

The study concludes that vulnerability in Puthuvype is multidimensional, emerging from the interaction of environmental, economic, social, and governance factors. It highlights the need for integrated, community-centred interventions that strengthen environmental management, livelihood security, public services, and institutional responsiveness to enhance the resilience of coastal communities.

Key Words: Coastal Community, Multi-layered Vulnerability, Coping Strategies, Puthuvype, Kerala

TABLE OF CONTENTS

CHAPTER I: INTRODUCTION.....	1
1.1 Introduction.....	2
1.2 Statement of the problem.....	4
1.3 Background of the study	6
1.4 Relevance and significance of the study	9
1.5 Chapterization	11
CHAPTER II: REVIEW OF LITERATURE	12
2.1 Introduction.....	13
2.2 Review of literature.....	14
2.3 Theoretical Framework.....	39
2.4 Research Gap Analysis	40
CHAPTER III: RESEARCH METHODOLOGY	44
3.1 Introduction.....	45
3.2 Title of the Study	45
3.3 Research questions.....	46
3.4 Definition of Concepts.....	46
3.5 Pilot Study.....	48
3.6 Research Design.....	49
3.7 Sampling Strategy	50
3.8 Data Collection	52
3.9 Pre-test	54
3.10 Data Analysis	54
3.11 Ethical Considerations	54
3.12 Assumptions, Limitations, and Scope.....	55
CHAPTER IV: THE CASE OF PUTHUVYPE	58

CHAPTER V: ANALYSIS AND DISCUSSIONS	70
5.1 Introduction.....	71
5.2 Profile of the Participants.....	72
5.3 Thematic Analysis and Discussions.....	73
5.3.1 Background of the Community.....	73
5.3.2 Environmental Challenges	75
5.3.3 Livelihood and Economic Challenges	79
5.3.4 Housing and Living Conditions	83
5.3.5 Social Vulnerability	86
5.3.6 Institutional Access.....	90
5.3.7 Services and Schemes	93
5.3.8 Coping Mechanisms.....	96
5.3.9 Community Support and Relationships	99
CHAPTER VI: FINDINGS, SUGGESTIONS AND CONCLUSION	104
6.2 Findings.....	105
6.3 Suggestions	109
6.4 Conclusion	112
REFERENCES AND ANNEXURE.....	115
REFERENCES	116
ANNEXURE 1 – Tool For Data Collection	122

CHAPTER I: INTRODUCTION

1.1 INTRODUCTION

Vulnerability can be referred to as a critical concept in the development, disasters, environmental changes, and wellbeing in the current world. Over the past few decades, there has been increasing recognition among researchers that the impact of hazards on individuals is a product of not just the power of the hazard but also the conditions within which people live. It is an advance in understanding, as opposed to the previous disaster studies that focused on natural hazards. In other words, vulnerability has been seen as a central component of understanding of risks and their management. Vulnerability is the situation and conditions of individuals and communities that make them susceptible to influences that hinder them to predict, cope and recover from hazards. In other words, it is the susceptibility to factors affecting the ability of individuals or groups to anticipate, tolerate and recover from a negative outcome, according to Blaikie et al. (2004). The Pressure and Release (PAR) model by the authors describes vulnerability as the result of processes that generate the conditions leading to the vulnerability of certain groups. In a similar way, according to the United Nations Office for Disaster Risk Reduction (UNDRR, 2023), vulnerability is described as the condition under which people or communities may be subjected to higher susceptibility due to physical, socio-economic, economic, and environmental factors. It is clear from the above views that vulnerability is an entrenched structure of development rather than natural occurrences.

The emerging vulnerability studies also portray multidimensionality of vulnerability. Vulnerability is increasingly seen as a process of interactions of physical, socio-economic, institutional and resource-based aspects of a community. According to Rufat et al. (2015), social vulnerability is shaped by such individual characteristics as socio-economic, demographic, health-based, risk perception, and coping capacity, which determine their reaction to a crisis. In a similar way, according to Cutter et al. (2003), vulnerability is the product of social inequalities and environment risks. As such, certain groups are affected more than others in a time of crisis. Thus, it is a multi-dimensional phenomenon.

Coastal regions are among the vulnerable human settlements out of the varied geographical contexts under the vulnerability phenomenon. The harsh realities of life in close proximity to coastlines bring about some unique challenges for communities living in such environments. They face several issues relating to environmental,

economic, and social vulnerabilities. Coastal communities worldwide are exposed to hazards like erosion, floods, rise of the level of seas, storm surge, saltwater intrusion, and other adverse weather phenomena, the impact of which might intensify in the coming years because of climate change (IPCC 2023).

Moreover, there is a large coastal population dependent upon natural resources and climate sensitive economic activity like fishing, aquaculture, agriculture and tourism. Hence, the direct effects of any environmental change would impact the income, food and housing security, thereby, the general quality of life. Vulnerabilities in coastal communities arise due to rapid urbanization, industrialization and environmental degradation and development intervention. Whereas on one hand, development planning can ensure economic growth and improve the infrastructure, yet on the other, it impacts the local ecosystem and alters traditional livelihoods to raise various other environmental and social threats. The development planning is thus often responsible for making coastal communities vulnerable to what experts term as "layered or multiple vulnerabilities", where environmental vulnerabilities and economic insecurities interact together (Adger, 2006). Located in the South Western part of India, the state of Kerala has an extensive coastline, spanning a distance of around 590 kilometres. Earlier, the coastal regions of the state ensured employment to the people through fisheries, inland fishing, agriculture, coir making, trading and other activities. Today, however, due to rising environmental pressure, many of these coastal regions have turned highly vulnerable to environmental and socio-economic changes. Coastal erosion, flooding, sea intrusion, scarcity of fish resource, pollution and other environmental challenges arising from climate variations have turned into significant concerns regarding the sustainability of living conditions and settlements in the coastal regions of the state of Kerala (Government of Kerala, 2021).

Following the disaster incidences, the importance of vulnerability in the coastal population of the state of Kerala has been realized even more. With the occurrence of floods in 2018 and 2019, it was realized how vulnerability could be influenced by environmental hazards, developmental process, governance structures and community resilience. Moreover, vulnerabilities were not only physical in nature but were also concerned with services, livelihood diversity, social networks, institutional support and adaptation abilities, as observed in Kerala (Ali & George, 2022). Various studies have also highlighted the threats for the people to get exposed to multiple environmental

hazards and development issues in the coastal communities. Within this bigger scenario of multiple vulnerabilities, it is essential to focus on Puthuvype, which is an island in Vypin Island, district of Ernakulam. Historically, the area has strong ties with fishing and marine activities. However, over the years, the place has undergone several transformations as a result of large industrialization, ports and petroleum depots.

Consequently, due to these changes, the geo-physical and socio-economic conditions of the locality have changed significantly. Whereas these changes have facilitated the growth and economic development in the region, yet simultaneously there has been a concern over the environmental degradation, pollution, coastal erosion, livelihood issues and alteration in the community lifestyle.

Earlier research work in the coastal region of Kochi revealed that access to natural resources and traditional livelihood along with regional ecosystem had been affected by the industrial growth and environmental changes. Hence, it has caused vulnerability to the coastal population. Environmental risks, livelihood insecurities, housing problems and governance issues faced by the Puthuvype community suggest that this community is an appropriate case of multiple forms of vulnerability for analysis. Vulnerability is often multi-dimensional and complex, as can be observed through the experiences of Puthuvype. The livelihood opportunities have been affected by the environmental variables (erosion and pollution); economic variables are insecure, thus causing housing problems and restricting resource access; while the social and institutional dimensions are insecure, thereby limiting coping and adaptation ability of the local population.

Further, no community wide vulnerabilities have been found. Household and individual vulnerabilities are different because of occupational, gender, socio-economic and institutional differences. The present research aims at examining the complex and multi-layered social, economic and environmental vulnerabilities of the Puthuvype, Kerala community.

1.2 STATEMENT OF THE PROBLEM

The international community of coastal populations faces an increasing number of intertwined and complicated issues related to environmental, socio-economic and developmental changes. Coastal communities' vulnerability increases under the influence of increasing impacts of environmental risks such as climate change, erosion,

flooding, resource degradation and livelihood insecurity. On the other hand, urbanization and industrialization lead to the creation of new kinds of vulnerabilities that arise as the relationship between people and their natural environment become strained. The issue of vulnerability of coastal populations can no longer be considered as strictly dependent on environmental risk exposure but becomes a multi-dimensional problem that involves social, economic, environmental and institutional aspects. Marine and coastal resources have traditionally formed the basis of socio-cultural identity and livelihoods of the coastal population of Kerala. However, environmental stresses, livelihood changes and developmental changes made this group face many difficulties. Traditional occupations and settlements of this population have been affected by coastal erosion, pollution, scarcity of fish stock, floods, salt water intrusions and climate change. Alongside this, development projects and industrial development opened up new possibilities and created new concerns in terms of environmental degradation, resource depletion, people resettlement and livelihood instability. Thus, the developments contributed to creating a highly complicated vulnerability situation.

The community of Puthuvype located in the coast of Ernakulam District is an example of the coastal community currently dealing with multiple layers of difficulties. The area of Puthuvype has undergone considerable changes due to economic development of the city of Kochi involving the development of industry and infrastructure. Developmental changes brought positive effects to the region, but at the same time triggered concerns about environmental degradation, pollution, destruction of the coast's ecosystem and depletion of the natural resources. Meanwhile, households still have problems related to occupational and economic insecurity, housing problems, provision of services, environmental threats caused by the geographical location of this community. All these factors suggest that vulnerability in Puthuvype should not be discussed from a single angle. Environmental changes influence economic opportunities, economic insecurity affects living standards and access to resources, socio-economic inequalities affect adaptive capacity of people in response to environmental changes, institutional response shapes adaptive capacity of households. These interdependent processes may often reinforce each other, creating complicated situations of vulnerability affecting different social groups in different ways.

Thus, in order to understand vulnerability, it is necessary to explore social, economic, environmental and institutional aspects as well as their interrelation. Although there is

a vast body of literature on issues of coastal vulnerability, environmental degradation, disaster risks, climate change impacts, fishing communities and development-induced changes in Kerala, most of the literature pays attention to some aspects of vulnerability only. Many studies address one particular area such as environmental risk or livelihood changes or development-induced issues but do not analyze all these issues together. Although such studies are helpful, they may fail to reveal synergies and cumulativeness of the vulnerability situations of coastal communities. Additionally, there is limited research addressing experiences of residents in coping with vulnerability challenges in their everyday lives. Finally, there is a need for research that could examine differential vulnerability across social groups. People of different genders, different occupations, different ages, different economic status, different households and with different access to resources will react differently to the changes taking place in social, economic and environmental spheres. Little is known about vulnerability differentials in the studied community.

Furthermore, while many policies and programs emphasize vulnerabilities of the coastal population, much less effort is being made to study coping practices used by the communities themselves to deal with risks and challenges they are confronted with. Households and communities frequently have to apply different methods to cope with difficulties in livelihood, economic insecurity, environmental degradation and socio-economic challenges. It is vital to find out how coping mechanisms will operate and develop development interventions based on local experience and capacities.

Therefore, considering development-induced and environmental changes as well as environmental significance and vulnerability of the studied community, it is important to conduct an integrated analysis of the vulnerability conditions of Puthuvype that will go beyond sector-wide analysis of the issue.

1.3 BACKGROUND OF THE STUDY

Puthuvype is a coastal locality which lies in Vypin Island, in the Ernakulam District, in Kerala. In relation to the broader geographical context, the locality lies towards the north of Kochi and falls within the coastal ecozone of the district that borders on the Arabian Sea, backwaters and estuaries. The natural environment around Puthuvype has played a very important role in shaping the lives and livelihoods of the community since ancient times. Fishing and related occupations are some of the main sources of

livelihoods to which the locality is associated from the past. Like other coastal locations in Kerala, the locality is ecologically vulnerable in nature. However, the process of development has brought about certain changes in terms of how the community interacts with the environment, thus bringing in concerns about environmental issues. The coast in Kerala hosts a variety of ecological systems. They are also home to large number of people. With the rising challenges in terms of environmental changes and demographic shifts, there is increased awareness regarding coastal threats such as climate variability, coastal erosion, environmental destruction and resource depletion, which affect the sustenance of coastal livelihoods and health/welfare of coastal communities who depend on the natural resources of the locality.

With the rise of industrialisation and development in the recent times, the locality has seen some changes which have transformed Kochi as an economic power and a major maritime hub. Due to its geographical location, large industrial projects such as those of petroleum, LNG, port and industries have sprung up in the area. This has certainly contributed to the expansion of economy, job creation and better infrastructural facilities in the locality. Along with the positives, however, it has had an impact on the socio-economic and environmental situation of the locality. As a result of industrialisation, there has been an increased level of concern regarding the quality of environment and sustainability thereof. There have been concerns expressed by the local people and community groups about pollution and degradation of the environment, lack of fish supply and problems created due to industrialisation to the traditional occupations in the locality.

Coastal ecosystem change has meant a reduction in the availability of natural resources that were traditionally a source of livelihood for the community such as the fishery and fishing industries. This change shows the complexity of the relationship between development and living condition of the community, as economic development leads to increased pressure on the environment and its degradation. Apart from that, the coastal locality in question also faces certain environmental risks because of its coastal location in addition to those created by development. Coastal erosion, tidal flooding, intrusion of salt water, waterlogging and extreme weather variations are some of the environmental threats which the coastal areas of Kerala are currently facing at an increasingly high rate. The coast in Kerala is considered as one of the vulnerable areas

from both the scientific as well as policy perspectives in the context of climate change and environmental threats.

The experience of local households regarding livelihood is indicative of certain environmental changes that have taken place over time. In recent times, traditional occupations such as fishing and others who are dependent on resources are suffering from various threats, such as income security, lack of resources, market uncertainties and livelihood changes. A number of households have been affected by all these changes to such an extent that they have to resort to diverse sources of income such as temporary migration, wage labour and changing livelihood. The ability of households and persons to overcome these challenges and adapt to the change is unequal as it depends on their economic security. Certain social and institutional conditions also play a role in making the community vulnerable. Availability of housing, public services, welfare scheme, infrastructure, health, education and good governance has a great effect on their resilience when facing difficulties and bouncing back from tough situations. Consequently, vulnerability in Puthuvype cannot be understood solely through environmental indicators but must be examined as a multidimensional phenomenon involving social, economic, environmental, and institutional dimensions.

While some studies have been conducted in relation to coastal vulnerability, impacts of climate change, fishing communities, and environmental concerns, little attention has been paid to the investigation of the interaction of multiple types of vulnerability within one particular area. In the literature reviewed by the researcher, different problems – the deterioration of the environment, issues of livelihood, and the risk of disasters have been separately discussed. The interaction and connection between them was barely addressed. In addition, the opinions of local residents were hardly taken into account in relation to vulnerability and development. Therefore, being rich in its environmental value and having undergone dramatic transformations, Puthuvype is a suitable subject of study that will help in investigating the complexities of vulnerability in modern coastal communities. For conducting sustainable and responsible development in coastal areas, there is a need to gain insight into the nature of multiple types of vulnerability. This is possible through understanding the problems that residents face as well as how they overcome them in everyday life. So, the present study will focus on the vulnerabilities faced by the residents of Puthuvype and its numerous dimensions.

1.4 RELEVANCE AND SIGNIFICANCE OF THE STUDY

Growing threats to coastal communities as a result of environmental degradation, climate risks, livelihoods transformation and developmental interventions require comprehensive research approaches. The study contributes to the discussion of the multi-layered vulnerabilities of Puthuvype inhabitants, contributing to the comprehension of the interaction between socio-economic, environmental and institutional factors of vulnerability in today's coastal context.

In terms of academic relevance, the study makes contributions to the field of vulnerability, communities in coastal areas, and development studies. Previous studies usually focus on the vulnerability in one specific dimension (environmental hazards, livelihood insecurities, disaster risks, climate change impact), and while being useful, they do not necessarily cover the interplay of different vulnerabilities. In turn, the present research intends to use a multidimensional approach to vulnerability, thus building upon previous studies in order to contribute to ongoing discussions of vulnerability and environmental change. Additionally, the research represents one of those rare works narrowing down the topic of wider coastal development studies.

The study is important due to the provision of empirical evidence on the basis of the experiences of the community members. While measures of vulnerability can be considered quantitatively on the basis of secondary data, they may not represent the way individuals feel and deal with problems in their daily lives. The present study will involve direct interaction with the community members in order to understand their attitudes and behavior concerning environmental risks, livelihood issues, housing, access to services, institutional supports and coping mechanisms, thus bringing forward aspects of vulnerability that cannot be captured in the course of statistical analysis.

Results of the research can also contribute to policy-making and development planning. Understanding the ways vulnerabilities emerge in the coastal community in combination with other factors is critical for planning more effective interventions for the purposes of local authorities, self-governance bodies, disaster management bodies and development actors. Knowledge of the problems that people face in accessing resources, services and institutional support will help develop programs leading to increased livelihood security, environmental sustainability, disaster preparedness and social protection. Furthermore, understanding the causes of vulnerabilities – which can

include issues of structures and governance – will facilitate the process of adopting a more inclusive development strategy.

The research can have great implications for the current discourse around Climate Adaptation, Disaster Risk Reduction and Community Resilience. Coastal communities are typically among those most affected by environmental and climatic change, thus it is vital to analyse their vulnerabilities as well as coping and adaptation mechanisms which can serve as a good basis for building resilience and sustainable coastal development.

There are numerous implications of the research related to social work practice. Social work is an occupation that deals with such objectives as human well-being enhancement, social justice promotion, community capacity building, and addressing structural inequities in the interest of vulnerable populations. Environmental, economic and social problems of coastal communities can make the access to resources, services and opportunities difficult, thus hindering the well-being of such populations. Hence, the necessity to understand the nature and causes of the vulnerability becomes evident in order to conduct efficient social work.

The results of the research will help social workers plan community-level interventions and get the welfare service providers informed on their users' needs. Besides, understanding of the vulnerabilities in coastal communities requires identifying their strengths and coping mechanisms, which should be taken into account when attempting to reduce vulnerability of the population. The research will help understand what challenges are faced in the community and how they can be resolved through certain strategies. Thus, it can become the basis for social work aimed at fostering community empowerment, participation, resilience and sustainable development.

Finally, the findings of the research will assist national and international initiatives on Disaster Risk Reduction, climate-resilient development, inclusion and sustainable development in the coastal context. The research provides an in-depth look at the vulnerabilities of a coastal community under rapid environmental and developmental transformation and can become the foundation for further planning, advocacy and intervention efforts.

1.5 CHAPTERIZATION

The chapterization of the dissertation is as follows:

- Chapter I: Introduction
- Chapter II: Review of literature
- Chapter III: Methodology
- Chapter IV: The Case of Puthuvype
- Chapter V: Thematic Analysis and Discussions
- Chapter VI: Findings, Suggestions and Conclusion

There will be bibliography of references appended after it in addition to the tool used for the study.

CHAPTER II: REVIEW OF LITERATURE

2.1 INTRODUCTION

Literature review is an analytical and critical analysis of the existing scholarly works, the research studies, the theoretical framework and the empirical findings related to a specific research topic. It can assist in establishing the context of the current study by pinpointing key concepts, theories, methodologies, and gaps in the literature. Creswell (2014) states in his literature review that a literature review is a process of creating a framework to determine the importance of a study and to understand how the proposed research will relate to the current literature. Likewise, Booth, Colomb and Williams (2008) state that literature review is a process that involves considering previous work to reveal patterns, discussions and unexplored questions in a field of research.

It is worth noting that literature reviews play a very important role in social science and disaster-related research because vulnerability is a complex and multi-dimensional concept that has been studied from different disciplines such as disaster studies, environmental studies, sociology, geography, development studies and climate studies. There has been a wealth of existing scholarship on issues of environmental vulnerability, coastal risk, social inequality, livelihood insecurity, resilience, governance and climate change. The intersections of these dimensions, however, in the particular community contexts, are not always well understood. Hence, a thorough review of the literature is needed to find the place of the present study in the existing theoretical and empirical discussion and to find out the limitations of existing studies.

Literature review is very crucial for this study on “Multi-Layered Vulnerabilities in a Coastal Community: A Case Study of Puthuvype, Kerala” as it helps to develop conceptual and contextual knowledge of vulnerability in the coastal area. Literature review focuses on the interconnected social, economic, environmental, institutional and developmental vulnerabilities faced by people of Puthuvype, which also helps in the examination of the way vulnerability has been theorised and studied in similar settings. It also facilitates the researcher to gain insight into the link between coastal urbanisation, industrialisation, environmental change and community-level experiences of risk and adaptation.

This chapter's literature comes from books, peer-reviewed journal articles, policy documents, government reports, and vulnerability, coastal community, disaster risk,

and environmental change studies. Special focus is given to the studies carried out in Kerala and the coastal parts of the city of Kochi, because these share socio-environmental characteristics with Puthuvype. The review also includes discussions about social vulnerability, coping mechanisms, community resilience in coastal areas, governance, fisheries-based livelihoods and industrialisation.

This chapter has multiple thematic sections. The first section explores the concept of vulnerability, its evolution over time, theoretical underpinnings, dimensions and links with resilience. The second section summarises the literature on vulnerabilities of coastal communities, including environmental and ecological vulnerabilities, livelihood and occupational insecurity, housing, social vulnerability, governance vulnerabilities, and coping and adaptive mechanisms. The chapter also reviews the literature on coastal urbanisation and industrialisation and socio-environmental changes in coastal localities around Kochi and Puthuvype, in the state of Kerala. The chapter ends with the theoretical framework and research gap analysis, which makes the conceptual context and academic significance of the current study.

2.2 REVIEW OF LITERATURE

2.2.1 Origin and Evolution of the Concept - Vulnerability

The notion of vulnerability has experienced a radical epistemological change in the study of disasters and in the discourse of development. Originally, disasters were perceived mainly in a hazard-based approach, in which natural phenomena, like floods or cyclones, were seen as external shocks. Nevertheless, in the late twentieth century, scholars started to underline that disasters are not only natural, but also rooted in social, economic and political organisation. One of the major points of change in this shift is the article *At Risk: Natural Hazards, People Vulnerability and Disasters* by Piers Blaikie and others, where the concept of vulnerability is the result of structural inequalities and not merely a result of environmental exposure. They believe that disasters are the phenomenon where hazards meet vulnerable people, which changes the analytical emphasis on hazards and makes social processes more important (Blaikie et al., 1994). The word vulnerable itself is a Latin word, *vulnerare*, which translates to wound, signifying vulnerability to injury. Currently, vulnerability is described as the extent to which people or systems are vulnerable to, and incapable of withstanding, negative effects (Adger, 2006). This definition brings out two very important elements:

the presence of a risk and the ability to cope or adjust. Vulnerability is also a socially differentiated process that is reinforced by the power relations, access to resources and institutional structures further developed by scholars like Ben Wisner and Terry Cannon (Wisner et al., 2004). The PAR model describes vulnerability as a developmental process, which starts with entrenched structural conditions such as political and economic inequalities, which are then converted into pressures such as inadequate access to resources or poor institutions, which culminate into conditions that put individuals at higher risk. Therefore, vulnerability is not an inert situation but a dynamic and relational process, which is continuously generated in the interactions between social systems and environmental risks.

2.2.2 Understanding the Relationship Between Vulnerability and Resilience

One of the shifts in the theoretical orientation of the disaster studies has been the slow shift towards vulnerability as the only focus, to a more holistic one that encompasses resilience, adaptation and capacity. The vulnerability, which is in the exposure to the harm, is contrasted with the resilience, which is a precursor to the capacity of people, households and communities to absorb the shocks, to reorganise and recuperate from the upheavals. The change is an indicator of a wider change to disaster risk reduction being reactive to proactive and adaptive strategies. Resilience can be defined as the capacity of communities or systems to absorb shocks and to adapt to the new conditions and resume their functionality following the disruptive events (United Nations Office for Disaster Risk Reduction, 2015). This view aligns to other international policy frameworks like the Sendai Framework on Disaster Risk Reduction that highlight local empowerment, risk management and preparedness as the greatest factors of disaster risk reduction. This conceptual change is further suggested by the empirical research in the context of Kerala flood-prone areas. There are numerous operationalisations of community resilience such as social, economic, governance, health and infrastructure capacities and the implication of this is that resilience is multi-sectoral and embedded within the daily social systems. That resilience is not an abstract concept but is contingent on material aspects like the availability of resources, institutional integrity and community awareness.

Vulnerability is not, however, dichotomously related to resilience. They are not opposites but are mutually dependent and existent conditions. On the one hand, a

community may be very vulnerable and on the other hand, it may be resilient. Neil Adger (2006) says that resilience is connected with vulnerability and suggests that resilience and vulnerability are related through access to resources and adaptive capacity and that social capital, institutions and knowledge systems mediate the relationships. Moreover, Carl Folke (2006) considers resilience as the capacity to recover as well as the capacity to adapt and evolve to the new environmental and social conditions. This offers a dynamic definition of resilience that the communities re-invent themselves using structures and practices, instead of reusing the levels at pre-disaster levels. The ability of resilience is not an individual capability on a community level, but it is a social construction and embodied in the interrelationship systems and practices. Community networks and social capital are one of the essential pillars of resilience. These networks are the kinship networks, neighbourhood networks and informal networks of support and facilitate collective action, sharing of resources and mutual support in times of stress or crisis. Their social cohesion is great, and it increases the response speed and recovery in case of disruption in the community. The local knowledge systems are very crucial particularly in the hazard prone areas. In the case of historically vulnerable populations, they are most likely to acquire context-relevant information, such as the means to give early warning, adoptive livelihoods, and native coping strategies. It is a form of knowledge gained by experience, and transmitted between generations and so makes preparedness more grounded and rooted and cultural to environmental concerns. Community resilience is also determined by institutional support and mechanisms of governance. Availability of responsive local government, welfare scheme, and disaster preparedness systems also contribute to minimize vulnerability. Trust, equitable resource distribution, and structural assistance during the crisis are some of the outcomes of the successful operation of inclusive and efficient institutions.

One of the most important community-level resilience-creating strategies is economic diversification. The diversification of livelihoods can benefit households and communities since they do not depend on a single source of livelihood and therefore they are not vulnerable to economic shocks and other uncertainties that the environment is facing. The exposure to risk is mitigated with the diversification of sources of income and presents alternative livelihoods and consequently enhances overall adaptability. These are fairly similar to the results of the social vulnerability literature in which the

coping capacity and risk perception are seen to be extremely important but in most cases underreported variables in the vulnerability measurement. This cross-section once again shows that strength is in the very structures that create vulnerability. Other researchers warn against the blind belief in the resilience discourse. The excessive focus on resilience can shift the pressure to communities and obscure structural inequalities and governance failures.

According to Ben Wisner (2004) a community emphasis on coping strategies may lead to ignorance of the fact that the vulnerability is caused by poverty, marginalisation and unequal resource distributions. The necessity of a concomitant vulnerability, resilience structure is increasingly being stressed in the current literature to gain a more insightful understanding of how communities view and react to risk. Vulnerability analysis in this plan will be based on structural sources of risk and inequality. This involves the investigation into socially economic inequalities, vulnerability of the environment, governance loopholes and institutional marginalisation that preconditions that there are certain groups that are more likely to be harmed. At the same time, the resilience analysis puts the emphasis on the capabilities and strengths at the community levels. It is interested in the coping mechanisms of individuals and groups in adapting to adversity, in the way the individuals and the groups distribute the resources available to them and in the way the individuals and the groups evolve adaptive mechanisms to various changing situations. This involves short term coping strategies and long term adjustments and change.

The framework, as a combination of these two views, is not grounded on the deficit-related concept of communities but provides a more balanced analysis. It acknowledges that the communities might be structurally vulnerable yet they are agency, knowledge and adaptive capacities which are vital in risk-finding and risk-reducing. The mixture approach would be especially applicable to the coastal communities such as Puthuvype where the environmental vulnerability is compounded with the socio-economic precarity and governance issues. Identifying vulnerability and resilience are useful in order to do a deeper analysis of multi-layered risk experience, negotiation and response in communities.

2.2.3 Coastal Communities, Coastal Ecosystems and Human–Environment Interactions

Coastal community is the location where people reside and depend on the marine and coastal environment for their livelihood, food and social and cultural development. The coastal communities invest a lot of money in some of the different financial sources that depend on the ecosystem for such as fisheries, aquaculture, coastal agriculture, tourism, transportations and others. Natural resources are a major source of livelihood to coastal communities and they are therefore susceptible to degradation of their environment. (Kurien, 2001)

It is worthy of note here that the world population is mainly clustered around the coasts which are of tremendous importance economically and ecologically. The coastal ecosystems have several socio-economic functions, as reported in the IPCC (2019) and are high productivity and with diversity of ecosystems. On the other hand, these areas are very populous and are characterized by high economic activity and are susceptible to environmental hazards such as floods, erosion, storm surge and sea level rise.

In the Indian context, marine and estuarine ecosystem has been an important contributor in sustaining the growth of coastal communities to sustain their activities of fishing, trade and transportation. Apart from this, each of the coastal communities has its identity and knowledge systems as they many generations back interacted with the coastal area (Kurien, 2001).

Coastal ecosystems and its ecological significance

Coastal ecosystems are one of the most ecologically productive and biodiversity ones in the world. The types of coastal ecosystems are mangrove ecosystem, estuarine ecosystem, wetland ecosystem, mud flat ecosystem, coral reef ecosystem, seagrass ecosystem, beach ecosystem and backwater ecosystem. Coastal ecosystems can provide multiple ecological services which are vital for the sustainability of an environmental system and can be beneficial to human health (Barbier et al., 2011).

The most effective buffer against storm surges, waves, flooding and erosion is the mangroves to ensure environmental sustainability. Their roots protect coastal areas from adverse impacts of storms, and act as natural buffers between the sea and land (Alongi, 2008). Wetlands are breeding and rearing grounds for different organisms and hence fisheries are supported. Coastal ecosystems facilitate nutrient recycling, provide water filtration services, perform carbon sequestration and help regulate climate (Barbier et al., 2011).

Coastal ecosystems provide other ecological services besides those mentioned above, as well as socio-economic services like fisheries and resource harvesting. Healthy coastal systems are essential to coastal tourism activities. So, when there is degradation of the environment, it's as if it is a degradation of the wellbeing of the society and the wellbeing of the community. Communities wellbeing is a key ingredient of coastal ecosystems sustainability (Adger et al., 2005).

Human's interactions with the environment, in coastal areas

Coastal communities are interdependent and involved with their environment. The environment is also a livelihood source for the coastal communities and people are affecting the environment by fishing, use of coastal land etc.

Over the years the coastal communities had acquired knowledge about the environment, and they were able to make sense of the dynamics of the environment. These societies were able to address the problems of environmental change (Kurien, 2001) due to their knowledge of environmental factors (tides, seasons, etc.) and fish habitat. It was useful to create coping strategies for the communities in the development of this knowledge system.

Over time this relationship and interactions between these societies have influenced environmental dynamics, due to socio-economic changes. Urbanisation, industrialisation, population growth, infrastructure development and other socio-economic changes have an impact on the environment and livelihood systems of coastal communities. The impact of these changes is seen to have influenced livelihoods from coastal communities, and the dynamics of the communities (Adger et al., 2005; IPCC, 2019).

Emerging Challenges in Coastal Environments

Coastal areas today are exposed to various environmental and development issues. Climate change has come up as one of the most important issues influencing coastal environments and ecosystems. Rising sea levels, altered precipitation patterns, increased temperatures, and rising extreme weather conditions are some of the impacts that have led to heightened environmental risks within coastal environments (IPCC, 2019).

Coastal erosion, loss of soil, infrastructure destruction, and forced relocation of people are common issues faced by coastal environments around the world. Salinity intrusion in ground water and agricultural land leads to reduced water availability and low productivity in agricultural lands. Coastal flooding is another factor that creates livelihood disruptions among people. In addition, environmental pollution due to industry, urban waste, shipping, and oil facilities is also a key environmental issue faced by coastal communities (Barbier et al., 2011).

The environmental issues faced by coastal areas also create socio-economic issues. These issues include population increase, overfishing, competition for resource use, and wage labor. Therefore, people in coastal areas tend to face various socio-economic and environmental risks simultaneously (Adger, 2006).

Coastal Kerala and the Context of Puthuvype

First, there is the coastal stretch of about 590 kilometres in Kerala that supports a wide range of coastal eco-systems including beaches, estuaries, wetlands, lagoons, mangroves, and backwaters. These are some of the eco-systems that are used by a large number of fishermen in Kerala. They support the lives of people in the area and help generate considerable economic resources for the state via fisheries, tourism, trading, and shipping (Government of Kerala, 2021).

The coastal zone in Kerala is significant due to its ecologically diverse eco-systems of which marine, lagoon, estuary, wetlands, and other forms are components. The Vembanad estuary and Kochi backwaters, among others, are part of ecologically vital eco-systems that support fish, birds, and other species. Furthermore, they help sustain livelihoods of thousands of people engaged in fisheries. In recent decades, there have been a series of developmental activities that have altered these eco-systems in various ways.

Puthuvype is an interesting locality located in the north part of Vypin Island of Ernakulam district. This is an ecologically important region in the area of Kochi coastal system. The Arabian Sea, backwater, and coastal wetland form a complex environment. Fishing, among other marine-based occupations, used to be the major sources of livelihoods and played a significant role in defining the culture of local communities.

Over the last few decades, there have been several infrastructural and industrial developments that include construction of the liquefied natural gas facility, petroleum facilities, roads, and development around the ports in the locality. Such changes have not only changed the environment but also the livelihoods, conditions of settlement, and perceptions of risks faced by communities in the area.

2.2.4 Environmental and Ecological Vulnerabilities in Coastal Contexts

Environmental and ecological vulnerability is a key aspect of the coastal areas in which human communities are tightly linked with the dynamics and frequently unstable natural systems. The core features of the coastal settings include exposure to various and interacting hazards such as sea-level rise, coastal erosion, storm surge, saline intrusion, and frequent flooding. The hazards are not solitary phenomena but are growing progressively more pronounced by larger processes of climate change, land-use change, and anthropogenic interventions, which combine to redefine coastal risk landscapes.

There exists a considerable amount of literature that puts the issue of coastal vulnerability into the framework of climate variability and long-term environmental change. According to the Intergovernmental Panel on Climate Change, low-lying coastal areas are one of the most at-risk areas in the world because of the increase in sea levels, the number of extreme weather events, and the loss of biodiversity (IPCC, 2014). The processes form part of what Nicholls and Cazenave (2010) define as a progressive amplification of coastal risk whereby the systemic changes in the environment are added up with the episodic hazards to generate an incremental effect on communities. This is specifically seen in areas that could see even small rises in sea level contributing to a large increase in flood prone areas and tidal ingress.

These interventions may cause disruptions of sediment flows and changes in the coastal geomorphology, which results in the local erosion intensification. Research has revealed that these alterations are not only posing physical land loss threats but also challenging the livelihoods and stability of settlements especially in the highly populated coastal areas.

In areas where there is a monsoonal climate, heavy rainfall usually surpasses the drainage capacity, leading to extended waterlogging and damage of infrastructure. Such events have been associated with the occurrence of altering precipitation patterns as

well as unplanned urban growth that minimizes natural drainage and enhances surface runoff.

Another important ecological issue is salinity intrusion, which is especially high in coastal aquifers and agricultural areas. According to Dasgupta et al. (2015), inland migration of saline water is caused by increases in sea level and over-pumping of groundwater, impacting groundwater as a source of drinking water and soil fertility. The long-term effect of this process is on food security and population health since it decreases agricultural production and raises the dependence on external water sources. The same has been recorded in empirical studies that have shown effects of salinity on crop patterns and livelihood changes, where communities have been forced to either adapt or give up their traditional ways.

Environmental vulnerability is increased by the degradation of coastal ecosystems. Mangroves, wetlands and backwaters are important in protecting the communities at the coastal areas against hazards through stabilisation of the shorelines, diminution of the wave energy, and sustaining the biodiversity. But these ecosystems have been lost and fragmented by rapid urbanisation, industrialisation and reclamation of land (Alongi, 2008). Weaknesses of such natural protective mechanisms make people more exposed to risks and less ecologically resilient, which increases vulnerability.

Along with the macro environmental processes, localised human interventions are important determinants of ecological vulnerability. Industrial activities, port development, and land-use changes can alter hydrological and ecological systems in ways that increase risk exposure. Research has indicated that natural drainage patterns are usually altered by reclamation and infrastructure projects, resulting in increased floods and stagnant water in the nearby regions (Neumann et al., 2015). These transformations explain how development processes may unwillingly introduce new types of environmental vulnerability even in the quest to foster economic growth.

The interaction between environmental processes and social systems is a recurring theme in the literature. Turner et al. (2003) maintain that vulnerability needs to be interpreted in relationships among human societies and environmental processes in which changes in the ecology and social conditions are mutually reinforcing. This view is also backed by studies that show that the environmental risks tend to impact more on communities with a low adaptive capacity hence associating ecological susceptibility

to large scale socio-economic disparities. Environmental vulnerability is becoming a dynamic and changing status. It is projected that climate change intensifies the coastal hazards both in frequency and magnitude with the increasing uncertainty and risk accumulation over time (IPCC, 2014). This is the temporal aspect, which highlights the necessity to go beyond the traditional assessments of vulnerability and seek methods, which consider the varying environmental baselines and accumulated effects.

2.2.5 Livelihood and occupational vulnerabilities

The issue of livelihood and occupational vulnerability is a major issue in coastal areas where economic activities are intimately associated to the natural resource systems and thus are very sensitive to environmental variability and ecological change. It is continually observed in the literature that the livelihoods of coastal populations, including fishing, small-scale agriculture, aquaculture, and informal labour, are sensitive to climate and market dynamics, which exposes them to the vagaries of environmental conditions and market forces. This reliance results in a structural connection between ecological turmoil and economic insecurity, in which disturbances in natural systems directly intersect into livelihood crises.

A large amount of literature places livelihood vulnerability within the greater context of sustainable livelihoods and entitlement theory. Amartya Sen (1981) suggests that vulnerability is not only because of a deficit of resources but because of limited access to entitlements and livelihood opportunities. This view has been applied to the coastal setting where social, political and institutional structures tend to mediate access to fishing grounds, coastal commons and markets. Neil Adger (1999) explains that livelihood vulnerability is highly associated with the environment change and institutional limitation especially in areas that depend on natural resource that is becoming more degraded or contested.

The literature often mentions fishing-dependent communities as one of the most vulnerable occupational groups. Research shows that dwindling stocks of fish, alteration of marine ecosystems, and more occurrence of extreme weather events has had a pronounced impact on income stability, and occupational security (Allison and Ellis, 2001). Small-scale fishers, especially, are limited to a variety of constraints, such as a lack of access to technology, credit, and formal markets, which in turn limit their capacity to adjust to the changing conditions. In most instances, mechanization and

commercialization of the fishing industry has only continued to marginalise the traditional fishers by increasing competition and minimizing access to shared resources.

Seasonality and uncertainty also contribute to livelihood vulnerability. The occupations of the coast also tend to be cyclical in nature, with income varying, depending on the cycles of the monsoons, fishing prohibitions, and ecological factors. This instability in time diminishes the ability of households to save and develop financial resilience. A study of the coast of India illuminates that households that are involved in fisheries and other associated activities often undergo fluctuating incomes, which result into indebtedness and dependence on informal credit systems (Béné et al., 2010). These circumstances generate a cycle of vulnerability wherein economic shocks are hard to absorb and take a significant amount of time to recover.

The point where there is a meeting of environmental change and livelihood systems is quite pronounced in the climate variability scenario. According to the Intergovernmental Panel on Climate Change, livelihoods that are resource-dependent are likely to suffer the most when climate change happens; particularly in coastal and low-lying areas (IPCC, 2014). Altering the sea temperature, salinity, and storm patterns affects fish distribution and productivity, thus modifying the conventional fishing methods and sources of income. Moreover, severe weather conditions like cyclones and floods interrupt working activities, destroy machinery and working days, further increasing economic vulnerability.

Occupational vulnerability is not confined to the primary resource-based practices but it is spread to informal and casual labour sectors which prevail in coastal economies. Research has indicated that a large percentage of the residents living on the coastlines are involved in daily wage labour, construction activities and small-scale trading that are typified by low income, no job security and no social protection (International Labour Organization, 2018). Such types of employment are very sensitive to environmental changes, because risks can bring economic operations to a stop, decreasing labour demand. Lack of formal contracts and insurance facilities further increases vulnerability, and workers lack safety nets when they are in times of crisis.

Vulnerability of livelihoods in coastal areas has been widely reported in the Indian context especially after the occurrences of major tragedies. The studies on response to the Indian Ocean tsunami of 2004 underscore the effects of the event on the livelihoods

of fishing communities, including loss of boats, fishing equipment, and fishing grounds (Bavinck et al., 2018). On the same note, research into recurrent flooding events has shown that the environmental hazards are cumulative in their effects on livelihoods, which slowly erode the economic stability and dependency on external assistance.

A limited scope of diversification is another significant aspect of livelihood vulnerability. Although diversification has been viewed as one of the strategies of adaptation, structural constraints like absence of education, skills, and insufficient access to alternative forms of employment limit the capacity of coastal households to change their occupations. This has seen to it that most households are left relying on a limited set of sources of income and this exposes them to more risks. Bene et al. (2016) suggest that the adaptive capacity needs to be improved not only through the diversification process but also by improving access to assets, institutions, and knowledge systems.

Gender is another important factor contributing to vulnerability to livelihood. In the coastal villages, women commonly find themselves in post-harvest practices like fish processing and marketing which are mostly informal, under paid and highly susceptible to shocks. Research shows that the economic value of women is often underestimated, and they do not have the opportunity to manage resources and make decisions, which makes them more vulnerable (FAO, 2018). Meanwhile, the women tend to be very important in the household coping mechanisms, which underscores the gendered and intricate livelihood systems.

livelihood vulnerability should be conceptualized as a subset in a larger framework of multi-layered risks, in which economic insecurity is combined with environmental exposure and social inequalities. Samuel Rufat et al. (2015) highlight the fact that in all the situations of disasters, socioeconomic status is a great factor of vulnerability, affecting the capacity of coping and recovery outcomes. This supports the position that vulnerability as a livelihood dimension is not a standalone dimension but is entrenched in the broader framework of social vulnerability.

2.2.6 Housing and Infrastructural Vulnerabilities in Coastal Communities

Housing and infrastructure are vital material aspects of vulnerability in coastal areas, they determine the exposure to hazards and the ability of communities to survive and adapt to the environmental pressures. The literature continuously shows that the

vulnerability is both socially constructed but also spatially entrenched, that settlement patterns, the quality of housing, and the provision of infrastructures are decisive factors influencing the result of risks. According to the argument of Susan L. Cutter et al. (2003), vulnerability is highly correlated with the nature of places, physical site and built environment factors affect the level of exposure and vulnerability to hazards.

In coastal regions, there is a tendency to locate settlements in low-lying and hazardous regions like shore, estuaries and reclaimed land. Such places are often influenced by historical mechanisms of marginalization and unequal land access, which can force the economically disadvantaged groups of people in the environmentally hazardous areas. Studies have shown that such patterns in space are not random, but are indicative of more socio-economic disparities, with the safer and better-serviced regions being inhabited by more wealthy groups, and the vulnerable populations living in regions prone to flooding, erosion, and tidal intrusion (Cutter et al., 2000; Wisner et al., 2004).

Housing in these areas is usually unstable, with poor construction material, ineffective construction design, and low capacity to withstand severe weather conditions. Research of the post-disaster communities reveals that the houses that are ill-constructed tend to be more vulnerable to destruction during floods and storms, and the loss and reconstruction cycles occur again and again. Blaikie et al. (1994) point out that these unsafe conditions are not only the direct result of the processes in a deeper structure, such as poverty, lack of regulation and access to resources. In most occasions, families are not financially stable to invest in construction of hazard resistant homes, which mean that they are left with homes with minimum protection against environmental hazards.

Insecurity of tenure to land also contributes to housing insecurity. Informal households that lack formal property rights and legal status can be limited in their access to credit, government-provided housing programs, and access to infrastructure services. This restricts their capacity to enhance housing conditions and the chance of being displaced in the case of development activities or calamities. Studies on settlements within the coastline and urban areas emphasize that in informal arrangements of tenure, increased vulnerability is linked closely with residents being left out of formal planning and protection initiatives (Fielding, 2012; UN-Habitat, 2011). Housing conditions are tightly linked to infrastructural vulnerabilities and play a significant role in creating a

risk environment. Simple infrastructure like drainage systems, roads, electricity and water supply is instrumental in reducing the effects of hazards as well as aiding in the recovery efforts. But in most coastal areas there is inadequate, poorly maintained, or uneven infrastructural provision. Poor drainage systems and clogged waterways in the flood-prone region enhance the effects of heavy rainfall and tidal flooding through waterlogging and long-term inundation. Empirical studies on urban flood risk in Kerala point out that the infrastructural development, such as drainage, communication, and transportation infrastructure, is one of the primary factors contributing to resilience in a community, and the inadequacy of the infrastructural systems predisposes the community to greater exposure and diminishes the capacity to adapt to changes.

Another important aspect of vulnerability is water and sanitation infrastructure. Salinity intrusion and freshwater sources contamination are common in the coastal areas, which impacts drinking water availability and health of people. Poor sanitation facilities add to these problems especially during periods of floods when waste systems are overtaken and pollute living conditions. Research has demonstrated that a disruption of water and sanitation systems during the disaster can cause a high probability of disease outbreaks and a longer recovery period (UNDRR, 2015). Transportation and connectivity infrastructure is also crucial in the creation of vulnerability. Access to transport and evacuation can be affected by poor road networks and access to emergency services and the timely delivery of relief materials. In most coastal communities, the state of the roads is so narrow or unpaved that during floods, they become inaccessible, which isolates the communities. Not only does this isolation raise the risk of immediate danger during disasters, but it also has an impact on the recovery in the long term since it restricts access to markets and employment opportunities, as well as vital services.

The other significant factor of infrastructural vulnerability is the connection with development processes. Infrastructure development on large scale like ports, industrial corridors, and urban growth tends to change the natural drainage systems and coastal geomorphology with unintended effects on the environment. Research has shown that these interventions may amplify flooding, erosion, and stagnation of water in the surrounding, thus causing new types of vulnerability despite their intentions to enhance economic growth (Neumann et al., 2015). This is representative of a larger criticism in the literature that development is not necessarily protective, but that in some circumstances, development can increase risk.

Housing and infrastructure have a significant relationship that is especially important in the context of cumulative vulnerability. The combination of poor housing conditions and poor infrastructure has a compounding effect, as the effects of the hazards are exacerbated and recovery becomes harder. Examples include, a structurally weak house in an area with poor drainage has higher chances of being severely damaged during flooding whereas lack of good infrastructure increases displacement and livelihood interruption. Rufat et al. (2015) emphasize that these interrelated aspects create an overall vulnerability pattern of communities, both in terms of short-term and long-term effects.

Moreover, infrastructural inequality tends to reflect the wider social and economic inequalities. Access to quality services including electricity, clean water and sanitation is often skewed with those who are marginalized getting less quality or inconsistent services. This disproportional representation of infrastructure contributes to the vulnerability patterns, since less advantaged populations are not as prepared to respond to and recover hazards. The literature therefore highlights the fact that infrastructural vulnerability is not a solitary technical problem but an expression of governance, planning priorities, and allocation of resources. There has been a growing appreciation of the need to have resilient and inclusive infrastructure in coastal areas in the recent years. The use of climate-resilient housing, better drains, and ecosystem infrastructure are encouraged as measures to mitigate vulnerability. Nonetheless, the success of these interventions is determined by their availability, cost-effectiveness, and relevance to local requirements. Such measures can work only in the interests of some layers of the population without eliminating the root causes of inequalities, leaving the most vulnerable groups vulnerable.

Besides the structural and spatial dimensions described in the literature, other lived experiences of the residents further explain how housing and infrastructural vulnerabilities are created and perpetuated in the day-to-day life. According to the data collected from the Puthuvype by the researcher, numerous households are found on low land where even an average rainfall contributes to water finding its way into the homes not as an occasional risk but as a chronic state of affairs. This lack of ability to raise the house structures because of the financial constraints further solidifies a cycle in which environmental exposure, low quality housing and economic insecurity all intersect. The land subsidence and insufficient drainage are also cited as processes that compromise

even momentary coping strategies such as soil filling by residents suggesting more infrastructural-level inadequacies. Meanwhile, constraints in housing programs and dependency on borrowing indicate that the institutional assistance is still not enough to overcome structural risks. These narratives indicate that housing and infrastructural vulnerability is not just a question of physical systems but it is rooted in more systematic socio-economic and governance systems, in which scarce resources, unequal growth and environmental demands intersect to create chronic and stratified risk situations in the society.

2.2.7 Social Vulnerability in Coastal Communities

The social vulnerability is a major dimension of risk in coastal society, which means that social organization, inequalities and demographics determine how individuals and groups expect, adjust and recover in response to environmental hazards. It is never stated in the literature that vulnerability is not equally distributed but is rather differentiated in accordance with the lines of class, gender, age and social marginality. Social vulnerability, according to Susan L. Cutter et al. (2003) is embedded within the existing characteristics of populations, and that is, the impacts of disasters are mediated by structural inequalities, and not hazards per se. The analysis conducted by Samuel Rufat et al. (2015) also supports this view since the authors illustrate that demographic and socioeconomic factors of income, age, and health significantly contribute to the vulnerability outcomes in the context of the disasters.

These structural insights can be observed in the lived experiences of the coastal communities where the vulnerability is a condition of normal existence and not an exceptional condition. Stories of Puthuvype field describe how economic precarity interacts with environmental exposure to come up with vulnerability. It is stated that people experience long-term financial constraints that prevent the opportunity to improve the accommodation or invest in the preventive measures, thus leaving the exposure to such frequent risks as floods. This conforms to the claims of Neil Adger (2006) that vulnerability is directly proportional to access to resources and entitlements that the low economic capacity constrains adaptive responses.

The gendered aspects of vulnerability are also reflected both in the literature and the field. It has been found that in non-formal, low-paid employment, women in coastal communities often have a dual role of caring at home, which contributes to their

susceptibility to stress and reduces their adaptive capacity (FAO, 2018). This two-fold burden in Puthuvype that economic activity follows the household work is captured in the daily wage labour that the women undertake to supplement the household income. These trends lead to the realisation of how the gendered roles are a factor in vulnerability not only in access to resources and labour expectations but also social expectations.

Age and health are other causes of differentiation of vulnerability. Children and the elderly are distinguished by the literature as the particularly vulnerable group due to their dependency and health-related needs (Rufat et al., 2015). The problem of children health is also evident in the field setting where the residents have complained of respiratory complications and chronic diseases which they attribute to the surroundings in the area. Those perceptions might not always be medically validated in the study, yet they have a significant role in the way communities perceive and experience risk. Existence of these health problems has consequences on household decisions like migration whereby some families have been reported to migrate to seek a safer environment to live.

Social marginality and exclusion contribute to vulnerability. Unpopular communities in most coastal areas do not have access to stable employment, formal education and institutional support that has discouraged their ability to absorb environmental and economic shocks. Puthuvype field observation indicates that underrepresentation on formal employment sectors exists and the residents indicated that no one was employed by the government in the community. It is a bigger trend of job marginalization where communities remain concentrated into informal and resource based livelihoods, which continue the vulnerability cycles.

Another less apparent but important factor of social vulnerability is stigma and social perception. Though a majority of the literature has been on material and institutional reasons, newer literature has realized the contribution of social identity and reputation in controlling the vulnerability outcomes. At Puthuvype, the community laments that the presence of industrial infrastructure and other environmental related problems has left the community with a bad external image, which affects social relationships including marriage. This form of social stigma is a non-material but very effective

aspect of vulnerability that influences individual opportunities and social solidarity within the society.

Social capital and community networks are some of the mitigating factors that are usually incorporated in the aspect of vulnerability. Social connections would be good in the mutual aid, information sharing and mobilization in case of crisis (Aldrich, 2012). Data on the field is however pointing in the direction that such networks too could be strained in cases where the environmental risks and economic pressures and migration clash. The aforementioned movement of the population out of the community due to health and environmental problems implies that there is a risk of social cohesion eroding that can also become more susceptible to it in the long-term.

The interaction between environmental exposure and economic insecurity and social structure provides evidence of the multi-layered nature of social vulnerability. The dimensions are not independent variables, but overlap to produce the compound effects. A case in point is the loss of livelihoods, health related problems and poor housing conditions where vulnerability is felt in more than one arena simultaneously. According to Rufat et al. (2015), these interactions are contextual and vary at various levels of disaster and recovery, and thus the necessity to analyse them locally.

Both the literature and the field evidence confirm that social vulnerability of the coastal population is rooted in the structural inequalities, experiences, and modifying socio-environmental factors. It is not only dictated by objectively measurable factors such as income and employment but other intangible factors such as health beliefs, stigma, and social relations. Such aspects of vulnerability as a multi-layered and complex phenomenon are observed in coastal environments such as Puthuvype where environmental risks are intertwined with economic and social limitations and cannot be seen through a single prism and have to be solved in a complex and context-specific way.

2.2.8 Institutional, Governance, and Development-Induced Vulnerabilities

The institutional and governance systems are a firm determinant of the vulnerability in the coastal societies as they determine how the resources will be distributed, the nature of the risks involved and the interests of the people that will be considered priority during the development processes. It has been reiterated in the literature that in addition to environmental exposure or socio-economic disadvantage predisposing people into

vulnerability, being in a position to exercise effective, inclusive and responsive governance also mediates vulnerability. According to the Sendai Framework on Disaster Risk Reduction, one of the main pillars of reducing the disaster risk is governance as it is stated that inappropriate coordination of institutions, absence of community involvement, and inefficiency in the implementation of the policies can make people very vulnerable (UNDRR, 2015). In this respect, governance is not administration but extremely political how the vulnerabilities of who are addressed and who are not addressed.

Among the most prevalent themes of the literature is the disconnect between the policy frameworks and the realities on the ground. Even though the governments typically possess schemes aimed at assisting in the improvement of housing, livelihoods, and disaster resilience, their application is not typically dispersed evenly. These interventions are not always wholly positive to the marginalised communities because of bureaucracy, lack of understanding and insufficiency in budgetary allocation. Such limitations are seen in the field evidence given by residents of Puthuvype, according to which they partly access housing programs, such as the Life Mission program. Although some families receive some assistance, the money is often not enough to construct robust housing, and the family has to go to debt and informal lending. This can be compared to the fact that institutional response failed to respond to the structural backgrounds of vulnerability as argued by Wisner et al. (2004) but rather respond with partial or short-term solutions.

Besides the welfare provision, governance also affects vulnerability, both in the planning and regulations and in particular the coastal development. This vulnerability presented by development has become a significant motif of the disaster and development literature, and is characterized as a state where large-scale projects, industrialization, and infrastructural intervention create new risks or augment the existent ones. It is asserted by scholars that development cannot be a good thing, it might produce uneven impacts; therefore, in most instances, it might be biased towards economic growth at the expense of social and environmental sustainability (Cernea, 2000). The ecological systems of the coastal areas are frequently altered by projects such as ports, terminals and industrial projects, people livelihoods are destroyed and the local economy reorganized.

The community level, which is a result of development, can be viewed as vulnerable as the industrial project process overlays the traditional livelihood system. This is because whenever LNG and IOC terminals are set up, the people of Puthuvype are always surrounded by a plethora of adverse effects, including environmental degradation, health complications, and economic disruptions. As much as there is always an explanation of such projects in the context of the development of the region and the creation of employment opportunities, the reports in the field show that the benefits are biased. As an illustration, the citizens living in the area have observed that the jobs that were produced during the construction process were not long-term but short-term and the long-term employment was taken by the migrant workers with the local population enjoying lesser dividends of the same. This is reflected in the broader literature on the subject that development projects tend to create transient economic resources and cannot provide sustainable livelihood to the communities concerned (Béné et al., 2016).

The other crucial challenge of institutional weakness is environmental governance. The industrial processes should be controlled adequately to prevent the destruction of environment and to protect the well being of the population. However, tracking, implementation and accountability failures can lead to situations where community bears the environmental cost of development. On the field level, there are air pollution complaints, foul smell and suspected chemical releases that have health and marine ecosystem impacts. Such scientifically proven or not perceptions are significant in how communities experience and make sense of risk. They refer to a lack of trust in regulatory institutions and the importance of open and inclusive governance system.

Land and property transition is also one of the transitions that come with development. Contrary to the anticipation that the infrastructure development would increase land and economic opportunities, in Puthuvype, individuals assert that there is a decline in property value within the area since the establishment of an industrial complex in the area. This means that local economies may be affected adversely by the perceived risks of industrial activity like environmental and health risks. The findings raise questions to the classic narratives of development and highlight the need to consider social and economic externalities of development projects. The poor engagement of the community in decision making is also an issue that makes institutions more susceptible. The literature points out that without inclusive governance that incorporates both local knowledge and voices of the local communities, effective risk reduction and sustainable

development is not possible (UNDRR, 2015). However, in the majority of cases, communities where such impacts are most likely to take place have no substantial roles in the planning and implementation process and therefore decision made by them does not reflect the needs and priority of the communities. Field evidence shows that the people of Puthuvype are of the opinion that development has been imposed on them without much consultation and consideration of their interests. Such exclusion reduces the capacity of communities to influence the results and enhances a feeling of being marginalised.

Another important dimension is intersection between institutional and socio-economic vulnerability. This absence of long-term, institutionalized employment in the community, as can be seen in the field data, reflects on the more general restrictions of structural planning and labour incorporation in economic planning. The inability of the governance structures to provide the communities with inclusive economic opportunities leaves them vulnerable to environmental and economic shocks due to their exposure to informal and insecure livelihoods.

The other similarity in the literature is the failure in governance is prevalent in responding and recovering during disaster situations. Delays in delivering assistance, intra-agency rivalry, and lack of emphasis on vulnerable groups can be part of the impact of hazards. Such trends can vary in various contexts, yet the specific instances suggest the structural problems with the translation of the policy into the successful action. Rufat et al. (2015) emphasize the role of governance and institutional capacity as the main determinants of vulnerability which influence not only the short-term consequences of disasters but also the long-term recovery patterns.

2.2.9 Community Coping Systems and Everyday Resilience Mechanisms

The environmental challenges not only affect the resilience, coping and adaptation of the communities that live in the coasts but it is also widespread in the daily routine activities, the social activities and the resources available in the locality. The fact that resilience is accumulated at typical relationships at the household, community and institutional level and not at individual interventions has dominated the literature on resilience. The regular floods and the risk of the coastal cases in the case of Kerala situation indicate that the word resilience is connected with the social structure, local knowledge and the existence of support system that together enable the community to

cope with the uncertainty state and take care of what happens after the disruptions (Ali and George, 2022).

The coping strategies are likely to be affected by the economic constraints and exposure of the environment to the household level. The explanations given by residents of Puthuvype on how they coped with the recurring floods and water intrusion is not by developing permanent infrastructure, which is prohibitively expensive but by a fairly improvisational and incremental process of addressing the quantity of water coming in, protecting their most prized assets and altering their everyday way of life in the monsoon season. It may be described as an everyday resilience behavior in which the literature defines it as a form of behavior when households are constantly negotiating risks within the framework of the resources available. Such steps may only assist to survive in the short-run but leave the structural problems unaddressed but unsieged.

The other part of coping and adaptation is the livelihood diversification and labour adaptations. Most of the coastal communities in Kerala are experiencing households that are engaged in other income generating activities to shoulder the fluctuations of the economy like daily wage labour, unskilled labour among others in addition to the regular jobs. The household data on Puthuvype indicates that the women in the household are also contributing to the household resilience, by way of their day to day wage labour, besides the untrustworthy fishing income. This corresponds to the local studies that acknowledge the application of gendered labour to sustain home economics in response to environment and economic crises. Structural constraints such as uneducation, skills, lack of formal opportunities in employment, and limit the flexibility levels such diversification.

Another coping strategy is migration, which is also a manifestation of resiliency and distress. The field accounts indicate that there are migration families which have migrated out of Puthuvype due to health and environment. Such a movement could be explained by the adaptive response to the inevitable threat, yet it is also a sign of the inability of the local authorities to provide safe and sustainable conditions of living. In other investigations of the affected disaster areas in Kerala, it is also stated that even migration is a last resort and it is taken up when local coping mechanisms are no longer able to keep up with accumulative vulnerabilities.

Social capital and community networks play a role in the resilience decision without institutional support. In the disaster response analysis of the disaster response in Kerala and more particularly, of the 2018 floods, it was identified that community-based networks, neighbourhood cooperation and informal support systems were the centre of the rescue, relief and recovery (Government of Kerala, 2019). The findings reveal the importance of social cohesion and group action as one of the ways of local resiliency. The dependency on the neighbours, family members and informal borrowing in times of need may not be as strong in Puthuvype but there is some evidence that social support structures are in existence though it is not always obvious that there are structured collective action structures in existence.

The literature and the region, in general, propose that coping, adaptation, and resilience to the coastal societies are complex, context-specific, and inherent to daily life. These are influenced by the interplay of economic resources, social networks, institutional support and environmental conditions. These relationships can be seen in how the households cope with recurrent risks, diversify livelihoods, and community networks in Puthuvype when there are structural vulnerabilities. It is important to know how those processes occur to come up with interventions that can help not only to improve coping strategies but also to treat underlying factors that predispose people to them.

2.2.10 Coastal Urbanization, Industrialization, and Environmental Change in Kerala

The coastal areas of Kerala have undergone rapid socio-economic and environmental changes in the recent years due to rapid urbanization, industrialization, infrastructure development and climatic changes. These changes have greatly impacted coastal landscapes, housing structures and livelihoods, more so in the areas around Kochi, where major development initiatives have put greater strain on vulnerable coastal ecosystems. Recent literature has highlighted the need to look beyond natural hazards to identify coastal vulnerability in Kerala in the context of development pathways, environmental governance and evolving socio-economic variables.

Ecosystems, traditionally forested, have been cleared to be utilized for residential, commercial and industrial use, which has led to higher environmental pressures and lowered the ecological resilience of coastal areas. The Centre for Development Studies also found that unchecked urban expansion and reclamation efforts in coastal Kerala

have led to frequent flooding, clogging of drainage and water logging in low lying areas.

The environmental changes occurring in the coastal areas of Kerala are closely linked to rapid industrialization and infrastructure development. The expansion of ports, petrochemical industries, LNG terminals, and other large-scale industrial projects around Kochi has significantly transformed coastal landscapes and the livelihoods of nearby communities. Studies have highlighted that these development initiatives often generate uneven socio-environmental outcomes, where local coastal communities bear the environmental risks and disruptions to traditional livelihoods, while the economic benefits are largely concentrated among industries and external stakeholders. Such patterns have been particularly evident in Puthuvype, where industrial development has prompted concerns over environmental justice, community well-being, and the unequal distribution of development costs and benefits (Christy, 2024). This process falls into the larger discussion of development-induced vulnerability, which is when development projects create ecological degradation, livelihood disruption and social insecurity.

One such place is Puthuvype, situated in the coastal area of the state, which is an emerging crucial site of socio-environmental changes due to the industrial development. The current conversations about Puthuvype are mostly about the construction of the LNG terminal, IOC facilities, and related industrial projects in the area. Pollution, degradation of environment and alteration of socio-economic situation of the fishing communities residing around these industrial areas have been raised through reports and local studies. Over the past few years, it has become a place of conflict between economic modernization and community welfare as the area is being increasingly developed for industrial purposes and coastal livelihoods.

Ecological changes have direct impacts on the traditional fishing communities, which depend directly on marine and backwater ecosystems for their livelihoods. Research in the fisheries sector in Kerala shows that environmental degradation, mechanisation and over-exploitation of aquatic resources have been responsible for reducing the catch of fish and the uncertainty of employment experienced by small-scale fishers (Kurien, 2001).

Even in coastal areas as Puthuvype, fishing remains as a major source of livelihoods, though there is uncertainty in the sector. The studies available on the coastal economy of Kerala point to the fact that the traditional fishing communities are vulnerable to several factors at the same time, which include reduced income, environmental risks, market fluctuations, lack of occupational diversification, etc. Climate dependent and resource dependent livelihoods exacerbate economic insecurity in coastal regions.

Environmental pollution and its implications for public health have become major concerns in Kerala's coastal regions. Studies conducted in and around Kochi indicate that rapid urbanization, industrial activities, increasing vehicular emissions, and poor waste management have contributed to the deterioration of environmental quality, affecting both air and water resources and posing challenges for sustainable urban and coastal development (Vishnu et al., 2019). This has led to growing concerns about respiratory diseases, water pollution, and the decrease in the quality of life in nearby communities. In the sphere of Puthuvype, the narratives or discussions in the media have repeatedly been associated with the health related worries of the residents, especially children and the elderly.

The vulnerability of the coastal areas of Kerala is further aggravated due to climate variability and recurrent flooding. The Kerala floods of 2018 was a watershed moment in developing awareness of the interplay of climate change, ecological deterioration and unchecked development in the state. The Government of Kerala (2019) post-disaster assessment revealed that the effects of land use changes, reclamation of wetlands, obstructed drainage and settlement in low-lying areas contributed significantly to the aggravation of the flood impact. Researches on flood-prone coastal and riverine areas of Kerala also suggest that environmental degradation and development of infrastructure has caused the adaptive capacity of the natural ecosystems to diminish, leading to intensification and frequency of localized floods.

Water logging and tidal flooding have been reported more often in low-lying areas and coastal settlements around Kochi as a result of the changes in their drainage system and hydrology. Communities in reclaimed and low-elevation areas are more vulnerable as their communities can be inundated for long periods of time due to moderate amounts of rainfall. The socio-economic conditions, lack of infrastructure and adaptive capacities, are additional risks to this environment.

Meanwhile, the communities in Kerala, the coastal areas, have exhibited remarkable adaptive capacity and community-based resilience – especially in times of environmental crisis. Research done since the floods of 2018 show that local communities, fisher groups, neighbourhood networks and civil society organizations have played an important role in the rescue and relief operations. (Government of Kerala, 2019) Local ecological knowledge, mobility and community coordination were widely recognized among fishing communities as their ability to contribute in disaster response. But scholars warn that resilience shouldn't overshadow structural vulnerabilities or governance failures. Vulnerability cannot be eradicated by communities being able to manage environmental stress; underlying inequalities and developmental pressures still create vulnerability.

2.3 THEORETICAL FRAMEWORK

This study looks the problem through the Pressure and Release (PAR) Model of Vulnerability developed by Piers Blaikie, Ben Wisner, Terry Cannon and Ian Davis in *At Risk: Natural Hazards, People's Vulnerability and Disasters*. The framework does not just view disasters and vulnerabilities as the consequence of natural hazards but also as the consequence of social, economic, political and environmental processes that create unsafe living conditions. The model offers a lens through which to analyse the nature of vulnerability in communities in terms of how structural inequalities and developmental processes create this vulnerability.

The PAR model is a framework for understanding vulnerability, in terms of root causes, dynamic pressures, and unsafe conditions. Root causes are the underpinning structural issues of unequal distribution of power, limited access to resources, poverty and socio-political marginalisation. These structural pressures are manifested as dynamic pressures including weak governance, rapid urbanization, lack of institutional support, environmental degradation and inadequate infrastructure. This pressure finally leads to unsafe conditions, where communities are at risk due to poor environmental conditions, insecure housing, hazardous urban locations and fragile livelihoods (Wisner et al., 2004).

This framework is especially relevant for the current study as the vulnerabilities faced in Puthuvype are not restricted to environmental hazards only and are much more reflective of socio-economic and developmental processes. The problems faced by the

households in the low-lying areas involving recurring flooding, livelihood insecurity of the fishing community, decreasing fish catch, concerns about pollution of the environment, and lack of institutional support cannot be considered as separate issues. Instead, they are "interrelated" structural and developmental stressors in the community.

A key part of the framework is the focus on the interplay between vulnerability and coping. Communities can create adaptation strategies and resilience mechanisms but these may be constrained by structures. Puthuvype households implement coping strategies like taking up informal employment, accessing social networks and adapting to the cyclical flooding situations. But there are continuing constraints on long term resilience due to limited financial resources, inadequate institutional support, and environmental uncertainty. This is in line with Blaikie et al's (1994) argument that vulnerability is socially constructed and cannot be successfully tackled by coping strategies of individuals. The study also incorporates a broader understanding of social vulnerability, such as that provided by Susan L. Cutter et al. (2003) who state that vulnerabilities are influenced by demographic, socio-economic and spatial inequalities. The PAR model is complemented by this perspective in that it emphasizes that vulnerability is not distributed evenly across communities and social groups. As part of Puthuvype, various elements of economic precarity, fishing livelihood dependency, insecure housing conditions and inequitable institutional resources divide the experiences of vulnerability.

The theoretical framework thus allows the study to explore the vulnerability as a multi-dimensional and socially constructed process. It serves as an analytical framework to understand the linkages between environmental risks and marginalisation of livelihoods, weak governance, industrial development and social inequalities in the context of the coast of Puthuvype.

2.4 RESEARCH GAP ANALYSIS

There is already a large existing literature on vulnerability, coastal communities, disaster risk and environmental change that offers valuable lessons for understanding social and ecological vulnerabilities of coastal populations. Studies at the international level have extensively examined vulnerability as a multi-dimensional phenomenon shaped by environmental exposure, socio-economic inequalities, institutional

limitations, and governance structures (Blaikie et al., 1994; Adger, 2006; Cutter et al., 2003).

Likewise, studies in the Indian and Kerala settings have been done on coastal erosion, flooding, environmental deterioration, industrialisation, fisheries reduction, climate change challenges facing coastal communities etc. The majority of the studies conducted in Kerala has been largely on environment related issues of climate change, impact of the 2018 floods, coastal erosion and ecological degradation in low lying and flood prone areas. Other studies focused on the fisheries-based livelihoods, urbanization around Kochi, and the environmental effects of industrial and infrastructural development in coastal areas. Also, studies on resiliency and disaster responses in Kerala have noted the significance of local communities and informal support networks in disasters.

Although there has been increasing literature on the vulnerability of the coasts and on environmental change, there are some significant gaps. A major constraint is that many studies focus on environmental, economic, social or institutional vulnerabilities, but not on how they are linked and reinforce each other. Environmental studies tend to be more on physical aspects of risks like flooding, sea-level rise, erosion and socio-economic studies are more on livelihoods or poverty alone. Consequently, there has been little focus on how environmental risks are interlinked with livelihood vulnerabilities, living conditions, governance challenges, industrialization, health and social marginalization for coastal communities in their daily experiences. Also, there is a lack of qualitative and community-based research that emphasizes the lived experiences, perceptions and coping strategies of the residents themselves. Most of the current literature is of a quantitative nature, or uses environmental indicators or policy-level analysis. Such studies are useful for understanding the nature of vulnerability as a pattern, but cannot adequately reflect the lived experiences of vulnerability within communities. Emotional stress, social stigma, risk perceptions of the environment, and a compound effect of repeated insecurity are yet unexplored factors in many coastal studies.

Literature review shows that the field of disaster and ecological changes have been more explored at macro level in the context of Kerala, especially in the wake of the floods in 2018. A few less studies have focused on local and common vulnerabilities in particular coastal communities, particularly in communities that are experiencing rapid

industrial and infrastructural changes. While there are discussions about coastal industrialization and environmental issues in Kochi and the surrounding areas, little academic focus has been given to Puthuvype as a unique socio-environmental context.

The existing literature on Puthuvype is rather disjointed and focused on industrial development, protests against LNG terminal, environmental issues, and coastal change. Little research exists that considers how residents are affected and experience multiple vulnerabilities at once. In particular, the linkages among flooding, livelihood insecurity, housing precarity, industrialization, environmental health issues, governance constraints, and social issues in the everyday lives of the community are not explored.

Previous research has not considered the role of development processes as contributors to vulnerability production in coastal communities. The debate on industrialization and infrastructural development is often framed as an economic development and modernization process, but there are relatively few critical analyses on the differential social and environmental impacts on marginalized communities. In the context of Puthuvype, where the industrial sector and the fishing dependent and low income households reside, it is important to know how the development-induced environmental and social changes alter the community vulnerability.

Another aspect of the literature that lacks coverage is coping mechanism and adaptive practices in structurally vulnerable coastal areas. In disaster studies, the concept of resilience is widely discussed yet, at times, the dynamics of community resilience are romanticized and structural limitations on coping are not sufficiently discussed. The everyday practices undertaken by households in the adaptation to flooding, livelihood insecurity, environmental uncertainty, and institutional deficiencies needs to be explored qualitatively in greater detail.

This study aims to overcome these limitations as it takes a qualitative case study approach that centres around Puthuvype, a coastal community with multiple and overlapping vulnerabilities. The current analysis differs from existing studies that focus on vulnerability across single dimensions, by considering environmental, economic, social, institutional and development-induced vulnerabilities in one analysis. The study aims to highlight the lived experiences, perceptions, and coping strategies of residents, contributing a localized and community-based understanding of multi-layered vulnerability in a rapidly-changing coastal context.

The study also adds to the literature by exploring vulnerability as a socially-created and developmentally-based state. The research focuses on the industrialization, governance, housing insecurity, changes in livelihood, perception of environment and the adaptation of the coastal communities to experience and negotiate vulnerability in the contemporary Kerala, to provide a more comprehensive picture.

CHAPTER III: RESEARCH METHODOLOGY

3.1 INTRODUCTION

Research methodology constitutes an essential component of the research process as it provides the systematic framework through which a study is planned, conducted, and interpreted. It encompasses the various methods, techniques, and procedures employed by the researcher to collect, analyse, and interpret data in a manner that is consistent with the objectives of the study. A carefully designed methodology not only guides the researcher throughout the research process but also enhances the credibility, trustworthiness, and validity of the findings. According to Creswell and Poth (2018), research methodology serves as a blueprint that connects the research problem, data collection procedures, and methods of analysis, thereby ensuring that the study is conducted coherently and systematically.

The present study seeks to understand the multi-layered vulnerabilities experienced by residents of Puthuvype, a coastal community in Ernakulam district, Kerala. The study focuses on examining the social, economic, and environmental challenges affecting the community, the structural and governance-related factors contributing to these vulnerabilities, the differential experiences of vulnerability among various social groups, and the coping and adaptation strategies adopted at the household and community levels. Given the complexity and context-specific nature of these issues, it was necessary to adopt a methodological approach capable of capturing the lived experiences, perceptions, and realities of community members in a comprehensive manner.

This chapter outlines the methodological framework adopted for conducting the study. It presents the title of the study, research questions, and definition of key concepts that guided the inquiry. The chapter further describes the pilot study, research design, study area and participants, sampling strategy and criteria for the selection of respondents, sources of data, methods and tools of data collection, pre-test, and data analysis procedures. In addition, it discusses the ethical considerations observed during the research process as well as the assumptions, limitations, and scope of the study. Together, these methodological components provide a clear account of how the study was conducted and how the findings were generated to address the research objectives.

3.2 TITLE OF THE STUDY

“Multi-Layered Vulnerabilities in a Coastal Community: Puthuvype, Kerala”

3.3 RESEARCH QUESTIONS

General Research Question

How do residents of Puthuvype experience and navigate multi-layered social, economic, and environmental vulnerabilities, and how do they cope with them?

Specific Research Questions

1. What are the major social, economic, and environmental challenges affecting the community?
2. How the structural and governance factors contribute to these vulnerabilities?
3. How do different social groups experience vulnerability differently?
4. What coping and adaptation strategies are practised at the household and community levels?

3.4 DEFINITION OF CONCEPTS

Sl. No.	CONCEPTS	CONCEPTUAL DEFINITIONS	OPERATIONAL DEFINITIONS
1	Vulnerability	“Vulnerability refers to the characteristics and circumstances of individuals or groups that influence their capacity to anticipate, cope with, resist, and recover from the impacts of hazards and adverse conditions” (Blaikie et al., 2004).	Vulnerability refers to the conditions and circumstances that make residents of Puthuvype susceptible to social, economic, and environmental challenges and influence their ability to cope with and recover from these challenges.
2	Multi-layered Vulnerability	“Vulnerability is increasingly understood as a multidimensional phenomenon resulting from the interaction of social, economic,	Multi-layered vulnerability refers to the interconnected social, economic, and environmental vulnerabilities experienced by residents of Puthuvype and the ways in which these

		environmental, and institutional factors” (Birkmann, 2006).	dimensions interact to influence their daily lives, well-being, and livelihood security.
3	Coastal Community	“A coastal community refers to a population living in proximity to coastal ecosystems whose livelihoods, social life, and cultural practices are closely linked to coastal and marine resources” (FAO, 2011).	The coastal community refers to the residents of Puthuvype in Ernakulam district, Kerala, whose livelihoods, living conditions, and social relations are shaped by their location within a coastal ecosystem connected to the Arabian Sea and backwaters.
4	Social Vulnerability	“Social vulnerability refers to the susceptibility of social groups to potential losses from hazards and their ability to respond to, cope with, and recover from adverse events” (Cutter et al., 2003).	Social vulnerability refers to the social conditions and challenges experienced by residents of Puthuvype, including issues related to health, education, social exclusion, safety, social relationships, and access to social support and opportunities.
5	Economic Vulnerability	“Economic vulnerability refers to the susceptibility of individuals and households to economic losses and livelihood disruptions arising from shocks, stresses, and changing socioeconomic conditions” (Adger, 2006).	Economic vulnerability refers to livelihood-related challenges faced by residents of Puthuvype, including income instability, declining livelihood opportunities, unemployment, indebtedness, rising living costs, and other factors

			affecting household economic security.
6	Environmental Vulnerability	“Environmental vulnerability refers to the degree to which individuals, communities, and ecosystems are exposed and sensitive to environmental hazards and ecological changes, as well as their capacity to adapt to such changes” (Adger, 2006).	Environmental vulnerability refers to the environmental challenges experienced by residents of Puthuvype, including coastal erosion, flooding, pollution, ecological degradation, climate-related impacts, and changes in the coastal environment that affect community livelihoods and well-being.

3.5 PILOT STUDY

A pilot study is a small-scale version of the main study conducted before the actual research in order to test the feasibility of the research process and identify potential issues that may arise during fieldwork. According to Teijlingen and Hundley (2001), a pilot study helps researchers refine research procedures, improve data collection methods, and identify practical difficulties before undertaking the main study.

Prior to the commencement of the main study, a pilot study was conducted in Puthuvype to gain a preliminary understanding of the community and assess the feasibility of the research. The pilot study enabled the researcher to become familiar with the local context and obtain initial insights into the social, economic, and environmental issues affecting the community.

Informal interactions with community members were carried out during the pilot phase to understand the nature of vulnerabilities experienced by residents and to identify issues relevant to the research objectives. The pilot study also helped assess the suitability of the research design, sampling strategy, and data collection procedures. It provided an opportunity to identify practical challenges that could arise during

fieldwork and make necessary modifications before the commencement of the main study.

The observations and insights gained from the pilot study contributed to refining the focus of the research and provided valuable guidance for the subsequent stages of data collection and analysis.

3.6 RESEARCH DESIGN

Research design refers to the overall plan or blueprint that guides the process of conducting research. It provides a systematic framework for collecting, analysing, and interpreting data in order to answer the research questions effectively. According to Creswell and Poth (2018), research design is a logical structure that connects the research questions with data collection procedures and methods of analysis, ensuring that the findings are credible and relevant. Similarly, Yin (2018) describes research design as a plan that links empirical data to the initial research questions and ultimately to the study's conclusions.

A well-developed research design plays a crucial role in ensuring the scientific rigour and quality of a study. It helps the researcher select appropriate methods of data collection, identify suitable participants, organise the research process systematically, and maintain consistency throughout the study. The research design also enhances the credibility, dependability, and trustworthiness of the findings by providing a clear framework for conducting the investigation (Creswell & Poth, 2018).

The present study adopts a qualitative research approach. Qualitative research seeks to understand people's experiences, perceptions, meanings, and interpretations of social reality within their natural settings. Rather than measuring variables quantitatively, qualitative research aims to explore the complexity of human experiences and social phenomena through rich and detailed descriptions (Denzin & Lincoln, 2018). This approach is particularly appropriate for studies that seek to understand how individuals perceive and make sense of their everyday lives.

Within the qualitative research paradigm, the study employs a case study research design. According to Yin (2018), a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, particularly when the boundaries between the phenomenon and the context are not clearly evident. Case study

research enables an in-depth exploration of a specific setting, community, organisation, or event through multiple sources of evidence, thereby providing a holistic understanding of complex social realities.

The selection of a case study design is particularly relevant to the present research because it focuses on the lived experiences of residents in Puthuvype, a coastal community in Kerala that is exposed to multiple and interconnected social, economic, and environmental vulnerabilities. The research seeks to understand not only the challenges faced by the community but also the structural factors that contribute to these vulnerabilities and the coping and adaptation strategies adopted by different social groups. These issues are deeply embedded within the local social, cultural, economic, and environmental context and therefore require an in-depth contextual investigation rather than a broad generalisation.

The case study design allows the researcher to examine the phenomenon of multi-layered vulnerability in its natural setting while capturing the perspectives of diverse community members and understanding the interactions between individual experiences, community dynamics, and institutional structures. The design also facilitates the use of multiple qualitative data collection methods, including in-depth interviews, observations, and field notes, thereby enabling a comprehensive and nuanced understanding of the research problem.

3.7 SAMPLING STRATEGY

Sampling is the process of selecting a subset of individuals from a larger population to obtain information that is relevant to the objectives of a study. In qualitative research, sampling is primarily concerned with selecting information-rich participants who can provide detailed insights into the phenomenon under investigation rather than achieving statistical representation (Patton, 2015).

The present study adopts purposive sampling as its sampling strategy. Purposive sampling is a non-probability sampling technique in which participants are intentionally selected based on their knowledge, experiences, and ability to provide meaningful information related to the research problem (Creswell & Poth, 2018). According to Patton (2015), purposive sampling enables researchers to identify and select individuals who possess firsthand experience and in-depth understanding of the phenomenon being studied, thereby generating rich and comprehensive qualitative data.

Purposive sampling was considered appropriate for the present study because the research seeks to understand how residents of Puthuvype experience and navigate multi-layered social, economic, and environmental vulnerabilities and the coping strategies they employ. These experiences cannot be adequately explored through random selection, as not every resident may have sufficient knowledge or direct experience of the issues under investigation. Therefore, participants were selected intentionally based on their residence in the study area and their lived experiences of social, economic, and environmental challenges.

The study also aimed to include respondents from diverse social and occupational backgrounds in order to capture multiple perspectives on vulnerability. This included fishermen, women engaged in informal occupations, daily wage workers, small business owners, homemakers, elderly residents, youth, and community members who have experienced changes in livelihood, environment, or access to services. Such diversity enabled the researcher to develop a holistic understanding of the interconnected vulnerabilities existing within the community.

The number of participants was determined based on the principle of data saturation, whereby data collection continued until no substantially new information or themes emerged from subsequent interviews.

3.7.1 Inclusion Criteria

- Permanent residents of Puthuvype with a minimum residence period of five years.
- Individuals aged 18 years and above.
- Residents who have directly experienced or observed social, economic, and environmental challenges within the community.
- Individuals willing to voluntarily participate in the study and provide informed consent.
- Participants capable of communicating their experiences and perceptions effectively.

3.7.2 Exclusion Criteria

- Residents below the age of 18 years.

- Temporary residents, visitors, or migrant workers who have lived in Puthuvype for less than five years.
- Individuals unwilling to provide informed consent.
- Persons who were unable to participate meaningfully due to severe illness or communication difficulties at the time of data collection.
- Individuals who had no direct experience or knowledge relevant to the objectives of the study.

3.8 DATA COLLECTION

Data collection is a systematic process of gathering information relevant to the research objectives and research questions. In qualitative research, data collection aims to obtain detailed descriptions of participants' experiences, perceptions, and meanings through direct interaction with them in their natural settings (Creswell & Poth, 2018). The present study employed both primary and secondary sources of data to develop a comprehensive understanding of multi-layered vulnerabilities experienced by the residents of Puthuvype. The primary data collection was carried out in Puthuvype after obtaining the necessary academic permission and informed consent from the participants. Before commencing the interviews, the researcher visited different parts of the community to become familiar with the local setting and establish rapport with the residents. Initial interactions with community members facilitated the identification of respondents who met the inclusion criteria and possessed lived experiences relevant to the objectives of the study.

Participants were approached individually, and the purpose, objectives, and voluntary nature of the study were clearly explained to them. They were assured that their participation was entirely voluntary and that the information shared would be treated with confidentiality and used solely for academic purposes. Interviews were conducted at locations and times convenient to the participants, creating a comfortable environment that encouraged open discussion.

An interview guide was used to facilitate the interviews while allowing participants the flexibility to express their experiences and perspectives in their own words. The interview guide covered themes related to social, economic, and environmental

vulnerabilities, structural and governance factors, differential experiences among social groups, and coping and adaptation strategies.

Each interview lasted approximately 40 to 60 minutes, depending on the participant's responses and willingness to share their experiences. With the consent of the participants, important responses were documented through written notes, and observations regarding the physical environment, housing conditions, community interactions, and livelihood activities were recorded throughout the fieldwork. Data collection continued until thematic saturation was achieved, where no substantially new information emerged from subsequent interviews.

3.8.1 Sources of Data

Primary Data

Primary data refers to first-hand information collected directly from participants for the specific purpose of the study (Kumar, 2021). In the present study, primary data were collected from residents of Puthuvype through in-depth interviews. The primary data provided detailed insights into the social, economic, and environmental vulnerabilities experienced by the community, as well as the coping and adaptation strategies adopted at the household and community levels.

Secondary Data

Secondary data refers to information that has already been collected and documented by other researchers or institutions (Kumar, 2021). For the present study, secondary data were obtained from books, peer-reviewed journal articles, government reports, census documents, policy documents, official websites, newspapers, and previous research studies related to vulnerability, coastal communities, disaster risk reduction, livelihoods, and the socio-economic and environmental context of Puthuvype and Kerala. Secondary sources helped provide contextual understanding and supported the interpretation of primary data.

3.8.3 Tools of Data Collection

Interview Guide

The primary tool used for data collection was an interview guide. The interview guide consisted of themes developed based on the research questions, enabling the researcher to obtain detailed narratives while maintaining consistency across interviews.

3.9 PRE-TEST

Prior to the main data collection, a pre-test of the interview guide was conducted in Puthuvype. The purpose of the pre-test was to assess the clarity, relevance, and sequencing of the questions and to identify any difficulties that respondents might face during the interview process.

The pre-test also helped the researcher assess the flow of the interview and make necessary modifications to ensure that the questions effectively captured the experiences and perspectives of the respondents regarding social, economic, and environmental vulnerabilities. The revised interview guide was subsequently used for the main data collection.

3.10 DATA ANALYSIS

The data collected through interviews were analysed using thematic analysis. Thematic analysis is a qualitative data analysis method that involves identifying, organising, and interpreting patterns or themes within the data.

Following the completion of data collection, the interview responses were systematically reviewed and organised. The data were then coded and grouped into meaningful categories based on recurring ideas, experiences, and issues expressed by the respondents. These categories were further analysed to identify broader themes related to social, economic, and environmental vulnerabilities, structural and governance factors, differential experiences of vulnerability among social groups, and coping and adaptation strategies.

The themes that emerged from the analysis formed the basis for interpreting and presenting the study's findings.

3.11 ETHICAL CONSIDERATIONS

Ethical principles were carefully observed throughout the research process to ensure the rights, dignity, and well-being of the participants. Prior to data collection, the purpose and objectives of the study were clearly explained to all participants. Their informed consent was obtained before conducting the interviews.

Participation in the study was entirely voluntary, and respondents were informed that they had the right to decline participation or withdraw from the study at any stage.

without any consequences. The participants were also assured that the information provided by them would be used solely for academic purposes.

Confidentiality and anonymity were maintained throughout the study. Personal identifiers such as names and other identifying information were not disclosed in the research report. The privacy of the respondents was respected during data collection, and interviews were conducted at locations convenient and comfortable for the participants.

The researcher-maintained honesty and integrity throughout the research process by ensuring that the data collected were accurately recorded, interpreted, and presented without distortion or misrepresentation. Care was also taken to avoid any form of physical, psychological, or social harm to the participants during the study.

3.12 ASSUMPTIONS, LIMITATIONS, AND SCOPE

Assumptions

- Residents of Puthuvype experience multiple and interconnected forms of social, economic, and environmental vulnerability that influence their everyday lives and well-being.
- Environmental issues such as coastal erosion, pollution, environmental degradation, and climate-related changes have affected the livelihoods and living conditions of the community.
- Livelihood activities, particularly those dependent on coastal and marine resources, have undergone significant changes, creating economic insecurity for certain sections of the population.
- Different social groups within the community experience vulnerability differently based on factors such as occupation, gender, age, socio-economic status, and access to resources.
- Structural and governance-related factors, including access to public services, welfare schemes, and institutional support, influence the vulnerability experienced by community members.

- Households and community members have developed various coping and adaptation strategies to manage the challenges arising from social, economic, and environmental vulnerabilities.
- The respondents possess adequate knowledge and lived experience of the issues being studied and are capable of providing meaningful insights into the realities of the community.
- The responses provided by the participants are honest reflections of their experiences, perceptions, and challenges and therefore provide a reliable understanding of the situation within the community.

Limitations of the Study

- The study was confined to Puthuvype, a coastal community in Ernakulam district, Kerala; therefore, the findings cannot be generalised to all coastal communities.
- As a qualitative case study, the research focused on obtaining in-depth insights rather than achieving statistical representation.
- The findings are based on the perceptions and experiences of the respondents and may be influenced by individual interpretations and recollections.
- Time and resource constraints limited the number of respondents who could be included in the study.
- Certain sensitive issues related to livelihoods, governance, or personal experiences may not have been fully disclosed by respondents during the interviews.

Scope of the Study

The study focuses on understanding the multi-layered vulnerabilities experienced by the residents of Puthuvype, a coastal community in Ernakulam district, Kerala. It examines the social, economic, and environmental challenges affecting the community and explores the structural and governance-related factors that contribute to these vulnerabilities.

The study also seeks to understand how different social groups experience vulnerability and investigates the coping and adaptation strategies adopted at the household and community levels. By exploring the lived experiences and perspectives of community members, the research aims to provide a contextual understanding of vulnerability within a coastal setting and contribute to the existing body of knowledge on coastal communities and vulnerability studies.

The findings of the study may be useful for researchers, social work practitioners, policymakers, local governance institutions, and development agencies working towards enhancing the well-being and resilience of vulnerable coastal communities.

CHAPTER IV:

THE CASE OF PUTHUVYPE

The case of Puthuvype

Community Profile

Puthuvype is a coastal community situated within Elankunnapuzha Panchayat in Kochi Taluk of Ernakulam district. Spread over approximately 11.52 square kilometres, the area is characterized by its close relationship with the sea, backwaters, and interconnected canals. While official records describe its geographical location and demographic composition, the residents themselves define Puthuvype through its history, fishing traditions, and strong sense of community. Throughout the fieldwork, participants consistently portrayed the locality as a place where generations of families have lived in close association with the coastal environment, making fishing not merely an occupation but an integral part of everyday life.

The historical identity of Puthuvype was explained in detail by Participant 6, a former community representative, who traced the origin of the locality to the great flood of 1341. According to the participant, the overflowing Periyar River deposited large quantities of sediments along the coast, gradually forming new land. This newly formed land came to be known as *Puthuveppu*, meaning "newly formed land," which later evolved into the present-day name, Puthuvype. Reflecting on this history, the participant remarked, *"Our elders always said this land was created after the great flood. That is why it was called Puthuveppu, and over time it became Puthuvype."* This historical narrative continues to shape the community's identity and its connection to the surrounding coastal landscape.

Fishing remains the defining feature of the community. Across almost every interview, participants described fishing as the primary source of livelihood for a majority of households. According to Participant 6, nearly three-fourths of the population depends either directly or indirectly on fishing and related activities. Several respondents explained that families have been engaged in fishing for generations, passing on traditional knowledge and skills from one generation to the next. For many households, the sea represents both a source of livelihood and a way of life. As Participant 2 observed, *"Almost every family here has someone connected to fishing. It has always been our main occupation."*

Although fishing continues to dominate the local economy, participants noted that livelihoods within the community have gradually diversified. Women commonly engage in daily wage labour, fish vending, or other informal employment to supplement household income. Some younger residents seek work outside the fishing sector, while others had previously worked during the construction phase of nearby industrial projects. However, participants pointed out that these employment opportunities were largely temporary, and many eventually returned to irregular forms of work after construction activities ended.

Residents also described Puthuvype as a community that has undergone noticeable transformation over the years. Earlier, the area was remembered as a relatively quiet fishing settlement with extensive open spaces and wider water channels. Over time, however, infrastructure development, industrial establishments, and increasing population have altered the physical and social landscape. While some participants acknowledged that development had brought improved roads and greater connectivity, many also felt that the character of the community had changed considerably. Participant 2 reflected on this transformation by saying, *"Puthuvype has changed a lot. Earlier it was mostly a fishing village, but now many things have come here. Life is not the same as it used to be."*

The interviews also revealed that the community is socially diverse. Besides fishing households, Puthuvype is home to families engaged in different occupations and includes residents from various social backgrounds, including Scheduled Caste communities such as the Pulaya community. Participants observed that women, older participants, children, and participants with disabilities constitute a significant section of the local population, contributing to the diverse social composition of the area. Despite these differences, many respondents described the community as one where people have lived together for generations and continue to share a strong sense of familiarity and belonging.

The narratives portray Puthuvype as a community whose identity is deeply rooted in its coastal environment and fishing heritage while simultaneously experiencing rapid social and physical transformation. The interviews suggest that residents view their community with a sense of attachment and pride, even as they acknowledge that

changing environmental conditions, livelihood patterns, and developmental activities have gradually reshaped everyday life.

People and Livelihood

The fishing continues to be the primary occupation in Puthuvype and remains central to the identity and economy of the community. For many households, fishing is not merely a source of income but a tradition that has been passed down through generations. Participants explained that their daily routines, family responsibilities, and seasonal activities are closely linked to the sea. The dependence on marine resources has created a strong occupational identity, with many families having at least one member engaged in fishing or related activities.

Several participants described fishing as an occupation that demands resilience and adaptability. Fishermen often leave home early in the morning or late at night depending on weather conditions and fishing seasons. Their income is highly uncertain and varies according to the availability of fish, market demand, and sea conditions. As Participant 1 explained, *"Fishing is our livelihood, but we never know how much we will earn. Some days we return with a good catch, and on other days we come back almost empty-handed."* This uncertainty has become a routine part of life for many fishing households.

According to Participant 6, nearly seventy-two per cent of the population depends directly or indirectly on fishing and allied activities. This heavy reliance on a single occupation means that changes affecting the marine environment have immediate consequences for household incomes. Participants repeatedly noted that fishing has become increasingly difficult compared to previous decades, with many believing that fish availability has declined over time. Although the reasons varied in the participants' accounts, they consistently expressed concern about the future sustainability of fishing as a livelihood.

Women also make significant contributions to household income through various forms of work. Participants explained that many women are employed as daily wage labourers, engage in fish vending, or undertake other informal jobs whenever opportunities arise. Their earnings often supplement the irregular income generated through fishing and help families manage everyday household expenses. Participant 1

observed, *"Most women here work whenever they get an opportunity. Whatever they earn helps the family because fishing income alone is not enough."*

Some residents recalled that the construction of the nearby LNG Terminal temporarily created employment opportunities within the community. During the construction phase, several local residents found work in construction-related activities, providing an additional source of income for many households. However, these opportunities were short-lived. Once construction was completed, most of these jobs disappeared, leaving workers to return to fishing or other forms of informal employment. Participant 2 reflected on this experience by stating, *"During construction, many local people got work. But after everything was finished, those jobs disappeared, and very few local people were employed afterwards."*

Participants also noted that the remaining employment opportunities associated with industrial establishments were limited for local residents. According to Participants 2 and 3, many of the available jobs are now occupied by migrant workers, while members of the local community continue to depend on traditional occupations. This has contributed to a perception among residents that industrial development has not translated into stable employment for local households.

The interviews further revealed that economic opportunities within Puthuvype remain limited outside the fishing sector. While small businesses, tea shops, restaurants, and tourism-related activities exist, participants felt that only a small section of the population benefits directly from these ventures. Traditional fishing families often have limited access to such opportunities due to financial constraints, lack of resources, or the specialised nature of their existing occupations. As Participant 3 explained, *"Tourism benefits only those who own businesses. Ordinary fishing families like ours do not gain much from it."*

The accounts of participants portray a community whose livelihoods remain deeply rooted in fishing despite gradual economic changes. While residents have explored alternative sources of income whenever possible, fishing continues to provide the foundation of household survival for a majority of families. At the same time, the interviews suggest that limited employment diversification and the temporary nature of alternative job opportunities have reinforced the community's continued dependence on traditional occupations.

Environment

The natural environment forms an inseparable part of everyday life in Puthuvype. Surrounded by the sea, backwaters, canals, and low-lying lands, the community has historically depended on its coastal ecosystem for livelihood and sustenance. Participants described the environment as both a valuable resource and an important element of the community's identity. However, many residents also felt that the environmental conditions of Puthuvype have changed considerably over the years, affecting not only the landscape but also their daily lives.

A recurring concern expressed by several participants was the presence of large industrial establishments located near the community, particularly the LNG Terminal and the IOC facilities. Residents frequently associated these industries with changes in the local environment. Participant 1 explained that unpleasant odours are often noticeable, particularly during the night, making it uncomfortable for families to remain outdoors or even keep their windows open. Recalling these experiences, the participant stated, *"Sometimes at night the smell becomes very strong. We don't know exactly what it is, but everyone notices it."*

Similar concerns were shared by Participants 2, 3, 4 and 6, who believed that industrial activities had altered the environmental quality of the locality. While participants were unable to identify the exact source of the emissions, many felt that the air had become noticeably different after the establishment of the industries. According to Participant 4, *"Earlier, the air felt fresh because we lived close to the sea. Now many people feel that the atmosphere has changed."*

Another issue repeatedly mentioned during the interviews was dust pollution generated by the continuous movement of heavy vehicles transporting industrial materials. Residents explained that large container trucks and tankers frequently pass through the area, producing considerable amounts of dust that settle on houses, roadside vegetation, and public spaces. Participant 1 observed, *"The roads are always busy with heavy vehicles. The dust enters our houses, and we have to clean everything again and again."* Participants described this as an everyday inconvenience that has gradually become part of life in the community.

The coastal environment itself has also undergone visible changes. Participants who had lived in Puthuvype for several decades recalled that the area once had wider canals,

more open spaces, and healthier water bodies. Participant 6 drew attention to the gradual narrowing of the RMP Canal, explaining that what had once been a broad water channel measuring nearly ten to twelve metres in width has, over the years, been reduced to only one or two metres in several stretches. According to the participant, this change resulted primarily from land reclamation carried out over many years. Reflecting on this transformation, the participant remarked, *"The canal used to be much wider. As land was reclaimed, it became narrower, and today it cannot carry water the way it once did."*

Participants also described the influence of tides on everyday life. High tides and low tides were said to affect the movement of water through canals and nearby water bodies, occasionally leading to overflow into surrounding areas. Residents viewed these tidal changes as a familiar part of living in a coastal community, although several observed that such occurrences have become more noticeable in recent years.

For fishing households, the marine environment continues to be closely linked with their livelihoods. Many participants believed that fish availability has declined compared to previous years. While individual explanations differed, some residents felt that industrial activities near the coast had affected the marine ecosystem. Participant 1 expressed this perception by saying, *"Earlier, there was more fish. Now the catch is not the same, and many people believe the sea has changed."* Similar views were echoed by other fishermen who associated changes in the coastal environment with their everyday experiences at sea.

Housing and Infrastructure

Housing and infrastructure are important aspects of everyday life in Puthuvype. While many residents have continued to improve their homes over the years, several participants explained that the coastal setting, low-lying terrain, and changing landscape present continuous challenges for maintaining safe and comfortable living conditions. Their accounts illustrate that housing is closely connected with financial capacity, local environmental conditions, and the availability of basic infrastructure.

One of the most frequently discussed concerns was the issue of water entering houses during periods of heavy rainfall. Participants living in low-lying areas explained that even short spells of intense rain can result in water accumulating around their homes and, in some cases, entering the living spaces. Participant 1 described her house as being

situated considerably below the level of the nearby road, making it particularly susceptible to waterlogging. She explained that among the surrounding houses, her home is one of the worst affected during the monsoon season. Recalling these experiences, she said, *"When it rains heavily, water comes inside the house. We know the problem will come every monsoon, but we don't have the money to raise the house."*

A similar experience was shared by Participant 3, who explained that her house had been constructed almost at ground level. During heavy rainfall, water enters the house, damaging household belongings and disrupting normal routines. Although she recognised the need to raise the floor level to reduce the problem, existing financial commitments, including a housing loan, made such improvements difficult. As she explained, *"The house is already under a loan. We know what has to be done, but we simply cannot afford it."*

Participants repeatedly highlighted that improving houses in Puthuvype often involves additional costs that are not commonly encountered elsewhere. Before constructing a house, many families first have to raise the level of the land or foundation to reduce the possibility of water entering the building. However, Participant 4 explained that even after adding soil, the land gradually subsides over time, requiring repeated efforts and additional expenditure. According to the participant, *"Even if we fill the land, after some time it settles again. It feels like we are doing the same work over and over."*

Housing improvements were therefore closely linked to household finances. Several participants explained that although they were aware of measures that could make their homes safer, limited income often prevented them from undertaking major structural modifications. Instead, families relied on temporary arrangements during the monsoon season, moving household items to higher places and carrying out minor repairs whenever possible.

Road infrastructure was another issue raised during the interviews. While residents acknowledged that road connectivity has improved over the years, they also pointed out that roads in certain locations are now considerably higher than the surrounding residential plots. Participants felt that this difference in elevation contributes to water collecting in nearby houses during periods of heavy rainfall. Rather than viewing roads as a problem in themselves, they described the changing ground levels as something that has altered the way rainwater moves through the neighbourhood.

Transportation was also discussed by several participants. Although buses and other public transport services connect Puthuvype with nearby towns and Kochi city, residents felt that public transport remains inadequate, particularly for those who rely on it for work, education, and accessing public services. Participant 6 explained that limited bus services often make travel inconvenient, especially during peak hours and emergencies.

The condition of canals and drainage channels also emerged during the interviews. Long-term residents recalled that several water channels in the area had gradually become narrower over the years due to land reclamation and development activities. Participant 6 referred to the RMP Canal, explaining that it had once been significantly wider and was capable of carrying larger volumes of water. According to the participant, the reduction in its width has altered the movement of water through the locality. Reflecting on these changes, the participant remarked, *"Earlier the canal carried away much more water. Today it has become much narrower than before."*

Public Services

Access to public services plays an important role in the everyday lives of the residents of Puthuvype. During the interviews, participants discussed the availability of healthcare, transportation, drinking water, emergency services, and government welfare programmes. While these services were generally available within or near the community, several respondents felt that they were often insufficient to meet the needs of the growing population.

Healthcare services emerged as one of the frequently discussed public services. Participant 7, an Anganwadi teacher working in the locality, explained that Elankunnappuzha Panchayat is served by one Community Health Centre and one Family Health Centre. According to the participant, these institutions provide primary healthcare services to the local population, while patients requiring specialised treatment are referred to the Ernakulam General Hospital. She remarked, *"For common illnesses people usually depend on the local health centres, but serious cases have to be referred to Ernakulam General Hospital."*

Several participants also expressed concern regarding the increasing number of respiratory illnesses within the community. Although residents associated these health concerns with changes in the surrounding environment, they explained that treatment

generally involves repeated visits to nearby health facilities. Families with children and older participants reported frequent dependence on public healthcare services, particularly for respiratory infections and seasonal illnesses.

Transportation was another service discussed during the interviews. Participants acknowledged that buses connect Puthuvype with nearby towns and Kochi city, making travel possible for employment, education, healthcare, and other daily needs. However, several residents felt that the frequency of bus services remains inadequate. Participant 6 explained that limited public transport often causes inconvenience, especially for residents who depend entirely on buses for commuting.

Drinking water availability was also mentioned by participants as a seasonal concern. According to Participant 6, water scarcity becomes more noticeable during the summer months, requiring households to manage available water carefully until regular supply is restored. Although the issue does not affect residents throughout the year, participants explained that it becomes a recurring concern during prolonged dry periods.

Emergency services available to the community were described by Participant 7. The participant explained that the panchayat is served by two police stations located in different administrative areas and a fire station situated at Malippuram. These facilities provide essential emergency support for the residents of Puthuvype and neighbouring localities.

Government welfare programmes were also discussed during the interviews, particularly the Life Mission housing scheme. Participants acknowledged that the scheme had enabled several families within the community to construct new houses or improve their existing dwellings. However, opinions regarding its adequacy differed. While some residents appreciated the financial assistance provided, others felt that the amount was insufficient to meet the actual cost of constructing houses in a low-lying coastal area. Participant 4 explained, *"The assistance is helpful, but most of the money is spent just on raising the land and foundation. We still have to borrow money to complete the house."* Similarly, Participant 1 noted that although neighbouring households had benefited from the scheme, financial limitations had prevented her family from making similar improvements.

Community and Local Institutions

The local institutions play an important role in the everyday lives of the residents of Puthuvype. Participants referred to government departments, local self-government institutions, welfare programmes, educational institutions, healthcare facilities, and community organisations as important sources of support. At the same time, many residents felt that the benefits and assistance provided through these institutions did not always correspond to the realities and needs of the community.

Several participants spoke about their interactions with the local self-government institutions, particularly in relation to housing, infrastructure, and basic services. Residents explained that concerns such as water entering houses, drainage issues, and other local problems had been brought to the attention of the authorities on multiple occasions. While participants acknowledged that officials visited the locality and that certain initiatives had been undertaken, many felt that long-term solutions had yet to be achieved. Participant 1 reflected on this by stating, *"We have informed the authorities many times. They know about our situation, but the problems still continue."*

Government welfare programmes were viewed with mixed opinions. Participants recognised that schemes such as the Life Mission housing programme had benefited several households by providing financial support for house construction. However, many residents believed that the assistance available was often insufficient to meet the actual costs involved, particularly in a low-lying coastal area where raising the land and foundation is necessary before construction can begin. As Participant 4 explained, *"The scheme is helpful, but building a house here costs much more than the assistance provided."*

Participants also discussed the role of institutions connected with fisheries and coastal development. Since fishing remains the principal occupation for many households, residents expected greater institutional support for protecting their livelihoods. Some fishermen explained that they had experienced increasing restrictions in accessing certain fishing areas that had traditionally been available to them. According to Participant 6, these changes had affected the routine activities of many fishing families and were viewed as a significant concern within the community.

The presence of large industrial establishments near Puthuvype also influenced residents' interactions with institutions. Several participants recalled that community

members had voiced their concerns regarding environmental conditions, unpleasant odours, and perceived health issues through meetings, public discussions, and local protests. Participant 6 explained that these concerns had been raised repeatedly over the years, reflecting the community's efforts to draw attention to issues they believed affected their everyday lives. As the participant remarked, *"People have protested and raised these issues many times because they want their concerns to be heard."*

The interviews further suggested that community institutions extend beyond formal government bodies. Participants frequently referred to neighbours, local leaders, Anganwadi workers, and other community members as important sources of information and assistance. Residents explained that local networks often help families become aware of government schemes, available services, and community programmes. During periods of difficulty, neighbours were also described as offering practical support and sharing information about available resources.

Despite the challenges described during the interviews, participants expressed a continued willingness to engage with local institutions and participate in community initiatives. Rather than viewing these institutions as separate from the community, residents regarded them as an essential part of everyday life and believed that stronger collaboration between the community and local authorities could contribute to addressing many of the issues experienced in Puthuvype.

CHAPTER V: ANALYSIS AND DISCUSSIONS

5.1 INTRODUCTION

The data collected from the field were analysed using thematic analysis to identify the major themes and sub-themes related to the multi-layered vulnerabilities experienced by the residents of Puthuvype. Thematic analysis is a qualitative analytical method that facilitates the systematic identification, organisation and interpretation of recurring patterns within qualitative data, enabling researchers to understand participants' experiences and the meanings they attach to them (Braun & Clarke, 2006). This approach was considered appropriate for the present study as it provided a structured framework for examining the interconnected social, economic and environmental challenges experienced by the coastal community.

The analysis presented in this chapter is based on the narratives shared by the participants during the field study and is interpreted in relation to the objectives and research questions of the study. The discussion also draws upon relevant literature and theoretical perspectives on vulnerability to better understand the factors that shape the lived experiences of the community. Rather than examining individual issues in isolation, the analysis adopts a multi-layered perspective, recognising that environmental, economic and social vulnerabilities are closely interconnected and collectively influence the lives of the residents.

Based on the thematic analysis, the findings have been organised under the following major themes:

- Background of the Community
- Environmental Challenges
- Livelihood and Economic Challenges
- Housing and Living Conditions
- Social Vulnerability
- Institutional Access
- Services and Schemes
- Coping Mechanisms
- Community Support and Relationships

These themes collectively provide a comprehensive understanding of how the residents of Puthuvype experience, respond to and navigate the multiple vulnerabilities associated with living in a rapidly changing coastal environment. The chapter analyses each theme in detail by integrating the participants' experiences with relevant scholarly literature, thereby providing a deeper understanding of the complex and interconnected nature of vulnerability within the study area.

5.2 PROFILE OF THE PARTICIPANTS

The respondents for this study were residents of Puthuvype, a coastal community located in Ernakulam district, Kerala. Puthuvype has traditionally been a fishing settlement, where the sea and coastal resources have played a central role in shaping livelihoods, social relationships and the overall way of life. Over the years, however, the community has experienced significant changes due to rapid industrialisation, environmental degradation and urban expansion, making it an appropriate setting for examining the multiple dimensions of vulnerability experienced by coastal populations.

The participants included both men and women from different households within the community. Most of them had lived in Puthuvype for several years and possessed extensive knowledge of the area's environmental and socio-economic changes. Their long association with the locality enabled them to provide detailed accounts of how the community has evolved over time and how these changes have influenced their everyday lives. The respondents represented diverse occupational backgrounds, including fishermen, homemakers and daily wage labourers. While fishing remained the primary occupation for many households, several participants explained that families increasingly relied on multiple sources of income due to the uncertainties associated with traditional livelihoods.

The respondents were selected because of their direct experiences of living in a coastal environment that has undergone considerable ecological and developmental transformation. They were able to share first-hand perspectives on issues affecting the community, including environmental changes, livelihood insecurity, housing conditions, access to services and the challenges associated with residing in close proximity to major industrial establishments. Their narratives reflected not only individual experiences but also broader community concerns that have emerged over time.

Many participants belonged to economically modest households and described the everyday realities of managing livelihoods, housing and family responsibilities within a changing coastal landscape. Their experiences provided valuable insights into how environmental, social and economic challenges intersect in the lives of coastal residents. At the same time, the respondents demonstrated a strong attachment to Puthuvype and a deep understanding of the community's history, culture and social relationships. Their lived experiences formed the foundation of this study, enabling a comprehensive exploration of the multi-layered vulnerabilities faced by the community and the ways in which residents continue to navigate and adapt to these challenges.

5.3 THEMATIC ANALYSIS AND DISCUSSIONS

5.3.1 BACKGROUND OF THE COMMUNITY

Puthuvype is a coastal settlement located on Vypin Island in Ernakulam district, Kerala. Positioned between the Arabian Sea and the backwaters, the locality has historically maintained a close relationship with its surrounding natural environment. For generations, the sea has served not only as a source of livelihood but also as the foundation of social organisation, cultural identity and everyday life. The community's settlement pattern, occupational structure and social networks have evolved around this unique coastal landscape, creating a strong dependence on marine and coastal resources.

The narratives shared by participants reveal that the community possesses a deep sense of belonging to the locality. Many residents described Puthuvype as a place where families have lived for several generations, with strong kinship ties and long-standing neighbourhood relationships. Their attachment to the locality extends beyond physical residence and is closely connected to shared traditions, occupations and collective memories of living by the sea. Participants frequently associated their identity with fishing and other marine-related occupations, indicating that the coastal environment continues to shape both individual and community life.

Despite rapid urbanisation in nearby Kochi, many residents perceived Puthuvype as retaining the characteristics of a traditional coastal village. Community members described a lifestyle in which social interactions remain highly interconnected, with neighbours supporting one another during emergencies, festivals and everyday activities. Religious institutions, local organisations and informal community groups

continue to play an important role in maintaining social cohesion and facilitating collective action.

At the same time, participants consistently highlighted that the community has undergone significant transformations over the past two decades. The establishment of large-scale infrastructure and industrial projects, improvements in road connectivity and increasing urban expansion have altered both the physical landscape and the socioeconomic structure of the locality. While some residents acknowledged that these developments created new employment opportunities and improved accessibility, many believed that they had also reduced traditional livelihood spaces and increased environmental pressures on the coastal ecosystem.

The occupational profile of the community reflects a gradual diversification of livelihoods. Although fishing remains an important occupation, many households reported relying on multiple income sources to ensure economic stability. Younger generations increasingly seek employment in private companies, construction, transportation, port-related activities and service sectors instead of depending exclusively on fishing. Participants explained that uncertainty in fish catch, rising operational costs and changing environmental conditions have made it difficult for many families to rely solely on marine resources. Consequently, livelihood diversification has become a common strategy for sustaining household income.

The demographic composition of the community also demonstrates diversity in age, occupation and socioeconomic status. Elderly residents possess extensive knowledge of seasonal changes, fishing practices and coastal ecology, often comparing present environmental conditions with those experienced several decades ago. In contrast, younger participants expressed aspirations for education and stable salaried employment while simultaneously maintaining emotional and cultural ties with their traditional coastal identity. Women described their significant contribution to household management, informal economic activities and community networks, highlighting their central role in sustaining family wellbeing despite limited visibility in formal livelihood statistics.

Field narratives further indicate that residents perceive the natural environment as an inseparable part of community life. The sea, backwaters and coastal lands are viewed as shared resources that support livelihoods, recreation and cultural practices. However,

participants repeatedly observed that the relationship between the community and its environment has become increasingly uncertain due to coastal erosion, pollution, industrial expansion and changing climatic conditions. Many residents reflected that areas once used for fishing, recreation or social gatherings have gradually changed, creating concerns about the future of both the environment and the community's traditional way of life.

This resonates with the Pressure and Release (PAR) model proposed by Blaikie et al. (1994), which argues that vulnerability is produced through the interaction of environmental conditions and broader social, economic and political processes. Rather than being passive victims of hazards, communities experience vulnerability through historical patterns of resource dependence, development interventions and unequal access to opportunities. Similarly, studies on social vulnerability emphasise that demographic characteristics, livelihood structures, social relationships and local context significantly influence how communities experience and respond to environmental risks (Rufat et al., 2015). In the context of Puthuvype, the community's strong dependence on coastal resources, combined with ongoing socioeconomic transformation, creates a complex setting in which traditional resilience coexists with emerging vulnerabilities.

The background of the community illustrates that Puthuvype is characterised by a strong coastal identity, diverse livelihood patterns and closely connected social relationships. However, these strengths are increasingly being challenged by environmental change, livelihood uncertainty and rapid urban development. Understanding these foundational characteristics is essential for interpreting the environmental, social and economic vulnerabilities discussed in the subsequent themes.

5.3.2 ENVIRONMENTAL CHALLENGES

Water Inundation and Tidal Flooding as Everyday Vulnerability

Unlike sudden disasters that occur as isolated events, environmental vulnerability in Puthuvype is experienced as part of everyday life. The community occupies a low-lying coastal landscape where heavy rainfall, high tides and poor drainage interact to produce recurring water inundation. Rather than being perceived as exceptional events, seasonal flooding has become an expected part of living in the area, influencing housing, mobility, sanitation and daily routines.

The discussion indicates that flooding in Puthuvype cannot be understood solely as the result of intense rainfall. Instead, it emerges from the interaction between the natural characteristics of the island and human-induced alterations to its landscape. The tidal nature of the settlement means that rainfall occurring simultaneously with high tide prevents the natural discharge of water, resulting in prolonged waterlogging across residential areas.

This reflects the argument of Blaikie et al. (1994), who state that disasters are not produced by hazards alone but by the interaction between hazards and socially created vulnerability. In Puthuvype, heavy rainfall is transformed into a persistent environmental problem because of inadequate drainage, low elevation and increasing anthropogenic pressure on the coastal ecosystem.

The continuous nature of inundation has gradually normalised environmental risk within the community. Instead of preparing for occasional disasters, households have adapted to a condition where exposure to floodwater has become a routine part of everyday existence. Such chronic exposure represents a form of slow-onset vulnerability that continuously weakens household resilience and increases dependence on individual coping mechanisms rather than institutional protection.

Ecological Transformation and the Loss of Natural Drainage Systems

One of the most significant environmental transformations identified in Puthuvype is the degradation of its traditional drainage network, particularly the narrowing of the RMP canal. Historically, the canal functioned as an important ecological infrastructure capable of storing excess rainwater and regulating water flow during monsoon periods. However, decades of land reclamation and developmental interventions have substantially reduced its width and carrying capacity.

The shrinking of the canal represents more than a physical alteration of the landscape; it signifies the gradual loss of a natural protective system that historically reduced environmental risk. As the canal's ability to absorb and transport excess water has diminished, floodwater increasingly accumulates within residential areas, transferring environmental pressure directly onto households.

This transformation illustrates how development processes can unintentionally create new forms of vulnerability. The Pressure and Release model explains that unsafe

conditions often emerge through long-term structural changes rather than immediate hazard events. In Puthuvype, land reclamation and changing land use patterns have weakened the ecological resilience of the settlement, making even moderate rainfall capable of producing significant disruptions.

The discussion therefore suggests that environmental vulnerability in Puthuvype is closely linked to the loss of ecological infrastructure. The replacement of natural drainage spaces with built environments has altered the hydrological behaviour of the island and increased the community's exposure to recurring environmental stress.

Industrial Development and Environmental Degradation

Industrial expansion has become one of the defining characteristics of Puthuvype's changing landscape. The establishment of major facilities such as the LNG terminal, IOC installation and BPCL infrastructure has transformed an area that was traditionally dependent on fishing and coastal resources into an industrial corridor. While these developments introduced employment opportunities during their construction phase, they also generated new environmental concerns that continue to shape community vulnerability.

The coexistence of industrial infrastructure and residential settlements has created a complex environmental setting where concerns about pollution, gas leaks, dust emissions and marine contamination are embedded within everyday life. Rather than viewing these issues as isolated incidents, residents increasingly perceive industrial activity as contributing to the gradual deterioration of environmental quality.

This perceived ecological decline extends beyond human health and directly affects the coastal ecosystem upon which local livelihoods depend. Discussions on declining fish availability, deteriorating water quality and changes in the marine environment indicate that environmental degradation simultaneously produces ecological and economic consequences. As a result, industrial development functions as a multiplier of vulnerability, connecting environmental change with livelihood insecurity, health concerns and social uncertainty.

The experience of Puthuvype demonstrates that development projects may simultaneously generate economic opportunities and environmental risks, producing

uneven outcomes for communities whose livelihoods remain closely tied to natural resources.

Environmental condition and Public Health

The environmental characteristics of Puthuvype also contribute to a range of public health concerns. The settlement is situated within a marshy and tidal ecosystem where stagnant water frequently accumulates due to inadequate drainage infrastructure. Combined with poor waste management and sanitation limitations, these conditions create an environment conducive to the spread of waterborne and vector-borne diseases.

The relationship between environmental conditions and health demonstrates that vulnerability extends beyond exposure to physical hazards. Flood-prone environments influence access to clean water, sanitation, healthcare and safe living conditions, making environmental degradation a determinant of community wellbeing.

Residents' reliance on multiple healthcare systems, including Allopathy, Ayurveda and Homeopathy, reflects the recurring nature of environmental health problems within the locality. Rather than isolated medical issues, these health concerns are embedded within the ecological characteristics of the settlement and the limitations of local infrastructure.

Rufat et al. (2015) argue that environmental exposure interacts with health status and coping capacity to produce social vulnerability. This interaction is clearly visible in Puthuvype, where marshland ecology, flooding and inadequate infrastructure collectively increase the health burden experienced by households.

Environmental Stress as a Continuous Process of Multi-layered Vulnerability

The environmental challenges experienced in Puthuvype are interconnected and cumulative rather than independent events. Water inundation, degraded drainage systems, industrial pollution, tidal fluctuations and marshland conditions interact to create a landscape of continuous environmental stress. These pressures simultaneously affect housing, livelihoods, health and social wellbeing, demonstrating the multi-layered nature of vulnerability within the community.

The case of Puthuvype highlights that environmental vulnerability is not merely a consequence of living near the sea but is produced through the interaction of fragile

island ecology, rapid industrialisation, altered hydrological systems and inadequate environmental planning. These overlapping processes have transformed environmental hazards into chronic conditions that shape everyday life and influence the community's ability to achieve sustainable development.

Viewed through the Pressure and Release framework, the environmental problems of Puthuvype represent the outcome of long-term structural changes that have increased exposure while reducing the protective functions of both natural ecosystems and public infrastructure. The discussion therefore reinforces the central argument of this study that vulnerability in Puthuvype is multi-layered, dynamic and socially produced rather than simply the result of natural environmental processes.

5.3.3 LIVELIHOOD AND ECONOMIC CHALLENGES

Dependence on Fishing and Structural Economic Vulnerability

The livelihood structure of Puthuvype is characterised by a high dependence on fishing and fishing-related activities, making the local economy closely tied to the condition of the coastal ecosystem. Approximately 70–72 per cent of households depend directly or indirectly on marine resources for their livelihood, creating a situation where environmental changes immediately translate into economic uncertainty.

Such dependence on a single livelihood source creates what vulnerability scholars describe as structural economic vulnerability. Rather than arising from individual circumstances, economic insecurity is embedded within the occupational composition of the community itself. Any disruption to marine resources, fishing access or coastal ecology simultaneously affects a large proportion of households, reducing income stability and limiting adaptive choices.

The Access Model proposed by Blaikie et al. (1994) argues that vulnerability is fundamentally shaped by people's access to livelihood opportunities and productive resources. Households with limited access to diversified income sources possess fewer alternatives when their primary occupation is disrupted. In Puthuvype, the concentration of livelihoods around fishing increases the community's sensitivity to environmental and developmental changes, making economic vulnerability a structural rather than temporary condition.

Industrial Expansion and the Transformation of Traditional Livelihoods

The establishment of major industrial projects, including the LNG terminal, IOC facilities and associated infrastructure, has significantly altered the livelihood landscape of Puthuvype. While these developments generated employment opportunities during their construction phase, the benefits proved largely temporary and did not create sustainable long-term employment for the local population.

At the same time, industrial expansion has reduced access to traditional fishing grounds through restricted zones and changing coastal land use patterns. Areas that were previously available for fishing and related activities have gradually become inaccessible, reducing both livelihood space and resource availability. This represents a shift from a community historically organised around coastal livelihoods to one increasingly influenced by industrial priorities.

The coexistence of industrial growth and livelihood decline illustrates an unequal distribution of development benefits. While infrastructure expansion contributes to regional economic growth, its local impacts include reduced access to natural resources and increased livelihood insecurity. The findings therefore demonstrate that development itself can become a dynamic pressure that reshapes vulnerability by altering traditional systems of resource access.

Declining Fish Availability and Income Insecurity

Economic vulnerability in Puthuvype is further intensified by declining fish availability, which residents associate with environmental degradation, industrial pollution and changes in the coastal ecosystem. Reduced fish catch directly affects daily income, making household earnings increasingly unpredictable and seasonal.

Unlike salaried employment, fishing income depends on multiple uncontrollable factors including weather conditions, tidal cycles, fuel costs and resource availability. Consequently, households experience continuous financial uncertainty rather than occasional economic shocks.

Rufat et al. (2015) identify socioeconomic status as one of the principal drivers of social vulnerability, particularly in flood-prone and coastal communities where environmental change directly influences income generation. The experience of Puthuvype supports

this argument, demonstrating how ecological degradation simultaneously reduces livelihood security and household resilience.

The decline in fish availability therefore represents not only an environmental issue but also a process that weakens economic stability, increases dependence on informal labour and limits long-term financial planning.

Limited Livelihood Diversification and Informal Employment

Although some households have attempted to diversify their income sources, opportunities remain limited by the island geography, occupational traditions and restricted local employment options. Many families supplement fishing income through daily wage labour, construction work, transportation services and informal employment, while women predominantly engage in casual and low-paid work.

However, these alternative income sources are characterised by irregular employment, low wages and limited social protection. Rather than reducing vulnerability, they often function as temporary coping mechanisms that provide short-term financial relief without ensuring long-term economic security.

The limited diversification of livelihoods reflects broader patterns observed in island communities, where geographical isolation and dependence on natural resources restrict occupational mobility. As a result, households remain economically vulnerable even when multiple income sources are available because none provide sufficient stability to withstand prolonged environmental or economic disruptions.

Debt, Housing Investment and Financial Stress

Debt has emerged as an important dimension of economic vulnerability in Puthuvype. Recurrent flooding and land subsidence compel households to invest repeatedly in raising floor levels, reinforcing foundations and improving housing structures. These adaptations require substantial financial resources that exceed the capacity of many families.

Although government schemes such as the Life Mission programme provide financial assistance, the available support is often insufficient to meet the actual costs of constructing or modifying houses in flood-prone areas. Consequently, many

households rely on bank loans, informal borrowing and financial assistance from relatives, creating long-term indebtedness.

According to the Access Model, vulnerability increases when households lose access to productive assets and become dependent on financial obligations that reduce future livelihood choices. In Puthuvype, debt functions not only as an economic consequence but also as a mechanism that reproduces vulnerability by limiting the capacity of households to invest in education, health, livelihood diversification or disaster preparedness.

Declining Land Value and Reduced Economic Mobility

Contrary to expectations associated with urban expansion, land in Puthuvype has not consistently appreciated in value. The concentration of industrial infrastructure and growing environmental concerns have reduced the attractiveness of the locality, leading to declining property demand and lower land values.

This decline has significant implications for household economic security. Land traditionally functions as an important asset that provides financial stability, borrowing capacity and opportunities for relocation. When property values decrease, households lose an important source of economic resilience and become increasingly constrained within vulnerable environments.

The reduced economic value of land therefore limits both physical mobility and social mobility. Families are less able to relocate to safer locations, invest in improved housing or generate capital for alternative livelihoods, reinforcing a cycle of place-based vulnerability.

Livelihood Vulnerability as a Multi-layered Process

The livelihood challenges of Puthuvype extend beyond income instability and reflect a broader interaction between environmental change, industrial development and limited access to economic opportunities. Dependence on fishing, declining marine resources, restricted livelihood spaces, irregular employment, indebtedness and declining land values collectively produce a condition of chronic economic vulnerability.

Rather than functioning as isolated problems, these factors reinforce one another, reducing household resilience and limiting adaptive capacity. The case of Puthuvype

demonstrates that livelihood vulnerability is deeply embedded within the social and ecological transformation of the island, where changes in the environment directly reshape economic opportunities and long-term wellbeing. This supports the central premise of the Pressure and Release framework that disasters and vulnerabilities are produced through structural processes that progressively constrain people's access to secure livelihoods and sustainable development.

5.3.4 HOUSING AND LIVING CONDITIONS

Housing in a Fragile Coastal Landscape

Housing in Puthuvype reflects the interaction between the area's fragile coastal ecology and the socio-economic realities of its residents. Unlike urban settlements where housing is primarily influenced by market dynamics and infrastructure availability, residential spaces in Puthuvype are continuously shaped by tidal movements, marshy soil conditions and seasonal flooding. Consequently, housing vulnerability is not limited to the structural quality of buildings but extends to the environmental characteristics of the land on which they are constructed.

Many residential areas are located at or only marginally above ground level, making them highly susceptible to water ingress during periods of heavy rainfall and high tides. The location of houses within low-lying coastal terrain means that even moderate rainfall can disrupt everyday life, affecting household safety, sanitation and mobility. This illustrates that exposure is embedded within the physical geography of the settlement rather than arising only during extreme weather events.

The Pressure and Release model argues that unsafe conditions emerge when vulnerable populations occupy hazard-prone environments due to broader structural processes rather than individual choice. The housing pattern in Puthuvype reflects this process, where long-established settlement history and dependence on coastal livelihoods have resulted in communities remaining within environmentally sensitive areas despite increasing risks.

Land Subsidence and the Cycle of Structural Insecurity

One of the distinctive housing challenges identified in Puthuvype is land subsidence. Households frequently invest in filling land and raising floor levels to reduce flood

impacts, yet the reclaimed land gradually sinks over time, requiring repeated modifications.

This creates a continuous cycle of structural vulnerability in which housing improvements provide only temporary protection rather than permanent solutions. Families repeatedly allocate financial resources to elevate houses, repair damaged foundations and reconstruct surrounding land, only to face similar problems during subsequent monsoon seasons.

The recurring nature of these investments demonstrates that housing vulnerability in Puthuvype is a dynamic process rather than a one-time condition. Instead of progressing towards greater resilience, many households remain trapped in a cycle where environmental conditions continuously undermine structural improvements. This reflects Blaikie et al.'s understanding that vulnerability is reproduced through ongoing interactions between environmental processes and limited access to resources.

The inability to achieve lasting housing security also affects long-term planning, as resources that could otherwise support education, livelihood diversification or savings are repeatedly diverted towards maintaining basic living conditions.

Inadequate Infrastructure and Everyday Living Conditions

Housing vulnerability in Puthuvype extends beyond individual dwellings to the broader infrastructure that supports daily life. The absence of adequate drainage systems, narrowing of canals, poor waste management and limited road connectivity collectively reduce the quality of the residential environment and increase exposure to environmental hazards.

Poor drainage prevents the timely removal of rainwater, allowing water to remain stagnant around houses for extended periods. This not only damages property but also creates unhygienic conditions that increase the risk of waterborne diseases and mosquito breeding. Housing therefore becomes directly connected to public health, demonstrating the multidimensional nature of vulnerability within the community.

Transportation limitations further compound these challenges. Restricted bus services and inadequate road infrastructure reduce mobility, making access to education, employment, healthcare and emergency services more difficult, particularly during periods of flooding.

Rather than functioning as isolated infrastructure deficiencies, these conditions collectively shape everyday living experiences and reduce the adaptive capacity of households.

Housing Affordability and the Financial Burden of Adaptation

For many households in Puthuvype, maintaining a safe living environment requires substantial financial investment. Structural modifications such as raising floor levels, filling land and repairing flood-related damage have become recurring household expenditures rather than occasional improvements.

Government housing assistance programmes provide some financial support, yet the available assistance is often insufficient to meet the actual cost of constructing or modifying houses within a flood-prone coastal environment. As a result, households frequently rely on loans and informal borrowing to finance essential housing improvements.

This process transforms environmental vulnerability into economic vulnerability. Investments intended to increase safety simultaneously create financial obligations that reduce household resilience and increase indebtedness. Housing therefore becomes both an adaptive strategy and a source of long-term economic stress.

The experience of Puthuvype demonstrates that adaptation is unevenly distributed. Households with greater financial resources are better able to modify their homes, while economically weaker families remain exposed to recurring environmental risks, reinforcing existing inequalities.

Housing Vulnerability as a Manifestation of Multi-layered Risk

The housing conditions observed in Puthuvype illustrate the interconnected nature of environmental, economic and social vulnerability. Low-lying settlements, unstable reclaimed land, inadequate infrastructure and limited financial capacity combine to create a persistent condition of housing insecurity that extends beyond physical structures.

Rather than representing separate problems, these factors reinforce one another. Environmental hazards increase the need for structural adaptation, adaptation generates financial stress, and economic constraints limit the ability of households to implement

long-term solutions. Consequently, housing becomes the physical space where multiple dimensions of vulnerability converge.

The case of Puthuvype demonstrates that improving housing resilience requires more than individual household investment. Sustainable solutions depend on restoring ecological drainage systems, strengthening infrastructure, improving environmental planning and ensuring adequate institutional support for vulnerable coastal communities. Without addressing these structural factors, households will continue to experience recurring cycles of housing insecurity despite repeated adaptation efforts.

Viewed through the lens of multi-layered vulnerability, housing in Puthuvype is not merely a shelter but a reflection of broader environmental transformations, development choices and socio-economic inequalities that collectively shape the everyday experiences of the coastal community.

5.3.5 SOCIAL VULNERABILITY

Demographic Composition and Differential Vulnerability

The interaction between demographic characteristics, environmental exposure and socio-economic conditions shapes social vulnerability in Puthuvype. The community includes a significant proportion of children, elderly persons, persons with disabilities and economically marginalized households, each of whom experiences environmental and economic stress differently.

The island geography and recurring environmental challenges increase the dependence of these groups on family support systems and community networks. During periods of flooding, waterlogging or health emergencies, limited mobility and restricted access to services make children, older adults and persons with disabilities particularly susceptible to disruption and hardship.

Rufat et al. (2015) identify demographic characteristics as one of the strongest determinants of social vulnerability, arguing that age, health status and dependency significantly influence a community's capacity to prepare for, respond to and recover from environmental hazards. The situation in Puthuvype reflects this relationship, where vulnerability is unevenly distributed across different social groups and reinforced by local environmental conditions.

Rather than existing as isolated categories, demographic characteristics interact with poverty, housing conditions and institutional access, creating multiple and overlapping forms of disadvantage.

Health Burden and Industrial Risk

Health has emerged as a significant dimension of social vulnerability in Puthuvype. Environmental degradation and industrial expansion have altered not only the physical landscape but also the wellbeing of the community. Respiratory illnesses, particularly among children, are widely associated by residents with industrial pollution, dust emissions and deteriorating air quality.

Unlike acute health emergencies, these conditions represent chronic and cumulative risks that influence everyday life. Frequent illness increases household expenditure on healthcare, affects educational participation among children and reduces the productivity of working members, thereby extending the impact of environmental degradation into the social and economic domains.

The close relationship between environmental exposure and health demonstrates the multi-layered nature of vulnerability in Puthuvype. Health problems are both outcomes of environmental stress and factors that further reduce household resilience, limiting the capacity of families to cope with future shocks.

The PAR framework emphasises that disasters should be understood through the interaction between hazards and socially produced vulnerability rather than through hazard events alone. The recurring health concerns in Puthuvype illustrate this process, where industrial development and environmental change continuously shape community wellbeing.

Migration, Social Change and Community Transformation

An emerging aspect of social vulnerability in Puthuvype is the gradual migration of families seeking healthier living environments. Concerns about pollution, recurring environmental problems and declining quality of life have encouraged some households to relocate, altering long-established community relationships.

Migration represents more than physical movement; it reflects changing perceptions of safety, wellbeing and future opportunities. The departure of families gradually

transforms neighbourhood networks and reduces the continuity of traditional social relationships that have historically supported collective resilience.

The social consequences of migration are particularly significant in a community where kinship networks, neighbourhood solidarity and shared occupational identities have long functioned as informal support systems. The weakening of these relationships may reduce the community's collective capacity to respond to future environmental and economic challenges.

Social Stigma and Identity

The discussion indicates that vulnerability in Puthuvype extends beyond material deprivation and environmental exposure to include social perceptions and identity. Residents report that the locality is increasingly associated with industrial pollution and environmental risk, creating a negative public image that influences social relationships beyond the community itself.

This stigma is reflected in difficulties related to marriage alliances and broader social acceptance, particularly affecting younger generations. Such experiences demonstrate that environmental degradation can produce symbolic forms of exclusion that influence opportunities for social mobility and community integration.

Social vulnerability therefore operates not only through limited access to resources but also through the ways communities are perceived and positioned within wider society. The environmental identity of Puthuvype has become intertwined with pollution and industrial risk, affecting residents even outside the immediate geographical boundaries of the settlement.

Gender, Youth and Unequal Social Opportunities

The social impacts of vulnerability are experienced differently across gender and age groups. Women in Puthuvype often perform dual roles, contributing to household income through informal labour while simultaneously carrying primary responsibility for domestic work, caregiving and family management.

This unequal distribution of responsibilities increases women's exposure to environmental and economic stress while limiting opportunities for education, skill development and formal employment. Similarly, young people face restricted pathways

to stable employment, with many relying on irregular work or continuing family occupations despite declining livelihood opportunities.

The limited availability of diversified employment reinforces intergenerational patterns of vulnerability, where economic insecurity and occupational dependence are reproduced across successive generations.

Blaikie et al. (1994) argue that access to resources and livelihood opportunities is shaped by broader social relations, including gender and power structures. The experiences of women and youth in Puthuvype demonstrate how these structural inequalities influence both present wellbeing and future opportunities.

Social Vulnerability as an Outcome of Intersecting Inequalities

The case of Puthuvype illustrates that social vulnerability cannot be understood through a single characteristic such as age, gender or poverty. Instead, vulnerability emerges through the interaction of demographic factors, health conditions, environmental exposure, economic insecurity and social exclusion.

Children experiencing respiratory illness, elderly persons living in flood-prone houses, women balancing informal employment with caregiving responsibilities and youth facing limited economic opportunities all experience vulnerability differently, yet these experiences are connected through common structural conditions.

The social challenges observed in Puthuvype therefore represent a process of intersecting inequalities where environmental degradation, industrial transformation and limited access to opportunities reinforce one another. Rather than affecting all residents equally, these pressures disproportionately impact those with fewer social, economic and institutional resources.

Viewed through the lens of multi-layered vulnerability, the experiences of Puthuvype demonstrate that social vulnerability is dynamic, place-specific and continuously reproduced through the interaction of environmental change, livelihood insecurity and unequal access to resources. Strengthening resilience within the community therefore requires interventions that address these interconnected dimensions rather than treating social issues as separate from environmental or economic concerns.

5.3.6 INSTITUTIONAL ACCESS

Access to Healthcare Services and Spatial Vulnerability

Access to healthcare is a fundamental component of community resilience, particularly in environmentally vulnerable coastal regions where exposure to pollution, flooding and waterborne diseases is frequent. In Puthuvype, however, institutional access to healthcare remains constrained by both geographical and infrastructural limitations. Although the panchayat is served by a Community Health Centre and a Family Health Centre, residents depend on hospitals in Ernakulam city for specialised treatment and emergency care.

This dependence on external healthcare institutions creates an additional layer of vulnerability. During emergencies, seasonal flooding or periods of poor transportation, the time required to reach advanced medical facilities increases significantly, delaying treatment and reducing the effectiveness of healthcare interventions. The island geography of Puthuvype therefore transforms healthcare access from a routine service into a critical determinant of vulnerability.

The discussion demonstrates that institutional availability alone does not guarantee institutional accessibility. The effectiveness of healthcare services is shaped by transportation networks, environmental conditions and the capacity of local facilities to address community needs. Consequently, healthcare vulnerability in Puthuvype reflects broader structural inequalities rather than individual health conditions alone.

Emergency Response Capacity and Disaster Preparedness

Institutional capacity for emergency response plays a crucial role in reducing disaster impacts and strengthening community resilience. In Puthuvype, however, emergency services are limited in both availability and spatial coverage. The entire panchayat depends on a single fire station located at Malippuram, while policing responsibilities are divided between different jurisdictions.

The dispersed nature of emergency services raises concerns regarding response time during floods, industrial accidents or fire incidents. Given the presence of major industrial installations and the recurring environmental challenges experienced by the community, timely emergency response becomes particularly important.

From the perspective of the Pressure and Release model, vulnerability is intensified when institutional systems fail to adequately address existing unsafe conditions. Blaikie et al. (1994) argue that disasters emerge not only from hazards but also from limited access to protective resources and institutional support. The institutional landscape of Puthuvype reflects this relationship, where environmental exposure is accompanied by limited local emergency infrastructure.

The discussion therefore suggests that disaster preparedness should extend beyond post-disaster response and include strengthening local institutional capacity capable of addressing the unique risks associated with an industrial coastal settlement.

Transportation and Physical Accessibility

Transportation functions as a critical link connecting households with healthcare, education, employment opportunities and government services. In Puthuvype, limited public transportation and inadequate road connectivity significantly influence institutional accessibility, particularly for economically weaker households, elderly persons and persons with disabilities.

During periods of flooding and waterlogging, mobility becomes further restricted, reducing access to essential services precisely when institutional support is most needed. The interaction between environmental conditions and transportation limitations demonstrates that physical accessibility is an important dimension of vulnerability.

Research on social vulnerability identifies transportation dependence as a significant factor influencing disaster response and recovery because it affects evacuation capacity, access to relief services and continuity of livelihoods. In Puthuvype, transportation limitations similarly reduce the ability of residents to access institutional resources and opportunities available outside the locality.

Thus, institutional access is shaped not only by the existence of services but also by the community's ability to physically reach and utilise them.

Governance, Community Participation and Perceived Institutional Neglect

The relationship between communities and institutions extends beyond service delivery to include participation, trust and responsiveness. In Puthuvype, concerns regarding

environmental degradation and industrial pollution have generated repeated demands for greater institutional intervention. Despite community protests and public engagement, many residents perceive that their concerns have not resulted in sustained or effective policy responses.

This perception of institutional neglect contributes to a sense of marginalisation, particularly among households directly affected by flooding, pollution and livelihood loss. The gap between community expectations and institutional action weakens trust in governance systems and increases reliance on informal support networks.

The discussion indicates that institutional vulnerability is not solely the absence of services but also the perceived inability of governance structures to address long-term environmental and developmental challenges. As industrialisation continues to reshape Puthuvype, meaningful community participation becomes increasingly important for ensuring that development processes do not further intensify existing vulnerabilities.

Institutional Access as a Dimension of Multi-layered Vulnerability

The case of Puthuvype demonstrates that institutional access is closely interconnected with environmental, social and economic vulnerability. Healthcare limitations, restricted emergency response capacity, transportation constraints and governance challenges collectively influence the community's ability to prepare for, respond to and recover from everyday environmental stress.

Rather than functioning independently, these institutional limitations reinforce other forms of vulnerability. Environmental exposure increases healthcare needs, transportation barriers reduce access to services, and perceived governance gaps encourage dependence on informal community networks. Consequently, institutional access becomes both a protective resource and a potential source of vulnerability.

The findings support the broader argument that vulnerability is socially produced through unequal access to resources and institutions rather than by environmental hazards alone. In Puthuvype, strengthening institutional access requires more than increasing the number of facilities; it requires improving connectivity, enhancing local emergency capacity, promoting participatory governance and ensuring that development policies respond effectively to the lived realities of coastal communities.

Viewed through the lens of multi-layered vulnerability, institutional access represents a critical interface between the community and the state, influencing not only service delivery but also resilience, wellbeing and the long-term sustainability of life in Puthuvype.

5.3.7 SERVICES AND SCHEMES

Government Welfare Schemes and Coastal Vulnerability

Government welfare programmes are intended to reduce socio-economic vulnerability by providing financial assistance, housing support and social protection to marginalized communities. In Puthuvype, these interventions play an important role in supporting households exposed to environmental and livelihood uncertainties. However, the discussion indicates that the effectiveness of these schemes is often constrained by the unique environmental and economic realities of the locality.

As a low-lying coastal settlement experiencing recurrent flooding, land subsidence and livelihood instability, the community requires support mechanisms that address long-term structural vulnerabilities rather than short-term financial needs alone. While welfare programmes provide an important safety net, they are often designed using generalized criteria that do not fully reflect the additional costs of living in a disaster-prone coastal environment.

This mismatch between programme design and local realities limits the ability of welfare interventions to substantially reduce vulnerability, leaving many households dependent on their own resources and informal support systems.

Housing Assistance and the Limits of Financial Support

Housing assistance schemes, particularly the Life Mission programme, have enabled several households to undertake construction and housing improvements. Nevertheless, the financial assistance provided under these schemes is widely perceived as insufficient when compared to the actual costs of building or modifying houses in a flood-prone coastal region.

Unlike conventional housing construction, residential adaptation in Puthuvype often requires additional expenditure for land filling, raising floor levels, foundation reinforcement and repeated maintenance due to land subsidence and flooding. These unavoidable costs significantly increase the financial burden on beneficiaries.

Consequently, many households supplement government assistance through bank loans, informal borrowing or financial support from relatives, creating long-term indebtedness. Rather than completely reducing vulnerability, housing schemes sometimes shift environmental vulnerability into economic vulnerability by increasing financial obligations.

This demonstrates that welfare programmes designed without considering local ecological conditions may only partially address the challenges experienced by coastal communities.

Community Perceptions of State Support and Environmental Governance

The discussion reveals a perception that government interventions have been more effective in implementing industrial development than in addressing the environmental and social concerns arising from those developments. Community mobilisations and protests regarding industrial pollution, environmental degradation and livelihood impacts have not always resulted in sustained institutional responses, contributing to a sense of neglect among residents.

This perceived gap between community expectations and government action influences public trust in welfare systems and governance institutions. Residents increasingly view welfare assistance as reactive rather than preventive, addressing immediate needs without resolving the structural causes of vulnerability.

From the perspective of the Pressure and Release model, vulnerability is intensified when underlying social and institutional conditions remain unchanged despite repeated exposure to environmental stress. Blaikie et al. (1994) argue that reducing disaster risk requires addressing these structural processes rather than focusing exclusively on post-event assistance.

The experience of Puthuvype reflects this dynamic, where welfare support exists but does not fully mitigate the cumulative impacts of environmental change and industrial transformation.

Neighbourhood Groups and Community-Based Welfare Support

In addition to formal government interventions, local Neighbourhood Groups (NHGs) function as important sources of social and economic support within Puthuvype. These

groups facilitate information sharing, financial assistance, community participation and mutual aid, particularly among women and economically weaker households.

The role of NHGs illustrates how community-based institutions often compensate for limitations within formal welfare systems. Their close relationship with local residents enables them to identify immediate needs, mobilise local resources and provide assistance more quickly than larger institutional mechanisms.

The importance of NHGs also highlights the value of social capital in strengthening resilience. Informal community networks complement formal welfare programmes by creating locally accessible support systems that respond to everyday challenges as well as environmental emergencies.

However, the capacity of these groups remains limited by broader structural constraints and cannot substitute for comprehensive public investment in vulnerable coastal communities.

Unequal Access to Welfare Benefits and Structural Exclusion

The benefits of welfare programmes are not experienced uniformly across the community. Women, fish workers, daily wage labourers, elderly persons and economically weaker households continue to experience multiple disadvantages despite the availability of government support.

Fish workers remain particularly vulnerable because livelihood instability reduces their capacity to meet eligibility requirements, invest in housing improvements or recover from financial losses. Daily wage labourers similarly experience irregular income that limits their ability to utilise available schemes effectively.

Women face an additional burden as they combine income-generating activities with unpaid household responsibilities, reducing their time and opportunities to access institutional services. Elderly residents encounter mobility and healthcare barriers that further restrict the benefits derived from welfare programmes.

These experiences demonstrate that equal provision of services does not necessarily produce equitable outcomes. Existing social and economic inequalities continue to influence who can effectively access and benefit from available schemes.

Services and Schemes within the Framework of Multi-layered Vulnerability

The case of Puthuvype demonstrates that government services and welfare schemes play an important but limited role in addressing community vulnerability. While housing assistance, local welfare programmes and community-based initiatives provide valuable support, they are often insufficient to overcome the combined effects of environmental degradation, livelihood insecurity and infrastructural limitations.

The effectiveness of welfare interventions is constrained by the interconnected nature of vulnerability itself. Environmental risks increase housing costs, livelihood instability reduces financial capacity, and institutional limitations restrict access to available services. Consequently, individual schemes address only specific dimensions of a much broader structural problem.

The discussion reinforces the central argument of this study that vulnerability in Puthuvype is multi-layered and cumulative. Reducing vulnerability therefore requires an integrated approach that combines welfare support with environmental restoration, livelihood diversification, participatory governance and infrastructure development. Without addressing these interconnected dimensions, welfare schemes are likely to function as temporary coping mechanisms rather than long-term pathways towards resilience and sustainable coastal development.

5.3.8 COPING MECHANISMS

Household Adaptation to Recurring Environmental Stress

The coping strategies adopted by households in Puthuvype demonstrate that vulnerability is not experienced passively but is continuously negotiated through everyday adaptation. Living in a low-lying coastal environment exposed to flooding, tidal overflow and waterlogging has led residents to develop practical responses that enable them to continue living in the locality despite recurring environmental challenges.

During periods of heavy rainfall, families commonly move household belongings to elevated spaces, temporarily relocate to safer locations or utilise relief camps when conditions become severe. These practices have gradually become part of the seasonal rhythm of life rather than exceptional disaster responses, reflecting the normalization of environmental risk within the community.

This finding resonates with Adger (2000), who argues that adaptation in coastal communities is a social process shaped by local knowledge, experience and resource availability rather than technological interventions alone. In Puthuvype, coping mechanisms have evolved through repeated exposure to environmental stress, allowing households to reduce immediate impacts even though the underlying causes of vulnerability remain unchanged.

However, these adaptations are largely short-term responses that minimise disruption rather than eliminate risk. They illustrate the community's resilience while simultaneously highlighting the absence of long-term structural solutions.

Structural Adaptation and Financial Constraints

One of the most common adaptation strategies in Puthuvype involves modifying the physical structure of houses. Many households attempt to reduce flood impacts by raising floor levels, reinforcing foundations and filling low-lying land.

These measures represent investments in household resilience, enabling families to continue living in environmentally vulnerable locations. However, the effectiveness of these adaptations is constrained by land subsidence and recurring flooding, requiring repeated expenditure and continuous maintenance.

Few et al. (2007) argue that adaptation capacity is closely linked to access to economic resources and institutional support. Households with greater financial resources can implement protective measures more effectively, while poorer families remain exposed to recurring hazards. This unequal capacity for adaptation is clearly visible in Puthuvype, where financial limitations restrict the extent to which households can invest in permanent structural improvements.

Consequently, adaptation itself becomes a source of economic stress, reinforcing the interconnected relationship between environmental and financial vulnerability.

Livelihood Diversification as an Economic Coping Strategy

Environmental uncertainty and declining fishing income have encouraged many households to diversify their livelihood sources. Daily wage labour, transportation work, construction activities and informal employment have become important supplementary income sources that reduce dependence on fishing alone.

Rather than representing a transition away from traditional livelihoods, diversification functions as a survival strategy that enables households to maintain financial stability during periods of reduced fish availability or environmental disruption. Women, in particular, contribute significantly to this process through informal income-generating activities that support household expenditure.

According to Ellis (2000), livelihood diversification is one of the most significant strategies adopted by rural and coastal households facing environmental and economic uncertainty. Diversified income sources increase flexibility and reduce dependence on a single occupation, thereby strengthening adaptive capacity.

In Puthuvype, however, diversification remains constrained by limited local employment opportunities and geographical isolation. Most alternative occupations are characterised by irregular wages, informal working conditions and limited social protection, indicating that diversification reduces immediate risk without fundamentally improving long-term economic security.

Community Networks and Informal Support Systems

Formal institutional support is often complemented by strong informal social networks within Puthuvype. Families rely on neighbours, relatives, friends, religious institutions and local community groups for financial assistance, temporary shelter, information sharing and emotional support during periods of environmental stress.

These informal relationships represent an important source of social capital that strengthens the community's ability to cope with recurring challenges. Neighbourhood support enables households with limited economic resources to access immediate assistance without depending entirely on formal institutions.

Norris et al. (2008) identify social capital as a critical component of community resilience, arguing that trust, collective action and community participation significantly enhance recovery capacity following disasters. The experience of Puthuvype supports this perspective, where community solidarity functions as an everyday mechanism for managing uncertainty and reducing social isolation.

Nevertheless, informal support systems also have limitations. As environmental stress, migration and economic insecurity increase, the capacity of communities to sustain

collective support may gradually weaken, placing additional pressure on already vulnerable households.

Coping Mechanisms as Everyday Negotiations with Multi-layered Vulnerability

The coping mechanisms observed in Puthuvype illustrate that adaptation is an ongoing social process rather than a one-time response to disaster. Households continuously negotiate environmental, economic and social challenges through a combination of structural modifications, livelihood adjustments, informal support networks and behavioural changes.

These strategies demonstrate considerable resilience and local adaptive capacity. However, they are predominantly reactive rather than transformative, enabling residents to manage existing risks without substantially reducing the structural conditions that produce vulnerability.

This observation aligns with the concept of everyday resilience proposed by Berkes and Ross (2013), which emphasises that communities build resilience through continuous learning, local knowledge, social relationships and adaptive practices developed over time. In Puthuvype, coping is embedded within everyday life and reflects the community's long history of living within a dynamic coastal environment.

At the same time, the reliance on household-level adaptation reveals significant governance gaps. Residents repeatedly compensate for inadequate drainage systems, limited livelihood opportunities and insufficient institutional support through their own resources and community networks. These coping strategies therefore represent both resilience and the unequal distribution of responsibility for managing environmental risk.

The experience of Puthuvype demonstrates that while local coping mechanisms mitigate the immediate impacts of multi-layered vulnerability, sustainable resilience requires broader structural interventions to address environmental degradation, livelihood insecurity, and institutional limitations. Without such changes, households will continue to adapt to vulnerability rather than overcome it.

5.3.9 COMMUNITY SUPPORT AND RELATIONSHIPS

Community Solidarity as an Informal Safety Net

One of the most significant strengths identified in Puthuvype is the presence of strong community relationships that function as an informal safety net during periods of environmental and economic stress. Despite recurring flooding, livelihood uncertainty and infrastructural limitations, residents continue to depend heavily on neighbours, relatives and local social networks for immediate assistance and emotional support.

Unlike formal institutional responses, community support is readily available and rooted in long-standing relationships that have developed over generations. During periods of heavy rainfall and water inundation, neighbours assist one another by moving household belongings, providing temporary shelter, sharing food and helping vulnerable residents such as elderly persons and children.

These collective practices demonstrate that resilience in Puthuvype is not solely an individual or household characteristic but a community resource built through everyday interactions and mutual trust. The ability to mobilise local support reduces immediate hardship and enables households with limited financial resources to cope with environmental disruptions.

Putnam (2000) describes such networks of trust and reciprocity as social capital, arguing that communities with stronger interpersonal relationships are better able to coordinate collective action and respond effectively to crises. The experiences of Puthuvype illustrate this process, where social relationships compensate for gaps in formal institutional support and contribute significantly to community resilience.

Informal Networks and Collective Resilience

The resilience of Puthuvype is sustained not only through family relationships but also through a wide range of informal community networks. Local organisations, neighbourhood groups, religious institutions and informal leaders facilitate communication, coordinate assistance and provide practical support during times of difficulty.

These networks perform functions that extend beyond disaster response. They strengthen everyday social cohesion by encouraging cooperation, resource sharing and collective problem-solving. Information regarding government schemes, employment opportunities and environmental concerns is frequently exchanged through these local networks, making them important channels of community participation.

Norris et al. (2008) identify social capital, community competence and information exchange as essential components of community resilience. Rather than viewing resilience as the ability to simply recover from disasters, they emphasise the importance of adaptive social systems capable of responding collectively to changing conditions.

The experiences of Puthuvype reflect this perspective. Community relationships enable residents to navigate recurring challenges through cooperation and mutual assistance, demonstrating that resilience is embedded within everyday social life rather than activated only during emergencies.

Religious and Community Institutions as Sources of Support

Religious institutions occupy an important place within the social fabric of Puthuvype and contribute significantly to community wellbeing. Beyond their spiritual functions, these institutions provide spaces for social interaction, collective decision-making and community mobilisation during periods of environmental stress.

They often facilitate relief distribution, organise charitable activities and provide emotional support for families experiencing financial or environmental hardship. Their presence strengthens local social cohesion and reinforces a shared sense of identity among residents.

Berkes and Ross (2013) argue that community resilience is strengthened by local institutions that preserve collective knowledge, reinforce social identity and encourage participation. In Puthuvype, religious and community organisations perform these functions by maintaining social relationships and creating opportunities for collective action even under conditions of persistent vulnerability.

Their contribution demonstrates that resilience is produced not only through physical infrastructure or government intervention but also through locally embedded social institutions that strengthen community capacity.

Emerging Challenges to Community Cohesion

Although community relationships remain strong, the discussion also indicates emerging processes that have begun to challenge traditional patterns of social cohesion. Environmental degradation, declining livelihood opportunities, industrial expansion

and health concerns have encouraged some families to migrate, gradually altering neighbourhood relationships and reducing long-established social connections.

Economic insecurity also places increasing pressure on informal support systems. Households facing debt, unstable income and recurring housing expenses often possess fewer resources to assist others, limiting the capacity of communities to sustain traditional forms of mutual aid.

The growing social stigma associated with pollution and industrial risk further contributes to changes in community identity and external perceptions of Puthuvype. These processes indicate that while social capital remains an important resource, it is neither static nor unlimited.

Aldrich (2012) argues that communities recover more successfully from disasters when strong social networks exist, but prolonged economic and environmental stress can gradually weaken these relationships if structural problems remain unresolved. The situation in Puthuvype reflects this tension between enduring community solidarity and increasing structural pressures.

Community Relationships and Place Attachment

An important aspect of resilience in Puthuvype is the strong emotional attachment that residents maintain with their locality. Despite recurring flooding, pollution concerns and livelihood uncertainties, many households continue to remain in the community because of family history, cultural identity and deep social relationships.

This attachment reflects more than physical residence; it represents a shared understanding of Puthuvype as a place of belonging where livelihoods, memories and social relationships are interconnected. The willingness of residents to continuously adapt their homes, diversify livelihoods and participate in community activities demonstrates a commitment to sustaining life within the locality despite increasing challenges.

Adger (2003) suggests that social capital and place-based identity significantly influence adaptive capacity by strengthening cooperation and encouraging collective responses to environmental change. The experiences of Puthuvype support this perspective, illustrating how attachment to place contributes to both resilience and the decision to remain within environmentally vulnerable settings.

Community Support and Relationships in the Context of Multi-layered Vulnerability

The case of Puthuvype demonstrates that community support is one of the most significant resources available for navigating multi-layered vulnerability. Neighbourhood solidarity, informal networks, religious institutions and shared social identity collectively strengthen the community's ability to respond to environmental, social and economic challenges.

However, these relationships should not be interpreted as substitutes for institutional responsibility. Instead, they represent locally developed adaptive capacities that compensate for limitations in governance, infrastructure and welfare provision. The persistence of strong community support reflects resilience, but it also reveals the extent to which households depend on collective action to manage risks that remain insufficiently addressed through formal systems.

At the same time, migration, livelihood insecurity, environmental degradation and changing social dynamics indicate that community resilience is under increasing pressure. Without sustained investment in environmental restoration, livelihood security and institutional responsiveness, the informal support systems that currently sustain Puthuvype may gradually weaken.

The experience of Puthuvype ultimately illustrates that resilience is not merely the capacity to survive adversity but the ability of communities to preserve trust, cooperation and collective identity while continuously adapting to changing environmental and socio-economic realities. Community support therefore emerges as both a strength and a critical resource for achieving sustainable development in a coastal settlement experiencing complex and interconnected vulnerabilities.

CHAPTER VI:
FINDINGS, SUGGESTIONS AND
CONCLUSION

6.1 Introduction

This chapter presents the findings, suggestions, and conclusion of the study on the multi-layered vulnerabilities experienced by the coastal community of Puthuvype, Kerala. The findings are organised according to the sub-research questions to provide a clear understanding of the major social, economic, and environmental challenges faced by the community, the structural and governance factors contributing to these vulnerabilities, the differing experiences of various social groups, and the coping and adaptation strategies adopted at the household and community levels.

Based on the findings, the chapter proposes a set of practical suggestions for government and policymakers, local self-government institutions, community organisations and residents, and future researchers. These recommendations are intended to support more integrated, participatory, and sustainable approaches to addressing the complex vulnerabilities experienced by coastal communities.

6.2 FINDINGS

Specific Research Question 1

What are the major social, economic, and environmental challenges affecting the community?

The findings of this study indicate that the challenges experienced by residents of Puthuvype are closely interconnected and cannot be understood as isolated issues. Participants consistently described how environmental degradation, changes in livelihood opportunities, health concerns, and declining quality of natural resources collectively shape their everyday lives. Although Puthuvype has witnessed significant infrastructure and industrial development over the past few decades, many residents perceived that these developments have also introduced new forms of vulnerability that affect the social, economic, and environmental well-being of the community.

From an environmental perspective, respondents repeatedly highlighted pollution, degradation of coastal ecosystems, loss of mangrove vegetation, and the deterioration of water quality as major concerns. Many participants believed that industrial activities, increasing movement of heavy vehicles, and large-scale developmental projects have altered the local environment. Dust pollution, unpleasant odours, and concerns regarding air quality were frequently mentioned, with several residents associating

these environmental changes with respiratory illnesses and other health-related problems. Fisherfolk, in particular, expressed concern over the declining condition of the marine environment, stating that changes in coastal waters have affected fish availability and reduced the productivity of traditional fishing grounds.

Economic challenges were largely linked to changes in the fishing sector. Fishing continues to be the principal occupation for many households; however, participants reported declining fish catches, increasing operational expenses, fluctuating market prices, and growing uncertainty in sustaining their livelihoods. Several respondents noted that younger generations are increasingly reluctant to depend solely on fishing due to its unpredictable nature. While industrial establishments have generated employment opportunities for some sections of the community, these jobs were often perceived as temporary, contractual, or inaccessible to many traditional fishing households. As a result, livelihood insecurity remains a significant concern despite ongoing economic development in the region.

The study also identified several social challenges that influence the overall well-being of the community. Health concerns associated with environmental pollution emerged consistently across interviews. Participants also discussed the psychological stress created by uncertainty regarding livelihoods, environmental degradation, and the future of the community. Although basic public services such as education, healthcare, electricity, and transportation are generally available, respondents felt that these facilities alone do not compensate for the broader social and environmental changes affecting their quality of life.

Specific research question 2

What structural and governance factors contribute to these vulnerabilities?

The study found that several structural and governance-related factors have contributed to the vulnerabilities experienced by the residents of Puthuvype. Although participants acknowledged the presence of government welfare schemes, public infrastructure, and essential services, many felt that these measures have not adequately addressed the long-term environmental and livelihood concerns of the community. Participants frequently described a gap between development initiatives and the everyday realities faced by local residents, particularly those whose livelihoods depend directly on coastal resources.

One of the recurring concerns raised during the interviews was the impact of large-scale industrial and infrastructure development on the community. Respondents stated that while projects such as industrial establishments and port-related developments have contributed to regional economic growth, they have also altered the local environment and affected traditional livelihoods. Several participants expressed the view that community concerns regarding pollution, ecological degradation, and fishing-related issues were not sufficiently considered during the planning and implementation of these projects. This has contributed to a perception that development priorities have often outweighed local environmental and social needs.

Participants also highlighted limitations in institutional responsiveness to local issues. While government departments and local self-government institutions were recognised for providing basic services and implementing welfare programmes, respondents reported delays in addressing complaints related to environmental pollution, waste management, and infrastructure maintenance. Some participants felt that institutional responses were often reactive, addressing problems only after they had become severe rather than preventing them through timely intervention.

Another important finding was the limited participation of residents in development-related decision-making. Many participants indicated that they had little opportunity to express their concerns or contribute to discussions regarding projects that directly affect their community. This lack of meaningful public participation reduced their sense of ownership over development initiatives and contributed to feelings of exclusion from decisions influencing their livelihoods and living environment.

Specific research question 3

How do different social groups experience vulnerability differently?

The findings reveal that vulnerability in Puthuvype is not experienced uniformly across the community. Although residents share a common geographical setting and are exposed to similar environmental and developmental changes, the nature and intensity of vulnerability differ according to occupation, age, gender, economic status, and access to resources. These differences influence how individuals experience environmental risks, livelihood insecurity, and their capacity to cope with everyday challenges.

Fishing households emerged as one of the groups most directly affected by changing environmental conditions. Participants engaged in fishing described declining fish catches, increasing operational costs, and uncertainty in sustaining their traditional occupation. Since their livelihoods depend directly on coastal and marine resources, environmental degradation and changes in the coastal ecosystem have had immediate economic consequences. Unlike households with diversified sources of income, fishing families often have fewer alternatives when their primary livelihood is disrupted.

The experiences of women reflected a different dimension of vulnerability. Women involved in fish processing and marketing reported that fluctuations in fish availability directly affected their income and household responsibilities. Several participants also highlighted that women often shoulder additional responsibilities in managing household finances and caring for family members during periods of economic hardship. These responsibilities increase their vulnerability, even when they are not directly engaged in fishing activities.

Older adults were identified as another group facing distinct challenges. Elderly participants expressed concerns regarding declining physical mobility, health issues, and increasing dependence on family members during emergencies or periods of environmental stress. Participants noted that adapting to environmental and livelihood changes becomes more difficult with advancing age, particularly for those living alone or with limited financial resources.

The study also found that economically weaker households experience greater difficulty in responding to environmental and livelihood challenges. Limited financial resources reduce their ability to repair houses, invest in alternative livelihoods, or recover from unexpected economic losses. In contrast, households with stable employment, diversified income sources, or greater financial security were generally better positioned to manage similar challenges.

Specific Research Question 4

What coping and adaptation strategies are practised at the household and community levels?

The study found that residents of Puthuvype employ a range of coping and adaptation strategies to manage the environmental, social, and economic challenges they face.

Rather than relying on a single approach, households combine individual efforts, family support, community relationships, and institutional assistance to deal with everyday uncertainties. These strategies have developed over time through lived experiences and reflect the community's ability to adapt to changing circumstances.

At the household level, participants reported making practical adjustments to manage livelihood and financial challenges. Several families have diversified their sources of income by engaging in wage labour, small businesses, or other forms of employment alongside fishing. Households also described carefully managing their expenditures, prioritising essential needs, and depending on family members to contribute to household income during periods of economic difficulty. These measures help reduce the immediate impacts of declining fishing income and rising living costs.

Community support emerged as one of the most significant coping mechanisms identified during the study. Participants consistently highlighted the importance of neighbours, relatives, religious institutions, and local organisations in providing assistance during times of need. Whether responding to environmental challenges, financial hardship, or personal emergencies, residents frequently rely on informal social networks for information, emotional support, and practical help. These strong community relationships strengthen the community's capacity to cope with recurring challenges.

The study also found that government welfare schemes and public services contribute to household coping capacities. Participants acknowledged receiving benefits through various welfare programmes, including pensions, ration supplies, healthcare services, and other forms of government assistance. Although these schemes were generally viewed as helpful in reducing immediate hardships, many respondents noted that they do not fully address the underlying environmental and livelihood challenges affecting the community. Consequently, institutional support is often complemented by household efforts and community-based support systems.

6.3 SUGGESTIONS

The suggestions presented in this study are based on the findings that emerged from the experiences of residents in Puthuvype. The study revealed that the community's vulnerabilities are shaped by the interaction of environmental degradation, livelihood challenges, governance processes, and social factors. Addressing these issues requires

collaborative efforts from government agencies, local self-government institutions, community organisations, and other stakeholders. The following suggestions are proposed to reduce community vulnerabilities, strengthen resilience, and promote sustainable development in Puthuvype.

Suggestions for Government and Policymakers

- Government policies should address environmental conservation, livelihood protection, disaster risk reduction, and industrial development together rather than through separate sectoral interventions. Since the vulnerabilities in Puthuvype are interconnected, integrated planning will ensure that development is both sustainable and socially inclusive.
- Regular monitoring of air quality, water quality, and coastal ecosystems should be undertaken by the relevant government departments. Prompt action to address pollution and environmental degradation will help protect the health of residents and preserve the natural resources that support traditional livelihoods.
- Greater support should be provided to traditional fishing households through improved access to financial assistance, modern fishing equipment, skill development programmes, and livelihood diversification initiatives. Such measures can improve household income security and strengthen the resilience of fishing communities.
- Residents should be actively consulted before the implementation of major industrial and infrastructure projects that affect their community. Incorporating local knowledge and community perspectives into decision-making will improve transparency, increase public trust, and ensure that development reflects local needs.
- Departments responsible for fisheries, environmental protection, disaster management, and local development should work collaboratively to address the interconnected challenges faced by coastal communities. Better institutional coordination will contribute to more effective planning, implementation, and long-term community resilience.

Suggestions for Local Self-Government Institutions

- The local self-government institution should conduct regular awareness programmes, mock drills, and community training on disaster preparedness and

environmental risk management. These initiatives can improve community preparedness and encourage greater public participation in disaster risk reduction activities.

- Greater attention should be given to waste management, drainage maintenance, coastal cleanliness, and the conservation of local ecosystems such as mangroves. Regular monitoring and timely interventions can help reduce environmental degradation and improve the quality of life of residents.
- Periodic meetings should be organised to enable residents to share their concerns regarding environmental issues, infrastructure development, and local services. Such participatory platforms will strengthen communication between the local government and the community while ensuring that development decisions reflect local priorities.
- The local self-government institution should maintain updated records of vulnerable groups, including elderly persons, fishing households, women-headed households, and economically weaker families. Targeted interventions can help ensure that government schemes and support services reach those who need them most.
- Strong partnerships should be developed with fishermen's organisations, residents' associations, religious institutions, and non-governmental organisations to implement community development and disaster preparedness programmes. Such collaboration can improve resource mobilisation and strengthen local resilience.

Suggestions for Community Organisations and Residents

- Residents should actively participate in community meetings, environmental campaigns, and local development programmes. Greater public participation can ensure that community concerns are effectively represented in local planning and decision-making processes.
- Community organisations, residents' associations, youth clubs, and religious institutions should work together to organise activities such as mangrove restoration, coastal clean-up drives, waste management campaigns, and environmental awareness programmes. These initiatives can contribute to

protecting the local environment while encouraging shared responsibility among residents.

- The strong relationships among neighbours, relatives, and local organisations should be further encouraged through community-based support groups and volunteer initiatives. Such networks can play an important role in providing assistance during environmental emergencies, livelihood crises, and other community challenges.
- Community organisations can facilitate training programmes, financial literacy workshops, and entrepreneurship initiatives to help households strengthen their economic resilience. Improved financial planning and diversified skills can better prepare families to cope with livelihood uncertainties.
- Schools, youth clubs, and community organisations should encourage environmental education and community engagement among children and young people. Developing environmental responsibility from an early age can contribute to the long-term sustainability and resilience of the community.

6.4 CONCLUSION

This study explored the multi-layered social, economic, and environmental vulnerabilities experienced by the residents of Puthuvype, a coastal community in Ernakulam district, Kerala. Through a qualitative case study approach, the research examined the challenges faced by the community, the structural and governance factors that contribute to these vulnerabilities, the varying experiences of different social groups, and the coping strategies adopted at the household and community levels. By analysing the lived experiences of the participants, the study sought to develop a comprehensive understanding of how vulnerability is experienced and negotiated within a rapidly changing coastal environment.

The findings reveal that vulnerability in Puthuvype is a complex and interconnected phenomenon rather than the result of a single factor. Environmental degradation, changes in traditional livelihoods, industrial expansion, governance processes, and social inequalities interact to shape the everyday lives of residents. The study found that while industrial and infrastructure development has contributed to economic growth and improved connectivity, it has also generated environmental concerns and livelihood

challenges, particularly for fishing households that depend directly on coastal resources. This demonstrates that development and vulnerability coexist within the community, requiring balanced and context-sensitive approaches to planning and policy implementation.

The study also highlights that vulnerability is not experienced equally across the community. Factors such as occupation, age, gender, and economic status influence the ways in which individuals and households experience environmental and livelihood challenges. Fishing communities, women involved in fish-related activities, elderly residents, and economically weaker households encounter different forms of vulnerability based on their social and economic circumstances. These findings reinforce the understanding that vulnerability is socially differentiated and shaped by unequal access to resources and opportunities.

Another significant contribution of the study is the recognition of the important role played by household and community-level coping mechanisms. Residents do not depend solely on formal institutional support but actively draw upon family relationships, neighbourhood networks, religious institutions, and local organisations to cope with everyday challenges. Household-level financial adjustments, livelihood diversification, and strong community solidarity emerged as important factors that strengthen resilience despite continuing environmental and economic pressures.

The study answers the main research question by demonstrating that residents of Puthuvype experience and navigate vulnerability through the interaction of environmental change, livelihood transformation, governance processes, and social inequalities. Rather than existing independently, these factors overlap and reinforce one another, creating multiple layers of vulnerability that influence the community's everyday life. At the same time, residents continuously adapt through household initiatives, community support systems, and available institutional resources, reflecting both their resilience and their capacity to respond to changing circumstances.

This study contributes to the growing body of knowledge on coastal vulnerability by providing a community-centred understanding of the lived experiences of residents in Puthuvype. It emphasises the importance of recognising local knowledge, community participation, and integrated governance in addressing the complex challenges faced by industrialising coastal communities. As coastal regions continue to experience

environmental change and development pressures, policies and interventions must move beyond addressing isolated problems and instead adopt holistic approaches that recognise the interconnected nature of vulnerability. Such an approach will not only reduce existing risks but also contribute to building more resilient, inclusive, and sustainable coastal communities.

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ANNEXURE 1 – TOOL FOR DATA COLLECTION

Interview Guide

Basic Demographic Details

1. Name of the participant
2. Age
3. Gender
4. Occupation

What are the major social, economic, and environmental challenges affecting the community?

1. Background

- The history of Puthuvype.
- Major changes or events have shaped this community.
- Geography and social uniqueness

2. Environmental Challenges

- Major environmental problems.
- Heavy rains or water inundation.
- Changes in mangroves or coastal ecology.
- IOC and LPG terminal influence.

3. Livelihood and Economic Challenges

- Main sources of livelihood.
- Reliability of the income.
- Loans or debt.
- Economic Security

4. Housing and Living Conditions

- Housing conditions in the area.
- Infrastructural problems (roads, drainage)
- Cost of living.

5. Social Vulnerability

- Substance abuse
- Discrimination
- Education and Opportunities
- Are certain demographic groups more affected than others.

What structural and governance factors contribute to vulnerability?

6. Institutional Access

- Accessible of hospitals, schools, panchayat offices.
- Emergency services (police, fire station).
- Anganwadis and public institutions.

7. Services and Schemes

- Support of local authorities.
- Effectiveness of welfare schemes
- Gaps in services
- Role of NHGs

How do different social groups experience vulnerability differently?

- Gender roles and responsibilities
- Employment and income
- Safety and mobility
- Decision-making
- Access to services and support

What coping and adaptation strategies are practiced?

8. Coping Mechanisms

- Heavy rains or flooding
- Temporary relocation
- Food, water and emergency preparedness
- Relief camps and experience.
- House repairs or elevation
- Drainage improvements
- Other strategies

9. Community Support and Relationships

- Neighbours support
- Community groups
- Religious institutions
- Trust and cooperation
- Community coordination