

**"Strengthening Local Governance for Cyclone Disaster Management:
A Case Study of Puducherry District"**

RESEARCH REPORT

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By Bandla Sethuram

(sethurambandla65@gmail.com, M.A in Political Science, Pondicherry University)

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under the supervision of

Shri V. Srinivas, IAS

Director General, NCGG Secretary,

Department of Administrative Reforms and Public Grievances (DARPG) Government of India

&

Dr. Gazala Hasan, Assistant Professor (NCGG)

&

Under the mentorship of

Dr. Deep Narayan Pandey, Assistant Professor

Special Centre for Disaster Research

Jawaharlal Nehru University,

New Delhi



National Centre for Good Governance (NCGG)
Department of Administrative Reforms and Public
Grievances, Ministry of Personnel, Public
Grievances and Pensions, Government of India

CERTIFICATE

This is to certify that **Bandla Sethuram**, a student of **Pondicherry University**, has satisfactorily concluded the research report titled “**Strengthening Local Governance for Cyclone Disaster Management: A Case Study of Puducherry District**” as part of the internship program at the National Centre for Good Governance (NCGG) under my mentorship.

I, **Dr. Deep Narayan Pandey**, hereby validate the successful completion of the internship report within the internship program at the National Centre for Good Governance (NCGG). The report submitted by **Bandla Sethuram** is an authentic work carried out by him/her under my supervision and guidance. I have reviewed and assessed the intern's performance throughout the internship period.

26/06/24
26/06/24

(Signature and Date)

Dr. Deep Narayan Pandey
Special Center for Disaster Research
Jawaharlal Nehru University, New Delhi

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List of Abbreviations

1. UNDRR - United Nations Office for Disaster Risk Reduction
2. NDMA - National Disaster Management Authority
3. SDM - Sub-Divisional Magistrate
4. WMO - World Meteorological Organization
5. IMD - India Meteorological Department
6. KSDMA - Kerala State Disaster Management Authority
7. KILA- Kerala Institute of Local Administration
8. DRR - Disaster Risk Reduction
9. CBDRM - Community-Based Disaster Risk Management
10. SDMA - State Disaster Management Authority
11. DDMA - District Disaster Management Authority
12. ESFs - Emergency Support Functions
13. PDMA - Puducherry Disaster Management Authority
14. SEC - State Executive Committee
15. PRA - Panchayat Raj Act
16. LAD - Local Administration Department
17. PWD - Public Works Department
18. EWS - Early Warning System
19. CIR - Critical Infrastructure Resilience
20. NDRF - National Disaster Response Force
21. NGOs - Non-Governmental Organizations
22. MSSRF - M. S. Swaminathan Research Foundation
23. ToT - Training of Trainers
24. Eco-DRR - Ecology and Disaster Risk Reduction
25. CBDM - Community-Based Disaster Management
26. PRIs - Panchayati Raj Institutions
27. NCRMP - National Cyclone Risk Mitigation Project

ABSTRACT

Title: "Strengthening Local Governance for Cyclone Disaster Management: A Case Study of Puducherry District".

Puducherry, a Union Territory in India with western and eastern coastlines, faces constant threats from cyclones that significantly impact lives and infrastructure. This study investigates the critical role of local governance during cyclones, focusing on the Puducherry District. The research examines the effectiveness of disaster preparedness measures, community engagement, and coordination among local authorities during cyclone events. This study employs a mixed-methods approach, combining primary data from surveys conducted in randomly selected locations in Puducherry District with secondary data from historical records, policy documents, and existing literature. The surveys engage residents and discussion with local officials, and disaster management personnel to gather insights into cyclone preparedness, awareness levels, and perceptions of local governance effectiveness. Key objectives include assessing the role of local governance in cyclone preparedness, investigating response mechanisms, and evaluating post-cyclone recovery and rehabilitation efforts. Findings reveal that proactive planning, community participation, and efficient resource allocation are essential for minimizing cyclone-related losses. This research provides valuable insights into disaster management policies, emphasizing the pivotal role of local governance in safeguarding vulnerable communities during cyclones.

Keywords: local governance, cyclones, disaster preparedness, recovery, community engagement, Puducherry District

1. Introduction

Disasters, such as cyclones, impose profound challenges on communities worldwide, demanding robust preparedness and response strategies to mitigate their impact. In the face of these natural calamities, effective disaster management becomes paramount for safeguarding lives, infrastructure, and livelihoods. This research delves into the intricate dynamics of cyclone preparedness and response, exploring how various factors shape community resilience and recovery efforts, with a specific focus on Puducherry district.

Community involvement in decision-making processes related to cyclone management amplifies local voices in disaster planning and response efforts within Puducherry. Effective engagement ensures that community-specific needs, knowledge, and preferences are integrated into disaster management strategies, fostering a collaborative approach to resilience-building tailored to the socio-economic and cultural dynamics of this region. Engagement in cyclone preparedness drills provides crucial insights into community readiness and response capabilities in Puducherry. Participation rates in these drills reflect community preparedness levels and shed light on factors influencing active engagement or hesitancy among residents of this district. Effective disaster preparedness hinges on widespread community participation in drills to enhance familiarity with evacuation protocols, emergency communication channels, and safety measures specific to Puducherry's geographical and social context.

Local governance in Puducherry plays a central role in post-cyclone recovery efforts, spearheading initiatives to restore normalcy and rebuild communities affected by cyclones. Assessing the adequacy and effectiveness of recovery measures—such as the distribution of essential supplies, healthcare access, and infrastructure restoration—within the context of Puducherry provides a comprehensive view of recovery challenges and successes specific to this district. Governmental effectiveness in cyclone warning dissemination and emergency response is another pivotal focus of this study within Puducherry. Perceptions of government preparedness efforts—ranging from early warning systems to post-disaster recovery initiatives—highlights public trust and satisfaction levels within this district. Evaluating these perceptions offers valuable insights into the strengths and weaknesses of current disaster management frameworks in Puducherry, informing suggestions for bolstering resilience.

This research aims to illuminate these critical facets of cyclone preparedness and response in Puducherry, drawing from empirical data collected from a diverse respondent base within this district. By synthesizing these insights, the study seeks to inform evidence-based suggestions for enhancing disaster resilience, strengthening community cohesion, and fortifying governance frameworks.

1.1 Disaster

"A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts (UNDRR)."

This definition by United Nations Office for Disaster Risk Reduction (UNDRR) describes disaster as interaction of exposure, vulnerability, and capacity at any scale which affects human, material, economic and environment.

Cyclones are powerful natural phenomena with significant impacts on the regions they affect. Understanding their formation, types, and impacts is crucial for effective disaster management and mitigation.

1.1.2 Cyclones: Formation, Classification, and Impact

Cyclones, significant meteorological phenomena, are characterized by rapid inward air circulation around a low-pressure area. These atmospheric disturbances often bring violent storms and adverse weather conditions. In the Northern Hemisphere, cyclones rotate anticlockwise, whereas in the Southern Hemisphere, they rotate clockwise (NDMA). Understanding cyclones' formation, types, and impacts, particularly in the Indian context, is crucial for effective disaster preparedness and management.

1.1.3 Types of Cyclones

According to the classification by the World Meteorological Organization (WMO) Cyclones are primarily classified into tropical and extratropical cyclones. According to the WMO, tropical cyclones are weather systems with wind speeds exceeding 63 km/h (34 knots). These systems are powered by the heat from the sea and are driven by planetary winds, such as the easterly trades and temperate westerlies.

1. Tropical Cyclones

Tropical cyclones originate over warm tropical or subtropical waters between the Tropics of Capricorn and Cancer. Their formation is contingent on several critical conditions: a sea surface temperature exceeding 26°C to a depth of 60 meters, atmospheric instability, and the presence of the Coriolis force, which is essential for cyclonic rotation. The process begins with the evaporation of water vapor from the ocean surface, which then condenses to form massive vertical cumulus clouds through convection. During the mature stage of a tropical cyclone, vigorous thunderstorms develop, and the air rises, spreading out horizontally at the tropopause level. This horizontal spread creates a positive perturbation pressure that accelerates downward air movement due to convection. As the air descends, it warms by compression, creating a low-pressure "Eye" at the cyclone's centre, surrounded by turbulent cumulus cloud bands. This structure is crucial for maintaining the cyclone's intensity. (NDMA)

A tropical cyclone weakens when its source of warm, moist air is disrupted, typically after making landfall or moving over cooler waters. However, the weakening of the cyclone does not immediately eliminate the threats posed by high winds, heavy rainfall, and storm surges.

2. Extratropical Cyclones

Extratropical cyclones, also known as temperate cyclones, form in temperate and high latitude regions. These cyclones develop from the interaction between warm, humid air masses from the tropics and cold, dry air masses from the poles along the polar front. The denser, colder air forces the warmer air upward, creating instability and a low-pressure area at the junction of these air masses. The Earth's rotation further contributes to the formation and movement of

these cyclones. Extratropical cyclones differ from tropical cyclones in that they derive energy from horizontal temperature contrasts rather than heat from the ocean. (NDMA)

Indian Meteorological Department (IMD) classifies cyclones based on wind speed and their potential for causing damage. Cyclones are categorized as follows:

- Low Pressure: < 31 km/h
- Depression: 31-49 km/h
- Deep Depression: 49-61 km/h
- Cyclonic Storm: 61-88 km/h
- Severe Cyclonic Storm: 88-117 km/h
- Super Cyclone: > 221 km/h

Additionally, cyclones are classified by their damage potential:

- Category 1: 120-150 km/h, minimal damage
- Category 2: 150-180 km/h, moderate damage
- Category 3: 180-210 km/h, extensive damage
- Category 4: 210-250 km/h, extreme damage
- Category 5: > 250 km/h, catastrophic damage

1.1.4 Global Terminology of Cyclones

Cyclones are known by different names in various regions of the world. In the China Sea and Pacific Ocean, they are called typhoons; in the West Indian islands, Caribbean Sea, and Atlantic Ocean, they are known as hurricanes. The term tornado is used in the Guinea lands of West Africa and southern USA, while in northwestern Australia, they are referred to as willy-willies. In the Indian Ocean, they are simply called tropical cyclones (NDMA).

1.1.5 Impact of Cyclones

Cyclones have a multifaceted impact, including high wind speeds, heavy rainfall, and storm surges. These elements can cause extensive damage to infrastructure, agriculture, and human life. Storm surges, which involve a rise in sea level above the predicted astronomical tide, are particularly destructive. They lead to severe flooding, erosion of beaches and embankments, and reduced soil fertility. The strong winds associated with cyclones can damage buildings, uproot trees, and disrupt communication and power networks. Torrential rains can cause inland flooding, displace populations, and exacerbate the destruction (NDMA).

1.2 Research Objectives

1. To assess the effectiveness of local governance structures in conducting cyclone preparedness measures, including risk assessments and early warning systems in Puducherry District.
2. To analyse the effectiveness of post-cyclone recovery and rehabilitation efforts in Puducherry District.
3. To know the effectiveness of cyclone preparedness measures and response mechanisms during cyclones in Puducherry District, by analysing and interpreting the collected data.
4. To understand the gap between disaster risk governance and cyclone preparedness in Puducherry District.

1.2.1 Research Design and methodology

This study adopts a mixed-methods approach, integrating both quantitative and qualitative techniques to provide a comprehensive analysis of local governance in cyclone disaster management. The combination of these methods allows for a nuanced understanding of the effectiveness of disaster preparedness, response, and recovery efforts in Puducherry District.

1.2.2 Data Collection Methods:

1. Surveys: Structured surveys were conducted among residents in randomly selected locations within Puducherry District. These surveys aimed to gather quantitative data on cyclone preparedness, awareness levels, and perceptions of local governance effectiveness. The survey questions were designed to assess factors such as the implementation of early warning systems, community participation in disaster preparedness, and satisfaction with local governance responses during cyclone events.

2. Document Analysis: Policy documents, historical records of past cyclone events, and existing literature on disaster management strategies in Puducherry District were analysed. This secondary data provided contextual background and supplemented the primary findings from surveys and interviews.

3. Sampling Technique: Convenient and Random sampling was used to select specific locations within Puducherry District for surveys and interviews. This approach aimed to ensure a diverse representation of perspectives and experiences while maintaining feasibility within the study's scope.

1.2.3 Data Analysis:

1. Quantitative Data Analysis: Survey responses were analysed using descriptive statistics such as percentages, and averages. This allowed for an overview of trends and patterns in cyclone preparedness and perceptions of local governance effectiveness.

2. Qualitative Data Analysis: Qualitative data from discussions were analysed thematically. Coding and thematic analysis helped identify key themes and narratives related to local governance roles, challenges, and opportunities in cyclone disaster management.

1.2.4 Limitations of the study

The study's findings are subject to several limitations. First, the sample size and representativeness of the randomly selected locations within Puducherry District may not fully capture the diversity of experiences and perspectives across the entire region. Second, data reliability could be affected by respondent biases, recall errors in interviews, and incomplete records in historical data sources. Third, time constraints and resource availability may have limited the depth of data collection and analysis, particularly in assessing long-term impacts of post-cyclone recovery efforts. Finally, access to key stakeholders, including local officials and disaster management personnel, could have impacted the depth of insights gathered. Despite

these limitations, the study aims to contribute valuable insights into importance of local governance's role in cyclone disaster management.

1.3 Importance of Local Governance in Disaster Management: Case Stories

Kerala model of disaster management provides a significant example of effective local governance in disaster scenarios. During the 2018 Kerala floods, local governments, including panchayats and municipalities, prepared comprehensive disaster management plans. The Kerala State Disaster Management Authority (KSDMA) provided technical support, while the Kerala Institute of Local Administration (KILA) coordinated capacity building and training efforts. Local governments formed emergency response teams and integrated their plans into the District Disaster Management Plan. This approach ensured that the local community's needs and insights were incorporated into broader disaster management strategies, enhancing the effectiveness of the response. (KSDMA)

Japan's local governments have played a significant role in implementing the Sendai Framework. Municipalities engage in regular disaster preparedness drills, community-based early warning systems, and educational programs that teach residents how to respond to earthquakes and tsunamis. Local authorities also integrate DRR into urban planning, ensuring that infrastructure projects consider potential hazards and community vulnerabilities. (Voluntary National Report Submission by Japan to UNDRR)

Indonesia, local governments are crucial in managing disaster risks associated with frequent volcanic eruptions, earthquakes, and tsunamis. The government has decentralized disaster risk management, empowering local authorities to develop and implement local DRR plans. Community-based disaster risk management (CBDRM) initiatives have been widely adopted, involving residents in hazard mapping, evacuation planning, and disaster simulations.

Philippines has institutionalized the role of local governments in disaster risk reduction through the Philippine Disaster Risk Reduction and Management Act of 2010. This legislation mandates local governments to establish local DRR and management offices, develop local DRR plans, and allocate resources for disaster preparedness and response. Local governments have successfully implemented community-based early warning systems and conducted extensive public awareness campaigns to educate residents about disaster risks. (Philippines Disaster Risk Reduction and Management Act of 2010)

The **Sendai Framework** for Disaster Risk Reduction 2015-2030 is a global blueprint aimed at substantially reducing disaster risk and losses in lives, livelihoods, and health. It emphasizes the importance of understanding disaster risk, strengthening disaster risk governance, investing in disaster risk reduction (DRR) for resilience, and enhancing disaster preparedness. Within this framework, local governance is highlighted as a critical component for effective DRR, recognizing that local governments are the first line of defence in managing disaster risks and responding to disasters. (UNDRR)

In India, disaster management operates within a structured framework consisting of the National Disaster Management Authority (NDMA), State Disaster Management Authorities (SDMAs), and District Disaster Management Authorities (DDMAs). Local governments play a critical role within this framework, particularly in implementing the first response to disasters. However, challenges remain in ensuring that local governments are fully integrated into this system.

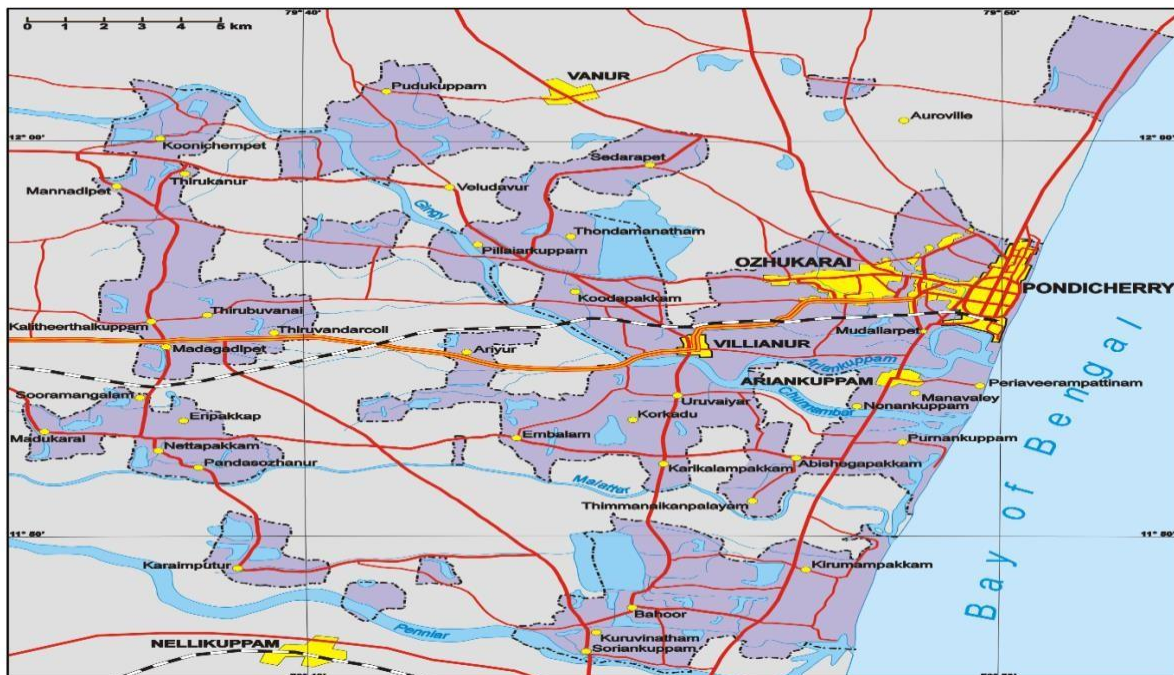
73rd and **74th** Constitutional Amendments played a pivotal role in decentralizing power, which enabled local governments to manage resources and make decisions pertinent to their areas. This decentralization is essential in disaster management because it allows for swift, localized responses that can address the unique needs and conditions of different communities. The Disaster Management Act of 2005 leverages this structure, explicitly defining the roles and responsibilities of local governments to ensure that they are prepared and equipped to handle disasters. This includes tasks such as risk assessment, resource allocation, public awareness campaigns, and the implementation of emergency response plans. By developing a legal and institutional framework that operates at all levels, the country can maintain a state of readiness and resilience against potential disasters. The National Policy on Disaster Management of 2009 further supports this framework, providing guidelines and policies to streamline efforts across various levels of government, ensuring a coordinated and effective disaster response system.

According to the Disaster Management Act 2005, local governments are responsible for establishing disaster response capabilities and developing local disaster management plans. These plans are essential for ensuring that disaster information is promptly relayed to the District Disaster Coordinator. Local disaster management groups, appointed by local governments, are tasked with developing, reviewing, and assessing effective disaster management practices. They assist local governments in preparing disaster management plans, ensuring community awareness on disaster response, identifying and coordinating disaster resources, and managing local disaster operations. The integration of local disaster management and operations with state disaster management systems is also a key responsibility of these groups. The mayor, or another elected council member, typically chairs the local disaster management group, highlighting the importance of leadership and governance at the local level in disaster management. Local governments play a crucial role in disaster management due to their intimate knowledge of their community's social, economic, infrastructural, and environmental needs. This localized understanding allows them to provide immediate and effective support during disasters.

1.4 Geographical Location of Puducherry District

Due to its location along the eastern coast of India on the Bay of Bengal, Puducherry is highly susceptible to cyclones and coastal hazards. The region's low-lying topography and flat terrain make it particularly vulnerable to storm surges and flooding that accompany cyclonic storms originating from the sea. Factors such as sea-level rise, changing coastline dynamics, and socio-economic activities further exacerbate these risks, highlights the need for robust disaster preparedness and mitigation strategies.

Figure 1



Source: Wikimedia Commons

Puducherry district, which encompasses multiple scattered portions including the main town of Puducherry and surrounding enclaves, the dispersed geographical layout presents unique challenges for disaster management. Coordinating emergency responses, including evacuation plans and timely dissemination of warnings, becomes more complex due to the diverse settlement patterns across the district. Local governments play a pivotal role in addressing these challenges by implementing tailored early warning systems, conducting detailed vulnerability assessments for each enclave, and educating residents about evacuation protocols and disaster readiness. Their proactive engagement in community resilience-building initiatives is crucial for reducing the impact of cyclones and enhancing overall disaster resilience in Puducherry district.

1.5 Review of Literature

Development of the Concept of Resilience

Alexander (2013), in his research paper titled “Resilience and Disaster Risk Reduction: An Etymological Journey,” examines the evolution and broadening of the term “resilience.” His primary objective is to highlight the significance of resilience in disaster risk reduction (DRR) efforts. Alexander traces the paradigm shift of the concept of resilience across history and various disciplines, demonstrating its direct relationship with DRR. Numerous examples in his work illustrate how resilience plays a crucial role in managing severe disaster scenarios.

Community Vulnerability and Resilience

Johnson et al. (2018), in their article “Community Vulnerability and Resilience in Disaster Risk Reduction: An Example from Phojal Nalla, Himachal Pradesh, India,” discuss the shared responsibility in reducing disaster risks, emphasizing the centrality of community vulnerability and resilience. Focusing on the 1994 floods in Phojal Nalla, the authors explore the interplay between heritage, capital, vulnerability, and resilience. They highlight the importance of comprehensive knowledge to understand these interlinked factors and propose solutions for systematic risk reduction.

Comparative Study on Community-Based Disaster Management (CBDM)

Jahangiri et al. (2011), in their paper “A Comparative Study on Community-Based Disaster Management in Selected Countries and Designing a Model for Iran,” stress the importance of community involvement in the disaster management cycle. Given Iran's high disaster risk, the need for a CBDM approach is critical. The paper develops a model based on practices from various countries, revealing that proactive disaster management requires active community participation. The level of community involvement, however, varies depending on the type of hazard and the specific situation.

Indonesian Experience with CBDM

Ali et al. (2019), in their research article “Community-Based Disaster Management: Indonesian Experience,” highlight Indonesia's vulnerability to disasters such as earthquakes, cyclones, floods, tsunamis, and volcanoes. The study presents Indonesia as a notable example of effective community participation in disaster management, supported by the government. The CBDM approach in Indonesia emphasizes preparedness and coping strategies, with the government and private sectors playing supportive roles. Despite some criticisms, such as poor understanding due to lack of socialization and formal organizations, the approach demonstrates significant advancements.

Community-Based Disaster Management in Canada

Buckland et al. (2002), in their study “Community-Based Disaster Management During the 1997 Red River Flood in Canada,” explore the link between community preparedness and disaster response activities. Their research focuses on rural groups in Manitoba, noting that communities with substantial physical, human, and social capital were better prepared. However, they also find that an extensive social capital can sometimes hinder the decision-making process.

Shift to a Holistic Approach in Disaster Management

Sadat et al. (2019), in their article “Handling Disaster Risks with the Community-Based Approach,” discuss the transition from conventional to holistic disaster management. The traditional approach focused on reactive measures, providing aid post-disaster. In contrast, the holistic approach involves comprehensive pre-disaster and post-disaster efforts, necessitating greater community participation. Regular community assessments can reduce vulnerability and enhance resilience, highlighting the need for a proactive and inclusive strategy in disaster management.

Crisis Management Plan of Puducherry

"Crisis Management Plan of Puducherry" provides a detailed framework for handling crises in the region, covering phases from initial alert to recovery. It discusses essential elements and introduces the Incident Command System for coordinated efforts. Central to the plan are Emergency Support Functions (ESFs) addressing key response areas: communication, medical services, public health, emergency warning, search and rescue, transportation, evacuation, debris clearance, damage assessment, relief camps, food and supplies, water and sanitation, electricity restoration, public works, firefighting, hazardous material response, law enforcement, and resource mobilization. Each ESF offers tailored strategies considering Puducherry's unique socio-economic and cultural context, highlighting the importance of proactive measures such as risk assessment, contingency planning, capacity building, and community participation. The plan advocates for transparent and collaborative approaches, aiming to foster resilience and support sustainable recovery by equipping stakeholders with the necessary tools and insights for effective crisis management and building a resilient future for the region.

Puducherry District Disaster Management Plan

The Puducherry District Disaster Management Plan outlines comprehensive strategies for disaster risk reduction and management in the region, aligning with the guidelines of the National Disaster Management Authority (NDMA) and the Disaster Management Act of 2005. Its primary objectives are to prevent loss of life and property, institutionalize disaster management at the district level, promote disaster preparedness, reduce vulnerability, and establish efficient mechanisms for rapid response and decision-making during disasters. The plan details an institutional framework comprising the Puducherry Disaster Management Authority (PDMA) and the State Executive Committee (SEC), responsible for policy formulation and planning. Emphasizing the pre-disaster phase, it focuses on prevention, mitigation, preparedness, capacity building, and community-based disaster management, with the Department of Revenue and Disaster Management as the nodal department. The response and post-disaster phases cover proactive response, relief, rehabilitation, and reconstruction activities, highlighting the need for effective coordination to ensure swift recovery. Overall, the plan is a well-structured document that promotes a proactive approach to disaster risk reduction, highlighting the importance of community involvement and inter-departmental coordination to build a resilient future for Puducherry.

2. Local Governance in Puducherry

In a democratic polity, representatives at all levels are crucial for voicing the people's views. Elections periodically and continuously select these representatives. Any discontinuity in conducting local body elections undermines democracy. Panchayats, formed at the local level, ensure people's participation. This study examines the status of the Panchayat Raj System in Puducherry, focusing on election delays and the implications of these delays on governance.

2.1 Genesis and Establishment of Local Government

Puducherry, known for its local body institutions, saw significant changes post its merger from France in 1954. Elections to the Commune and Village Panchayats were not conducted from 1968 until July 2006, despite the implementation of the Puducherry Panchayat Act 1973 and the Municipality Act 1973 on January 26, 1974. The Panchayati Raj System in Puducherry, governed by the Pondicherry Village and Commune Panchayats Act, 1973, devolved several powers to these local bodies. Amendments in 1994 aligned this legislation with the 73rd Constitutional Amendment, mandating the constitution of Commune Panchayats at the intermediate level and provisions for a District Planning Committee.

During French rule, communes managed local affairs without Village Panchayats. The mayor, the head of the commune, held significant administrative power, including issuing vital certificates and managing local governance functions. Post-independence, social movements and NGOs advocated for local elections, gaining momentum after the 1992 implementation of the Panchayat Raj Act (PRA). Despite these efforts, Puducherry delayed conducting local body elections until pressured by social movements and judicial interventions.

2.1.2 Violation of the Constitution

Constitutionally, a Panchayat's term is five years, necessitating subsequent elections either before the term's expiration or within six months of dissolution. Despite the completion of the five-year term, the second local body election in Puducherry was stalled. On August 22, 2011, Mr. V. Perumal filed a petition in the Madras High Court under Article 226 of the Indian Constitution, seeking a writ of mandamus to compel authorities to hold local body elections immediately, enforcing the constitutional mandate.

The High Court directed the initiation of the election process and the declaration of results within six months from the judgment date in August 2011. On December 3, 2012, the Election Commission announced plans to conduct the election in three phases. However, on December 13, 2012, the Madras High Court ordered the Puducherry Government to obtain the 2011 census data within two months and, upon receiving the approved final census, to carry out the delimitation of Municipal and Village wards, including reservations for backward classes. Following this, a notification was to be issued to the State Election Commissioner, Puducherry, to proceed with notifying the elections for the civic bodies.

Although the High Court did not set a specific timeframe for the delimitation process, the Supreme Court directed the Puducherry government to complete the delimitation of Municipal and Commune Panchayat wards within two months of receiving the census data. In May 2013, the Puducherry government established a committee under the chairmanship of Sri. G. Panneer Selvam to carry out the delimitation and determine the number of seats to be reserved for

Scheduled Castes, women, and backward classes based on the 2011 census. This committee has not yet submitted its report.

Despite conducting local elections, the Puducherry government was reluctant to devolve functions as mandated by the 73rd Amendment Act, leading to numerous protests. Thiru A. Jaganathan, President of the Village Panchayats President Association, led these protests, including hunger strikes and representations to the Lieutenant Governor. In November 2006, the government issued a gazette notification to devolve finances, functionaries, and allowances to Panchayat Presidents. Following persistent struggles, a Memorandum of Understanding was signed by Panchayat Raj Minister Sri. Mani Shankar Iyyar and Chief Minister Sri. Rangasamy to devolve powers to Panchayats. However, this agreement did not significantly alter the functioning of the local government.

In September 2007, a delegation led by Prof. Ramadass, MP of Puducherry, met with high-ranking officials including the President, Prime Minister, Home Minister, Panchayat Raj Minister, and Urban Development Minister of India, urging them to take necessary action. Although some progress was made, the core objectives of the Puducherry Panchayat Association remained unachieved. Post-election, the NGO Holistic Approach for People Empowerment (HOPE) in Puducherry played a crucial role in enhancing the capabilities of elected representatives. HOPE organized at least 11 training programs focusing on various aspects of governance, significantly contributing to the promotion of local self-government in Puducherry.

Significant changes in Puducherry's local governance were initiated through the establishment of two key committees. On July 2, 2007, the Puducherry government appointed a three-member committee chaired by P.R. Ramanathan. This committee's mandate was to identify activities under the 29 subjects listed in the 11th Schedule of the Constitution and to recommend specific power-sharing arrangements with elected representatives of local bodies. Based on its recommendations, the Puducherry government devolved 22 out of the 29 subjects on January 5, 2009. These subjects included:

1. Social forestry and farm forestry
2. Minor forest produce
3. Fuel and fodder
4. Non-conventional energy sources
5. Adult and non-formal education
6. Cultural activities
7. Markets and fairs
8. Maintenance of community assets
9. Land improvement, implementation of land reforms, land consolidation, and soil conservation
10. Minor irrigation, water management, and watershed development
11. Animal husbandry, dairying, and poultry

12. Small-scale industries, including food processing industries
13. Khadi, village, and cottage industries
14. Drinking water
15. Roads, culverts, bridges, ferries, waterways, and other means of communication
16. Rural electrification, including the distribution of electricity
17. Poverty alleviation programs
18. Education, including primary and secondary schools
19. Technical training and vocational education
20. Libraries
21. Health and sanitation, including hospitals, Primary Health Centres, and dispensaries
22. Welfare of weaker sections, particularly Scheduled Castes and Scheduled Tribes

Although powers were devolved based on the initial report of the Ramanathan Committee, the committee has yet to submit its full report. A second committee, chaired by Sri. Edward Kumar, was constituted on July 7, 2009. Its purpose was to draft new legislation for the Municipalities of Panchayats, but it has not yet submitted its report.

2.2 Local Administrative Department

The Local Administration Department (LAD) in Puducherry was established on July 1, 1963, with the primary objective of managing local governance at the secretariat level. This department was formed to ensure effective administration and oversight of local governmental affairs within the Union Territory. Its establishment marked a significant step towards organized and structured local governance, aiming to address the administrative needs of the local population and ensure that local bodies operate efficiently and in accordance with governmental regulations.

Figure 2



Source: FB post of Lt. Governor of Puducherry.

In June 1967, the Inspectorate of Municipal Councils and Local Boards was created to provide an additional layer of oversight and control over the municipalities within Puducherry. This body was tasked with ensuring that the municipalities adhered to established guidelines and standards, thereby promoting effective and transparent governance. The creation of the Inspectorate was a crucial development in strengthening the regulatory framework for

municipal administration, ensuring that local bodies functioned optimally and served the community's needs effectively.

The delimitation of wards in Puducherry led to the first general elections for municipalities and commune panchayats, which were conducted in June-July 2006. This democratic exercise was a milestone in the history of local governance in Puducherry, providing residents with the opportunity to elect their local representatives. The five-year term of the municipal councils and panchayats, which commenced following these elections, expired on July 13, 2011. This electoral process was significant in establishing a cycle of democratic governance at the local level, ensuring that the administrative framework remained responsive to the evolving needs of the community.

The Local Administration Department performs several critical functions aimed at ensuring effective local governance and community development. One of its primary responsibilities is overseeing urban planning and development. This involves regulating land use, planning infrastructure projects, and ensuring that the growth of municipal areas is sustainable and well-organized. By managing these aspects, the LAD plays a pivotal role in shaping the urban landscape of Puducherry.

Municipal administration is another key function of the LAD. The department supervises municipal councils to ensure effective service delivery and administration. This includes tasks such as property tax collection, maintaining public health and sanitation, and managing public spaces. Through these efforts, the LAD ensures that municipalities function smoothly and provide essential services to the residents.

In the realm of disaster management, the LAD is instrumental during natural disasters such as cyclones. It coordinates relief efforts, evacuation plans, and emergency services to mitigate the impact of such events on the local population. The department's proactive approach in disaster preparedness and response helps protect lives and property, ensuring that the community can recover swiftly and effectively.

Figure 2.1



with Mr. Subramaniam LAD Personnel

Local finance and budgeting also fall under the purview of the LAD. The department manages the financial affairs of local bodies, including preparing budgets and allocating funds. By ensuring transparency and accountability in financial transactions, the LAD promotes fiscal responsibility and efficient use of resources within municipalities and panchayats.

Community development is another crucial area of focus for the LAD. The department implements various social development programs aimed at improving the quality of life for residents. These initiatives often focus on education, healthcare, and livelihood enhancement, reflecting the department's commitment to holistic community welfare.

2.2.1 Collaborative Efforts with Other Government Departments

Effective governance requires collaboration between various government departments, and the LAD actively engages in such partnerships to enhance service delivery. During disasters, the LAD works closely with the Disaster Management Department and other relevant agencies to coordinate relief efforts and ensure comprehensive emergency response. This collaboration is vital in protecting residents and managing resources efficiently during crises. For infrastructure development projects, the LAD collaborates with the Public Works Department (PWD). Together, they plan and execute projects such as road construction and drainage system improvements, which are essential for maintaining and improving civic amenities. This partnership ensures that infrastructure projects are well-coordinated and meet the community's needs.

In matters of public health and sanitation, the LAD partners with the Health Department to maintain high standards of hygiene and disease prevention. This collaboration addresses critical issues such as waste management and public health campaigns, ensuring that the community remains healthy and well-served.

The LAD also works with the Education and Social Welfare Departments to promote literacy and access to quality education. By supporting educational initiatives and social welfare programs, the LAD contributes to the overall development of the community, ensuring that residents have opportunities for personal and professional growth. In the area of revenue and finance, the LAD coordinates with the Revenue Department to manage property tax collection and other financial matters. This collaboration ensures efficient and transparent financial processes, contributing to the fiscal health of local bodies and enabling them to function effectively.

2.3 Community Engagement During Disasters

Engaging with the community is a crucial aspect of the LAD's disaster management strategy. The department builds robust community networks by collaborating with various groups, including healthcare providers, local businesses, schools, and advocacy organizations. These networks facilitate the dissemination of information, coordination of resources, and addressing of community needs during emergencies.

Proactive communication is another key strategy employed by the LAD. By maintaining open channels of communication, the department provides regular updates, advisories, and alerts through local media, social platforms, and community meetings. This ensures that residents are well-informed and can take appropriate actions during disasters. Establishing credibility and trust is fundamental for effective community engagement. The LAD prioritizes transparency and accuracy in its communication efforts, ensuring that the information provided is reliable.

Engaging community leaders and influencers helps in conveying credible messages, further building trust within the community.

Addressing community concerns is essential during emergencies. The LAD actively listens to the fears, needs, and concerns of community members, fostering cooperation and reducing anxiety. This empathetic approach ensures that the department's response is aligned with the community's expectations and requirements.

Conflict prevention is also a critical component of the LAD's disaster management approach. By anticipating potential conflicts and addressing them proactively, the department helps maintain community trust and cohesion. Understanding and managing emotions such as anger and frustration during crises are vital for sustaining a supportive and cooperative community environment.

Since its formation, Puducherry district has experienced the impact of several significant cyclones, each causing considerable damage and influencing the region's disaster preparedness strategies.

2.4 History of Major Cyclones which Severely affected Puducherry

Cyclone Thane, which struck in late December 2011, was one of the most devastating cyclones to hit Puducherry. The cyclone's powerful winds and torrential rains wreaked havoc on the region, uprooting trees and causing widespread power outages. The storm rendered Cuddalore inaccessible due to damaged road networks, severely hindering relief efforts. The extensive structural damage included destroyed homes, businesses, and critical infrastructure, making it clear that the region needed to reassess and strengthen its disaster management strategies. The severity of Thane's impact pressed the necessity for robust emergency preparedness and resilient infrastructure.

In late November 2020, Cyclone Nivar struck with considerable force. Classified as a Very Severe Cyclonic Storm at its peak, Nivar brought sustained winds of 120 km/h. It made landfall between Puducherry and Chennai, near Marakkanam, causing widespread disruption. The heavy rainfall, amounting to 237 mm in Puducherry, led to significant flooding and infrastructure damage. The cyclone's overall damage was estimated at \$600 million, affecting both Tamilnadu and Andhra Pradesh severely. Nivar highlighted the region's ongoing vulnerability to natural disasters and emphasized the importance of enhancing disaster preparedness and response mechanisms.

Cyclone Mandous, which occurred in December 2022, caused significant coastal erosion in Puducherry, particularly in the Pillaichavady area.

Figure 2.2



Source: IMD during Mandous Cyclone

The cyclone's impact was severe enough to cause the collapse of fifteen houses, demonstrating the acute vulnerability of coastal communities to such events. The destruction of homes and property highlighted the need for improved coastal defenses and more comprehensive disaster mitigation plans. The aftermath of Mandous emphasized the critical importance of developing resilient infrastructure and effective evacuation strategies to protect vulnerable populations.

Cyclone Michaung, which struck in December 2023, led to the implementation of stringent precautionary measures in Puducherry. Authorities imposed Section 144 in coastal areas to prevent public gatherings and ensure residents' safety. Beach Road was closed, and various other precautions were taken to mitigate the cyclone's impact. The response to Michaung demonstrated the lessons learned from previous cyclones, showing an enhanced focus on preventive measures and efficient emergency response strategies. This proactive approach aimed to minimize damage and protect lives, reflecting a significant improvement in the region's disaster preparedness.

Each of these cyclones has left a lasting impact on Puducherry, shaping its approach to disaster preparedness and management. The recurring nature of these events highlights the critical need for continuous improvement in infrastructure resilience, emergency response, and community awareness. By learning from past experiences, Puducherry strives to enhance its capacity to safeguard lives and property from the inevitable threat of future cyclones.

The governance of Puducherry's Panchayat Raj System has been marked by challenges in democratic continuity and disaster resilience. Despite constitutional mandates and judicial interventions, delays in local body elections have disrupted governance, highlighting systemic issues compromising democratic principles. The region's evolution from French rule to post-independence advocacy reflects a struggle for local representation and autonomy, leading to legislative reforms aligned with national frameworks. However, gaps remain in effectively devolving powers and resources to Panchayats. Cyclones like Thane, Nivar, Mandous, and Michaung highlight the need for robust disaster management strategies and resilient infrastructure. Addressing electoral delays and enhancing disaster preparedness are crucial for effective governance and protecting Puducherry's communities from future natural calamities.

3. Role of Local Governance in Puducherry During the Pre-Cyclone Phase

Local governance in Puducherry plays a pivotal role in enhancing resilience against cyclones through comprehensive pre-cyclone preparedness measures. This chapter explores the critical components of local governance's role during the pre-cyclone phase, focusing on risk assessment, early warning systems (EWS), community awareness and preparedness programs, infrastructure and resource management, and effective disaster response strategies. By analysing these components, we gain insights into how local authorities in Puducherry systematically assess risks, deploy early warning systems, empower communities, manage infrastructure resilience, and coordinate multi-agency responses to safeguard lives and livelihoods from cyclonic impacts. Understanding these aspects highlights the importance of proactive governance in mitigating cyclone risks and fostering sustainable disaster resilience in coastal regions like Puducherry.

3.1 Risk Assessment and Early Warning Systems

Local governance plays an indispensable role in risk assessment, a critical component of pre-cyclone preparedness. This involves a systematic process of identifying, evaluating, and understanding the various risks posed by cyclones. Local authorities begin by identifying areas within Puducherry that are most susceptible to cyclone impacts, such as coastal regions and low-lying zones that are prone to flooding. This identification process involves detailed mapping of these areas to visualize potential risks and plan accordingly.

Additionally, assessing the population's exposure to these hazards is crucial. This step involves understanding the density of the population in vulnerable areas, the quality of housing, and the socio-economic conditions of the residents. These factors contribute to determining how exposed and at risk the population is in the event of a cyclone. Furthermore, the capacity of communities to cope with and respond to cyclones is evaluated. This includes assessing the resources available to the community, their levels of preparedness, and their previous experiences with disaster response.

Historical data analysis plays a significant role in risk assessment. By examining past cyclone events, their paths, impacts, and the effectiveness of previous response measures, local authorities can gain valuable insights. This historical perspective helps in understanding patterns and potential impacts, enabling better prediction and planning. Vulnerability mapping is another critical aspect, involving the creation of detailed maps that highlight areas at risk based on various parameters such as elevation, proximity to water bodies, and infrastructure resilience.

Risk assessment is not a one-time activity but an ongoing process. It requires continuous updating and refinement based on new data and changing conditions. By thoroughly assessing risks, local governance can prioritize resources effectively, ensuring that the most vulnerable areas receive the attention and support they need. This strategic allocation of resources is vital for developing robust disaster management strategies tailored to the specific needs of Puducherry.

3.1.1 Early Warning Systems (EWS):

An effective Early Warning System (EWS) is a cornerstone of disaster risk reduction, providing the necessary information to help communities take preventive actions before a cyclone strikes. EWS in Puducherry is designed to provide timely and accurate warnings to ensure that the population can take necessary precautions and evacuate if needed. The components of an EWS include hazard monitoring, risk communication, evacuation planning, community engagement, decision-making support, performance monitoring, error handling, and a multi-hazard approach.

Hazard monitoring involves the continuous observation of weather conditions using meteorological data. This includes tracking cyclones, predicting their paths, and assessing their potential impacts. Modern technology such as satellites, radar, and weather stations play a crucial role in this monitoring process. By leveraging these tools, local authorities can receive real-time data and make accurate predictions about impending cyclones.

Risk communication is another essential component of an EWS. It involves disseminating warnings through multiple channels to ensure that all residents receive timely alerts. These channels include SMS, radio broadcasts, public address systems, social media, and sirens. The effectiveness of risk communication depends on its reach and clarity. Messages must be concise, clear, and actionable, providing specific instructions on what residents should do to stay safe.

Evacuation planning is a critical aspect of an EWS, involving the development and regular updating of evacuation routes and the identification of safe shelters. Local authorities must ensure that these plans are well-communicated to the public and that shelters are adequately equipped to accommodate displaced people. Regular drills and simulations help to test these plans and ensure that the community is familiar with evacuation procedures.

Community engagement is vital for the success of an EWS. Local authorities must involve the community in preparedness activities, ensuring that residents understand the warnings and know how to respond. This includes educating the community about the importance of EWS, the different types of warnings, and the actions they should take when a warning is issued. By fostering a culture of preparedness, local governance can enhance community resilience.

Decision-making support involves providing accurate and up-to-date data to decision-makers to facilitate informed actions during a crisis. This includes real-time information on the cyclone's path, expected impacts, and the status of evacuation efforts. Decision-makers rely on this data to make critical decisions about resource allocation, evacuation orders, and emergency response measures.

Performance monitoring and error handling are crucial for maintaining the effectiveness of an EWS. Regular evaluations of the system's performance help to identify any weaknesses or gaps. Addressing these issues promptly ensures that the system remains reliable. Additionally, dealing with false alarms and improving system accuracy is essential to maintain public trust and confidence in the EWS.

A multi-hazard approach is necessary for comprehensive risk management. While focusing on cyclones, the EWS must also consider other potential hazards such as floods and landslides. This approach ensures that the system is robust and can handle various types of emergencies,

providing comprehensive protection to the community. By integrating these components, local governance in Puducherry can develop a people-centred EWS that is effective, reliable, and trusted by the community. Such a system not only enhances preparedness but also saves lives and minimizes the impact of cyclones.

3.2 Community Awareness and Preparedness Programs

Community-based disaster preparedness programs are crucial for enhancing the resilience of communities in cyclone-prone areas like Puducherry. These programs focus on empowering communities with the knowledge and skills needed to respond effectively to cyclones. By engaging the community in preparedness activities, local governance can ensure that residents are well-prepared and can act quickly in the event of a cyclone.

A notable example of effective community-based disaster preparedness is the Community-Based Disaster Preparedness Programme implemented in Cox's Bazar, Bangladesh. This program, which ran from 1996 to 2002, focused on communities within a 1.5 km radius around 30 cyclone shelters. Key activities included establishing village disaster preparedness committees and squads responsible for early warning dissemination, evacuation coordination, first aid, and search and rescue operations. These committees played a crucial role in ensuring that the community was prepared and could respond effectively during a cyclone.

The program also included gender-focused efforts to reduce vulnerabilities among women and children, recognizing that these groups are often disproportionately affected by disasters. By involving women and children in preparedness activities and ensuring their inclusion in disaster response plans, the program enhanced the overall resilience of the community. Household-level risk reduction discussions were conducted to encourage families to adopt measures such as storing emergency supplies and protecting livestock. These measures helped to ensure that households were better prepared for cyclones and could reduce their vulnerability.

The success of this program in directly benefiting 90,000 people and indirectly assisting 120,000 more provides valuable insights for similar initiatives in Puducherry. By adopting a similar approach, local governance can enhance community resilience and ensure that residents are well-prepared for cyclones.

In addition to specific programs, general initiatives for community awareness and preparedness are essential. These initiatives emphasize the importance of educating the community about cyclone risks, early warning systems, and evacuation procedures. Awareness campaigns can be conducted through various channels such as schools, community centres, and local media. These campaigns aim to ensure that residents understand the risks associated with cyclones and know what actions to take to stay safe.

Capacity building is another critical component of community preparedness. This involves training individuals and households in essential skills for disaster preparedness and response. Training programs can cover topics such as first aid, basic search and rescue techniques, and the use of emergency supplies. By equipping residents with these skills, local governance can ensure that the community is better prepared to handle emergencies.

Collaboration with local organizations, government agencies, and volunteers is also essential for effective community preparedness. By working together, these stakeholders can leverage their resources and expertise to enhance preparedness efforts. For example, local Red Cross

branches can provide training and support, while government agencies can offer resources and coordination.

Post-disaster support is another important aspect of community preparedness. Ensuring sustained assistance beyond immediate relief is crucial for helping communities recover and build resilience. This includes providing support for rebuilding damaged infrastructure, restoring livelihoods, and addressing long-term needs.

By focusing on these initiatives, local governance can enhance community awareness and preparedness, ensuring that residents are well-equipped to handle cyclones and minimize their impact on lives and livelihoods.

3.3 Infrastructure and Resource Management

Ensuring the resilience of critical infrastructure is a crucial responsibility of local governance in Puducherry. Critical infrastructure includes systems such as power grids, transportation networks, communication lines, and water supply, which are essential for the functioning of society and the well-being of residents. The resilience of these systems is vital for withstanding the impacts of cyclones and ensuring that they can operate effectively during crises.

Critical infrastructure resilience (CIR) refers to the capacity of infrastructure to withstand disruptions, operate effectively during crises, and adapt to shocks and stressors. Achieving CIR involves several challenges, including interdependencies among different infrastructure sectors, ownership complexities, lack of incentives for private stakeholders, and limitations in local government authority. Addressing these challenges requires a collaborative approach, involving various stakeholders such as government agencies, private sector entities, and community organizations.

To enhance infrastructure resilience, local governance can undertake several measures. First, conducting regular assessments of critical infrastructure assets vulnerable to cyclones is essential. This involves identifying key infrastructure such as power substations, hospitals, and major roads that are at risk. By understanding these vulnerabilities, local authorities can prioritize resources and implement measures to strengthen these assets.

Second, updating existing infrastructure to withstand cyclone impacts is crucial. This may involve retrofitting buildings to meet cyclone-resistant standards, reinforcing bridges and roads, and upgrading power and communication systems. Investing in resilient infrastructure not only reduces the risk of damage but also ensures that essential services can be maintained during and after a cyclone.

Third, fostering collaboration among various sectors is essential for addressing infrastructure resilience comprehensively. Engaging stakeholders from different sectors such as energy, health, and transportation can help in developing integrated solutions. For example, coordination between the energy sector and local authorities can ensure that power supply is maintained during a cyclone, while collaboration with the health sector ensures that medical facilities remain operational to provide essential services amidst the crisis. By taking a multi-sectoral approach and ensuring robust infrastructure management, local governance in Puducherry can significantly enhance its preparedness and resilience against cyclones, safeguarding both infrastructure and the well-being of its residents. This comprehensive approach not only mitigates the immediate impacts of cyclones but also facilitates faster recovery and sustainable development in the aftermath of disasters.

3.4 Response to Cyclones in Puducherry: Strengthening Disaster Management

Cyclones are recurrent natural disasters that pose significant threats to coastal regions like Puducherry. Effective disaster management requires a multifaceted approach encompassing robust emergency response mechanisms, seamless coordination among government agencies, and active public participation and volunteerism. This comprehensive strategy is essential for minimizing loss of life, mitigating damage to infrastructure, and promoting swift recovery in cyclone-affected areas.

3.4.1 Emergency Response Mechanisms

Puducherry's emergency response mechanisms are crucial components of its disaster management strategy, aimed at mitigating the impact of cyclones on its coastal communities. When cyclones approach, prompt and coordinated actions are taken to ensure the safety and well-being of residents and minimize the disruption caused by the disaster.

3.4.2 Assessment and Restoration: One of the primary objectives during and immediately after a cyclone is the assessment of damage and subsequent restoration efforts. Teams comprising government officials, emergency responders, and volunteers assess the extent of damage to buildings, infrastructure, and public health services. This assessment helps prioritize areas for immediate intervention and resource allocation. Critical facilities such as hospitals, water supply systems, and communication networks are restored on a priority basis to facilitate effective response and recovery.

3.4.3 Debris Removal: Cyclones often leave behind significant debris, obstructing roads and impeding access for emergency responders and relief supplies. Rapid debris removal operations are undertaken to clear affected areas, ensuring unhindered movement and facilitating the delivery of essential services to affected communities. This proactive approach minimizes logistical challenges and accelerates the overall recovery process.

3.4.4 Safe Drinking Water and Sanitation: Ensuring access to safe drinking water and maintaining sanitation standards are paramount during cyclone response efforts. Cyclones frequently disrupt water supply systems and sanitation facilities, increasing the risk of waterborne diseases and hygiene-related issues. Emergency teams distribute hygiene kits, water purification tablets, and establish temporary sanitation facilities to mitigate health risks and safeguard public health in affected areas.

3.4.5 Search and Rescue Operations: Search and rescue operations are critical in the immediate aftermath of a cyclone to locate and evacuate individuals stranded or in distress. Trained personnel, including disaster response teams, volunteers, and specialized units such as National Disaster Response Force (NDRF), conduct systematic searches in affected areas. Timely rescue operations save lives and ensure that vulnerable populations, including elderly persons, children, and individuals with disabilities, receive necessary assistance and support.

3.4.6 Psychosocial Support: Cyclones not only cause physical damage but also inflict emotional and psychological distress on affected individuals, especially children and vulnerable populations. Psychosocial support services are integral to Puducherry's disaster response strategy, providing counselling, creating safe spaces for emotional expression, and facilitating community healing. Trained counsellors, social workers, and volunteers work

together to address trauma, grief, and mental health challenges among cyclone survivors, promoting resilience and recovery.

3.4.7 Reuniting Separated Families: In the chaotic aftermath of a cyclone, families may become separated, exacerbating emotional distress and logistical challenges. Protection teams and child welfare authorities collaborate to reunite separated children with their families, ensuring their safety and well-being. This reunification process involves careful documentation, verification procedures, and coordinated efforts across agencies to prioritize the best interests of the child and uphold their rights during emergencies.

3.5 Coordination Among Government Agencies

Effective coordination among various government agencies is imperative for optimizing resources, streamlining response efforts, and ensuring comprehensive disaster management in Puducherry.

3.5.1 Unified Incident Structure: Puducherry adopts a unified incident structure that integrates local, state, and national agencies into a cohesive framework during cyclone responses. This structured approach ensures standardized protocols, unified command systems, and clear lines of communication among stakeholders. By establishing a unified incident management system, Puducherry enhances coordination, minimizes duplication of efforts, and expedites decision-making processes critical for timely response and recovery operations.

3.5.2 National and State Disaster Management Authorities: The National Disaster Management Authority (NDMA) and State Disaster Management Authorities (SDMAs) play pivotal roles in Puducherry's disaster response framework. These authorities collaborate with meteorological agencies, local administrations, and emergency response teams to monitor cyclone developments, issue timely warnings, and coordinate evacuation measures. NDMA and SDMAs provide strategic guidance, technical expertise, and resource mobilization support to enhance preparedness, response, and recovery capabilities across all levels of governance.

3.5.3 Interagency Taskforces: Interagency taskforces are instrumental in facilitating coordinated response efforts and addressing multifaceted challenges posed by cyclones. These taskforces bring together diverse stakeholders, including government agencies, non-governmental organizations (NGOs), community-based organizations, and private sector partners. Taskforces are established to oversee specific aspects of disaster management, such as logistics coordination, health services deployment, infrastructure restoration, and humanitarian assistance. By fostering collaboration and synergy among different entities, interagency taskforces optimize resource allocation, enhance operational efficiency, and strengthen resilience against cyclonic hazards in Puducherry.

3.6 Pillaiyarkuppam: A Model of Community Empowerment and Disaster Preparedness
Pillaiyarkuppam, a peaceful village in the coastal district of Puducherry, India, is well-acquainted with the unpredictable sea. The residents' lives are intertwined with the coastal environment, which, while providing many resources, can also bring destructive cyclones and floods. The challenge for Pillaiyarkuppam has been to not only withstand these natural events but to become stronger and more resilient as a community.

Due to its coastal location, the village is particularly vulnerable to natural disasters. Memories of past cyclones and floods are a constant reminder to the villagers of the urgent need to

improve their disaster preparedness and response capabilities. They face both the immediate physical dangers of these events and the long-term disruptions to their livelihoods.

3.6.1 Community Action

Recognizing this need, the M S Swaminathan Research Foundation (MSSRF), known for its work in sustainable development and ecological restoration, took action. In collaboration with various government departments, MSSRF launched a Training of Trainers (ToT) program called 'Disaster Management for Coastal Communities.' This program aimed to mobilize community leaders, educators, and volunteers to take proactive steps in disaster preparedness.

Figure 4.3



SOURCE: MSSRF

3.6.2 Training Program Highlights

The ToT program was designed to create a strong network of local trainers who would lead disaster preparedness efforts within the community. Participants included school teachers, lecturers, members of science forums, and volunteers from the farming and fishing sectors. The curriculum covered essential topics such as disaster risk assessment, emergency response strategies, recovery and rehabilitation processes, and the psychosocial impacts of disasters. The training combined theoretical knowledge with practical drills and simulations to ensure participants could apply what they learned.

3.6.3 Impact and Outcomes

The training program had an immediate and significant impact. Volunteers, now equipped with the necessary knowledge and skills, became agents of change in their community. They organized awareness campaigns, conducted mock drills, and formed emergency response teams to ensure Pillaiyarkuppam was well-prepared for future disasters. The program also gained recognition from the Puducherry State Disaster Management Agency (SDMA), which selected 20 coastal volunteers for further training under the APKA MITRA project. This recognition validated the quality and effectiveness of MSSRF's training efforts.

Pillaiyarkuppam's story is one of empowerment and resilience. It demonstrates how proper training and community engagement can transform a vulnerable community into one that is well-prepared and resilient. The village serves as an inspiring model for other coastal communities, showing that through education, training, and collective action, vulnerability can be turned into strength and fear into preparedness. Pillaiyarkuppam stands as a beacon of hope, lighting the way toward a more resilient future for all communities facing natural disasters.

3.7 Public Participation and Volunteerism

Public participation and volunteerism play pivotal roles in augmenting Puducherry's cyclone response efforts, fostering community resilience, and promoting solidarity among residents during times of crisis.

3.7.1 Community-Based Preparedness: Community-based preparedness initiatives empower local residents to actively participate in disaster response and recovery activities. Training programs, workshops, and simulation exercises are conducted to educate communities on evacuation procedures, first aid techniques, and hazard mitigation strategies. By equipping residents with knowledge and skills, Puducherry enhances community resilience, strengthens social cohesion, and encourages proactive engagement in disaster preparedness efforts.

3.7.2 Role of Volunteer Organizations: Non-governmental organizations (NGOs), civil society groups, and volunteer organizations play indispensable roles in complementing governmental efforts during cyclone responses. These organizations mobilize volunteers, deploy humanitarian aid, and provide essential services, including shelter management, medical assistance, and psychosocial support. Volunteers contribute diverse expertise and local knowledge, facilitating swift response, resource mobilization, and effective coordination with governmental agencies. The collaborative efforts between volunteer organizations and government stakeholders exemplify the synergistic approach to disaster management in Puducherry, leveraging collective strengths and community solidarity to address cyclonic challenges.

3.7.3 Crowdsourcing and Technology: Crowdsourcing platforms and technology-driven solutions enhance situational awareness, information sharing, and decision-making processes during cyclone responses in Puducherry. Platforms such as OpenStreetMap enable volunteers and responders to map affected areas, identify priority needs, and coordinate relief operations effectively. Social media platforms, mobile applications, and digital communication tools facilitate real-time reporting of emergencies, dissemination of safety advisories, and engagement with affected communities. By harnessing the power of crowdsourcing and technology, Puducherry leverages innovative solutions to strengthen disaster resilience, improve response coordination, and enhance communication strategies in cyclone-prone regions.

3.7.4 Role of Local Leaders and Influencers: Local leaders, community influencers, and grassroots organizations play pivotal roles in disseminating accurate information, promoting risk awareness, and advocating for proactive disaster preparedness measures among residents in Puducherry. These stakeholders serve as trusted conduits of information, cultural mediators, and catalysts for community mobilization during cyclone events. Through community outreach initiatives, awareness campaigns, and localized communication strategies, local leaders

empower residents to make informed decisions, adopt protective behaviours, and actively participate in collective efforts to mitigate cyclonic risks. The collaborative engagement between local leaders, influencers, and governmental authorities highlights the significance of inclusive governance, community empowerment, and collaborative partnerships in advancing cyclone resilience and sustainable development in Puducherry.

The role of local governance in Puducherry during the pre-cyclone phase is crucial for mitigating the impact of cyclones and enhancing community resilience. Through rigorous risk assessment, implementation of effective early warning systems, and robust community engagement initiatives, local authorities can proactively prepare communities for cyclonic events. Furthermore, investment in infrastructure resilience and seamless coordination among government agencies and volunteer organizations bolster the region's capacity to respond swiftly and effectively during cyclone emergencies. By continually refining strategies based on lessons learned and leveraging innovative technologies, Puducherry's local governance ensures that it remains at the forefront of disaster management, safeguarding lives, and minimizing socio-economic disruptions caused by cyclonic hazards.

4. Post-Cyclone Recovery and Rehabilitation in Puducherry

Recovering from the devastating impact of cyclones is a monumental challenge for coastal regions like Puducherry, India. Cyclones not only cause widespread destruction to infrastructure and livelihoods but also disrupt the socio-economic fabric of communities. Effective post-cyclone recovery and rehabilitation efforts are therefore essential to restore normalcy and foster resilience among affected populations. In Puducherry, a union territory exposed to frequent cyclonic hazards, the journey towards recovery involves a multifaceted approach that encompasses damage assessment, restoration of essential services and infrastructure, and long-term rehabilitation strategies. This chapter explores these critical aspects, examining how local governance, community engagement, and innovative initiatives play pivotal roles in shaping a resilient future for Puducherry's coastal communities. Through case studies and analyses, this chapter highlights the importance of integrating lessons learned from past disasters into proactive measures that mitigate future risks and ensure sustainable development in cyclone-prone regions.

4.1 Damage Assessment and Needs Analysis

The 2004 Indian Ocean tsunami profoundly affected Tamilnadu and Puducherry, offering critical lessons for post-disaster recovery. Tamilnadu was the most severely impacted on the mainland, with Puducherry also experiencing significant damage. The recovery efforts post-tsunami has shown the importance of thorough damage assessment and needs analysis in disaster management. In Puducherry, cyclones such as Thane in 2011 and Nivar in 2020 caused widespread destruction. Despite significant efforts, full recovery often remained elusive, with less than 20% of affected communities recovering completely even a year after the events. Accurate damage assessment involves evaluating the extent of destruction to housing, infrastructure, and livelihoods, while needs analysis helps in identifying immediate and long-term requirements of the affected population. This phased approach to vulnerability reduction ensures that resources are allocated efficiently and interventions are prioritized effectively.

4.1.1 Restoration of Services and Infrastructure

Restoring essential services and infrastructure is crucial for the well-being of communities affected by cyclones. In the immediate aftermath of a cyclone, efforts focus on repairing electrical lines and restoring communication networks to reestablish connectivity. Water supply and sanitation systems must be quickly repaired to provide access to clean water and functional sanitation facilities. Transportation networks, including roads and bridges, need to be cleared and repaired to ensure mobility and access to essential services. Healthcare facilities, such as hospitals and clinics, must be reopened and stocked with medical supplies to address health emergencies. Education continuity is critical, necessitating the repair of damaged schools and provision of temporary learning spaces. Housing reconstruction or repair is essential to provide safe shelter for displaced individuals. Additionally, public spaces like parks and community centres should be restored to support community cohesion and provide spaces for social interaction. The Local Administration Department (LAD) in Puducherry plays a pivotal role in coordinating these restoration efforts, ensuring that they are timely and inclusive, addressing the needs of all community members.

4.1.2 Long-term Rehabilitation Efforts

Long-term rehabilitation goes beyond immediate recovery, focusing on sustainable development and resilience-building. Livelihood restoration is a key component, involving support for affected communities to resume their primary occupations, such as fishing, agriculture, and small businesses. This support can include financial assistance, provision of necessary tools and equipment, and training programs to enhance skills. Economic recovery efforts aim to revive local markets, promote entrepreneurship, and create employment opportunities to stimulate the local economy. Ecosystem restoration is also crucial, involving the rehabilitation of mangroves, wetlands, and other coastal ecosystems that provide natural protection against future cyclones. Community awareness programs are essential to educate residents about disaster preparedness, early warning systems, and evacuation plans, fostering a culture of safety and resilience. Continuous risk assessment is necessary to adapt strategies and mitigate future risks, ensuring that recovery efforts are not only effective but also sustainable in the long term.

Successful recovery and rehabilitation require collaboration among government agencies, non-governmental organizations (NGOs), and active participation from the community. This collective approach ensures that recovery is comprehensive and inclusive, addressing the diverse needs of all affected individuals. By integrating lessons from past experiences and focusing on building resilience, Puducherry can enhance its capacity to withstand future cyclones and other natural disasters.

4.2 Case Study: Analysis of Response During Cyclones in Puducherry District

4.2.1 Disaster Vulnerability Assessment in Puducherry

Puducherry is recognized as a multi-hazard-prone region, particularly vulnerable to tsunamis and cyclones. A comprehensive vulnerability assessment was conducted to understand the city's exposure to these hazards, the sensitivity of its infrastructure and population, and its adaptive capacity. This assessment is crucial for planning and implementing effective disaster management strategies. By identifying the determinants of vulnerability, such as geographical exposure and socio-economic factors, the study provides valuable insights into the areas that require strengthening. This knowledge is essential for local governance to prioritize resource allocation and enhance the overall resilience of the community.

4.2.2 Cyclone Mandous Coastal Protection Measures

Cyclone Mandous, which impacted Puducherry in December 2022, resulted in significant coastal erosion and the collapse of fifteen houses along the Pillaichavady coast. The high tides caused by the cyclone severely eroded the coastline, exposing the vulnerability of coastal infrastructure.

Figure 4.1



Source: By Author During Field Investigation. Significant Coastal erosion in Kalapet beach

In response, District Collector E Vallavan inspected the affected area and emphasized the urgent need for coastal protection measures. A proposal was submitted to construct a groyne field comprising six groynes along the most vulnerable stretch of the coast. These structures are designed to mitigate erosion by stabilizing the shoreline and reducing the impact of strong waves. This proactive measure is expected to enhance the protection of coastal communities and prevent similar damage in future events.

4.2.3 Disaster Governance Priorities Post Tsunami and Cyclone Thane

The Indian Union Territory of Puducherry has made significant strides in disaster governance following the Indian Ocean Tsunami in 2004 and Cyclone Thane in 2011. These catastrophic events served as catalysts for the development and implementation of advanced disaster risk tools and approaches. Local governance has since prioritized enhancing early warning systems, improving infrastructure resilience, and fostering community involvement. The lessons learned from these disasters have shaped current disaster management practices, emphasizing the need for continuous improvement and adaptation. By integrating modern technologies and community-based strategies, Puducherry aims to build a more resilient society capable of withstanding future natural disasters.

Puducherry's response to cyclones has seen several notable successes. The implementation of effective early warning systems has been crucial in saving lives by providing timely alerts and warnings. Community involvement has also played a significant role, with active participation from local groups in preparedness and response efforts enhancing overall resilience. Additionally, infrastructure resilience initiatives, such as the construction of groynes to prevent coastal erosion, have shown positive results in protecting vulnerable areas.

Figure 4.2



Source: By Author During Field Investigation. Construction of Groynes in Kalapet Beach

Despite these successes, there are areas that require improvement. Response delays in some instances highlight the need for more efficient emergency services. Communication breakdowns between agencies and the public can hinder effective disaster response and must be addressed. Furthermore, there is a need for additional support for vulnerable populations, including financial aid and psychological support, to ensure comprehensive recovery and resilience.

To enhance future cyclone preparedness and response, several suggestions are proposed. Investing in advanced technology and communication infrastructure can further improve early warning systems. Strengthening the resilience of critical infrastructure, such as shelters and coastal protection measures, is essential. Improving coordination mechanisms between local, state, and national agencies will facilitate a more unified response. Conducting regular community awareness programs and preparedness drills can ensure that residents are well-informed and ready to act. Lastly, incorporating climate change adaptation strategies into disaster management plans will help address long-term risks and enhance overall resilience.

The case studies from Puducherry illustrate the significant role of local governance in managing cyclones. While there have been commendable successes, such as effective early warning systems and community involvement, continuous improvement is necessary to address existing gaps and enhance resilience. By learning from past experiences and implementing strategic suggestions, Puducherry can further strengthen its disaster management framework and better protect its communities from future cyclones.

4.3 Veerapattinam: A Case Study in Community-Based Disaster Management

Veerapattinam, located between Pondicherry and Cuddalore, is the largest seaside village in Puducherry's union territory. Its close proximity to the Bay of Bengal, just 7 km from Pondicherry's city center, makes it particularly susceptible to storm surges, tsunamis, and cyclones. These natural disasters can cause extensive damage to property and infrastructure, disrupt livelihoods, and result in fatalities due to powerful winds, heavy rains, and storm surges. Additionally, its coastal location makes it vulnerable to tsunamis caused by seismic activity in the Bay of Bengal.

4.3.1 Community Awakening

The community of Veerapattinam has a long history of resilience in the face of natural disasters. However, the 2004 tsunami was a pivotal moment, forcing the villagers to recognize the urgent need for better disaster preparedness and response mechanisms.

4.3.2 Early Warning Systems

One of the key initiatives undertaken by the villagers was the establishment of an early warning system. Local volunteers were trained to monitor weather updates and recognize signs of impending disasters. These volunteers, often fishermen with intimate knowledge of the sea, became the village's first line of defense against natural disasters. By combining modern technology with traditional knowledge, they could more effectively predict and respond to natural threats.

4.3.3 Community Drills and Training

Understanding that knowledge is the best tool for survival, Veerapattinam organized regular community drills and training programs. These drills simulated disaster scenarios, providing villagers with practical experience in evacuation procedures, first aid, and emergency response. Schools played a crucial role in this initiative, ensuring that the younger generation knew how to protect themselves and their families. By involving the entire community, Veerapattinam built a culture of preparedness and resilience.

Figure 4.4



Source: By Author During Field Investigation. Plantation for Defense. (Veerapattinam Beach)

4.3.4 Ecology and Disaster Risk Reduction (Eco-DRR) and Mangrove Plantation

In an innovative approach combining ecology and disaster risk reduction (Eco-DRR), Veerapattinam initiated a mangrove plantation drive along its coastline. Mangroves serve as natural barriers against storm surges, absorbing the impact of waves and reducing coastal erosion. Additionally, mangroves provide essential habitats for fish and other marine life, supporting local fisheries and biodiversity. By planting mangroves, Veerapattinam not only strengthened its resilience to natural disasters but also created new opportunities for sustainable livelihoods.

Figure 4.5



Source: By Author During Field Investigation. Casuarina Tree and Mangroves.

Figure 4.6



Source: By Author During Field Investigation. Coconut Trees as First Line of Defense.

4.3.5 Local Leadership and Empowerment

Central to Veerapattinam's transformation is the empowerment of local leadership. The village established a disaster management committee that includes local leaders, women, and youth, ensuring inclusive and representative decision-making. This committee coordinates disaster preparedness and response efforts and liaises with government agencies and other stakeholders. By involving all segments of the community in decision-making, Veerapattinam has fostered a strong sense of ownership and collective responsibility for disaster risk reduction.

Figure 4.7



Source: By Author During Field Investigation. Coconut Trees acting as First Line of Defense in Bommayaripalem

4.3.6 Success and Lessons Learned

The true measure of Veerapattinam's initiatives is reflected in the tangible outcomes. The village has achieved the remarkable feat of zero casualties in recent disasters, a testament to the effectiveness of its community-based disaster management (CBDM) strategies. The sense of community cohesion has never been stronger, and Veerapattinam's model has become a replicable framework for other villages and cities in India. Despite challenges such as limited resources, bureaucratic hurdles, and social inequalities, Veerapattinam's experience demonstrates that with determination, innovation, and community spirit, it is possible to build a more resilient future for all.

These case studies of Pillaiyarkuppam and Veerapattinam highlight the importance of community empowerment, effective training programs, and inclusive leadership in disaster preparedness and response. They offer valuable lessons for other coastal communities aiming to enhance their resilience against natural disasters.

Post-cyclone recovery and rehabilitation efforts in Puducherry illustrate both the challenges and the resilience of coastal communities in the face of natural disasters. From effective damage assessment and infrastructure restoration to long-term rehabilitation strategies and community empowerment initiatives, Puducherry has shown a commitment to building back better after cyclonic events. The success stories of Pillaiyarkuppam and Veerapattinam highlight the transformative power of community engagement and proactive disaster management practices. Integrating these lessons into policy frameworks and fostering greater collaboration between stakeholders will be crucial in enhancing Puducherry's resilience against future cyclones.

5. Collected Data Analysis and Interpretation of Cyclone Preparedness and Response

This chapter, we delve into the findings from surveys conducted among residents of few selected locations of Puducherry District are Veerampattinam, Ariyankuppam, Arikamedu, Kalapet and Lawspet Puducherry, focusing on their perceptions and experiences related to cyclone preparedness and response efforts. From gender disparities influencing disaster resilience to the varying educational backgrounds shaping information access and community engagement in preparedness drills, this analysis provides critical insights. These insights are essential for refining policies and practices that ensure inclusive and effective disaster management, thereby fostering a resilient community capable of navigating cyclonic events with greater preparedness and confidence.

Figure 5.1

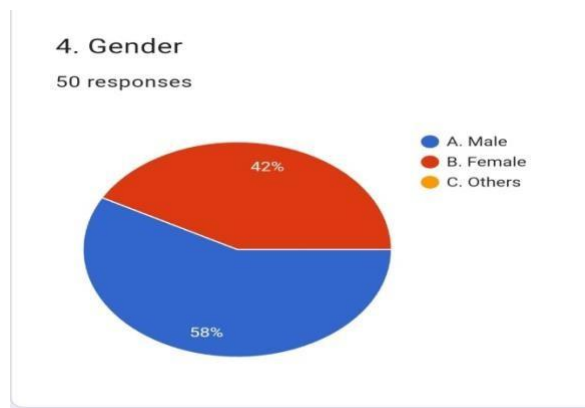


Figure 5.1

Blue: 58% of the respondents identified as male.

Red: Around 42% of the respondents identified as female.

This gender distribution indicates a higher representation of males in the survey sample.

The higher proportion of male respondents could influence the overall findings and perceptions reported, as gender can significantly impact perspectives on disaster preparedness and response. Men and women often experience and respond to disasters differently due to varying roles, responsibilities, and social expectations within communities. For example, women are often more vulnerable to disasters due to factors such as caregiving responsibilities, limited mobility, and social and economic inequalities. This could lead to different needs and priorities when it comes to disaster preparedness and response strategies. Therefore, understanding the gender distribution is crucial for interpreting the data accurately and ensuring that disaster management policies are inclusive and address the specific needs of both men and women.

It is important to ensure that both male and female perspectives are integrated into disaster management planning to address the needs and strengths of each gender effectively. The absence of a visible “Others” category suggests that non-binary and other gender identities are either underrepresented or not specifically accounted for in this survey. Future surveys should aim to include these identities to ensure comprehensive data collection.

Figure 5.2

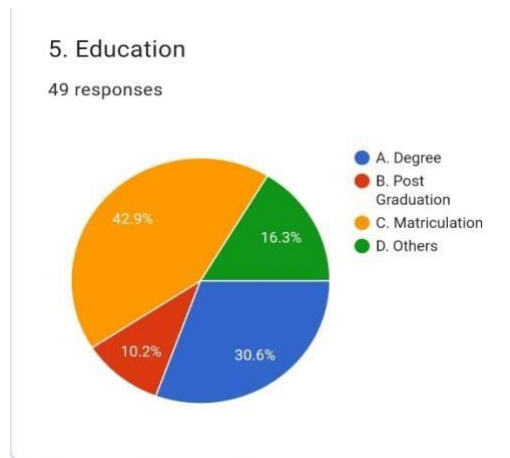


Figure 5.2

The educational qualifications of the respondents show a diverse range of academic backgrounds:

Matriculation (Orange): Approximately 42.9% of the respondents have matriculation-level education.

Degree (Blue): Approximately 30.6% of the respondents have a degree.

Post Graduation (Red): Around 10.2% of the respondents have completed post-graduation (including higher degrees like PhD).

Others (Green): The remaining respondents fall into the category of illiterate or have education levels beyond post-graduation (such as PhD).

High Matriculation Level (42.9%): The largest segment of respondents has completed matriculation. This indicates that a significant portion of the population has a foundational level of education. While they might have basic literacy and numeracy skills, they may lack advanced critical thinking and problem-solving abilities that higher education provides. This group might require more straightforward and practical disaster preparedness training and information, as their educational background may not have equipped them with the skills to critically analyse and act on complex emergency information.

Degree Holders (30.6%): A substantial proportion of the respondents hold a degree, indicating a higher level of education. This group is likely to have better access to information, greater analytical skills, and a higher likelihood of understanding and implementing disaster preparedness measures effectively. They might also be more proactive in seeking out information and participating in community preparedness activities. Educational campaigns targeting this group can be more detailed and involve advanced preparedness strategies.

Post-Graduation (10.2%): Respondents with post-graduation qualifications, including those with PhDs, represent a smaller yet significant segment. This group is likely to possess a high level of critical thinking and specialized knowledge. They could serve as key resources within the community, helping to lead and organize disaster preparedness initiatives. Leveraging their expertise in local disaster management committees or educational outreach programs could enhance community preparedness and resilience.

Others (16.3%): The remaining respondents, categorized as "Others," include those who are illiterate or have educational levels beyond post-graduation. This group is diverse and may include individuals with varying levels of understanding and engagement in disaster preparedness. Those who are illiterate may face significant challenges in accessing and understanding written preparedness materials. Special attention should be given to this subgroup to ensure they receive information in accessible formats, such as through visual aids, oral communication, and community workshops. On the other end of the spectrum, highly

educated individuals can be tapped as valuable resources for community education and leadership in disaster preparedness.

This educational diversity emphasizes the need for tailored communication and training programs that cater to different educational backgrounds, ensuring that all community members are adequately prepared for cyclones.

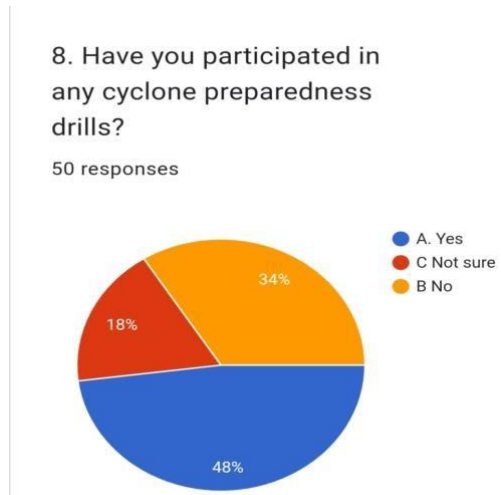


Figure 5.3

Participation in Cyclone Preparedness Drills

The participation in cyclone preparedness drills reveals significant insights into community engagement: Approximately 48% of respondents have participated in these drills, indicating that nearly half of the community is actively involved in proactive measures to enhance their readiness for cyclonic events. This high participation rate is a positive indicator, suggesting that these individuals likely have a practical understanding

Figure 5.3

of evacuation routes, emergency communication plans, and basic survival strategies, which can significantly improve overall community resilience. Such engagement typically results in better implementation of safety protocols, leading to reduced casualties and property damage during actual cyclones.

However, around 18% of respondents are unsure about their participation, which may stem from a lack of clear communication or awareness about the nature and purpose of these drills. This highlights a gap in the effective dissemination of information regarding disaster preparedness activities. Enhanced awareness campaigns that clearly define what cyclone preparedness drills entail and their importance could help convert this uncertainty into active participation. Additionally, 34% of respondents have not participated in any cyclone preparedness drills, posing a serious risk to their safety and the overall effectiveness of community preparedness efforts. Targeted outreach and engagement strategies are necessary to encourage greater participation among this group, addressing barriers such as time constraints, lack of awareness, or perceived irrelevance to ensure more inclusive and accessible drills. The participation in cyclone preparedness drills reveals a significant insight into community engagement.

Effective disaster preparedness requires regular and widespread community engagement in drills to ensure that individuals are well-prepared and confident in their response during actual events.

Figure 5.4

9. How would you rate the effectiveness of the communication from local governance regarding cyclone warnings and preparedness ?

50 responses

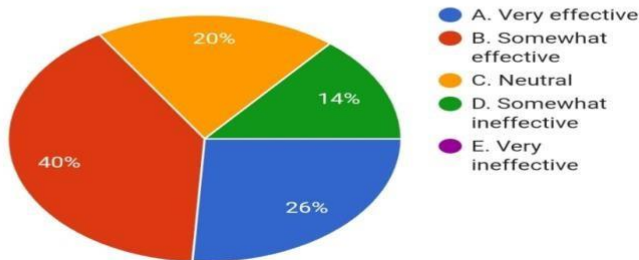


Figure 5.4

Effectiveness of Government Regarding Cyclone Warnings and Preparedness

The perceived effectiveness of government efforts in cyclone warnings and preparedness shows varied opinions among the community. Very Effective (26%) and Somewhat Effective (40%) responses combined account for 66% of respondents, indicating a generally positive perception of current

preparedness measures. This majority view suggests that many respondents believe existing strategies are functioning well to mitigate the impacts of cyclones. The positive feedback is a testament to the efforts made by local authorities, emergency services, and community organizations in preparing for cyclonic events. The perceived effectiveness likely stems from the successful implementation of early warning systems, efficient evacuation procedures, and public education campaigns.

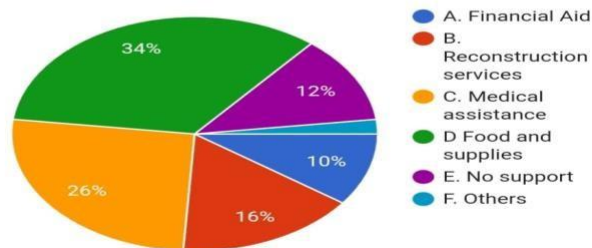
A significant portion of respondents, 20%, are neutral about the effectiveness of cyclone preparedness measures. This ambivalence might reflect a lack of direct experience with these measures or a perception that, while efforts are made, they may not be fully adequate or relevant. Addressing this neutrality requires targeted communication strategies to increase awareness and understanding of the specific actions taken and their benefits. Highlighting success stories and demonstrating the tangible impacts of preparedness measures can shift neutral perceptions to positive. On the other hand, Somewhat Ineffective (14%) indicates that a noticeable minority of respondents have concerns about the current preparedness measures. While no respondents rated the measures as very ineffective, the presence of somewhat ineffective ratings suggests areas for improvement. Understanding the specific reasons behind these ratings is crucial, as they might be due to perceived gaps in risk assessment, early warning systems, community awareness, or infrastructure management. Engaging with this group through surveys or focus groups can provide valuable insights into their concerns and suggestions for improvement, thereby enhancing public trust and confidence in government efforts, which is crucial for effective disaster management.

Public trust and confidence in government efforts are crucial for effective disaster management.

Figure 5.5

13. What kind of support did you receive from local governance for recovery after the last cyclone ?

50 responses



assistance followed closely at 26%, emphasizing the critical role of healthcare in disaster recovery. Reconstruction services, reported by 16%, highlight ongoing efforts to restore infrastructure. Financial aid was the least reported at 10%, suggesting potential gaps in financial support mechanisms. Concerningly, 12% received no support, highlighting challenges in ensuring comprehensive assistance. Overall, while immediate needs were largely addressed, enhancing financial aid and broadening support coverage are essential for more robust disaster recovery efforts.

The responses also reflect gaps in support effectiveness, with 12% reporting no assistance, indicating disparities in disaster response. Enhancing financial aid and broadening support coverage are essential for more robust disaster recovery efforts.

Effective disaster recovery requires a comprehensive approach that addresses all aspects of need—financial, medical, reconstruction, and basic supplies. Ensuring that aid reaches everyone is vital for equitable recovery.

Figure 5.5

Types of Support Received from Local Governance for Recovery After the Last Cyclone

The distribution of support from local governance post-cyclone reveals varying degrees of assistance received by respondents. Food and supplies were the most prevalent, with 34% reporting receipt, indicating a strong focus on immediate relief efforts. Medical

Figure 5.6

10. In the event of a cyclone, how quickly do local governance bodies respond?

50 responses

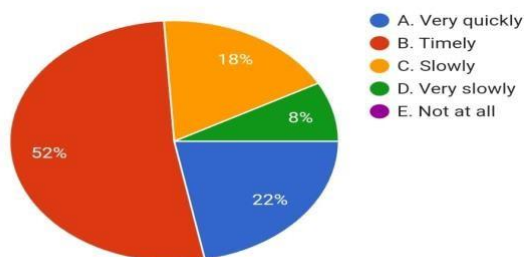


Figure 5.6

Response Time of Local Governance in the Event of a Crisis

Local governance bodies response speed during cyclones reveals that 52% of respondents perceive the response as timely, while 22% believe it is very quick, indicating a generally positive view of the efficiency and effectiveness of local governance in addressing cyclonic emergencies. However, 18% perceive the response as slow, and 8% as very slow,

highlighting areas for improvement. No respondents reported a complete lack of response, suggesting that some form of assistance is consistently provided. To enhance response speed, local governance should invest in advanced early warning systems for accurate and timely information dissemination, and conduct regular preparedness drills and training for authorities and emergency responders to ensure swift action during cyclonic events.

Fast and effective response times are crucial in reducing the immediate impacts of cyclones, such as injuries and fatalities, and ensuring timely aid distribution.

Figure 5.7

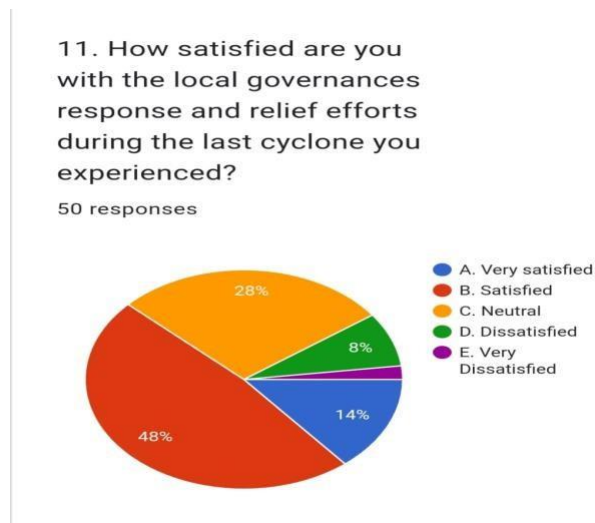


Figure 5.7

Satisfaction with Local Services During the Last Cyclone Emergency Response and Relief Efforts

The levels of satisfaction with local services during cyclone response and relief efforts are as follows:

The analysis of satisfaction levels with local services during the last cyclone response and relief efforts reveals that 48% of

respondents were satisfied and 14% were very satisfied, indicating a generally positive perception of local governance's efforts. However, 28% of respondents were neutral, and 8% were dissatisfied, highlighting areas where improvements are needed. No respondents were very dissatisfied, suggesting that while there are areas for enhancement, the overall response was adequate. To improve satisfaction levels, local governance should focus on increasing transparency in their response processes, ensuring that resources are efficiently distributed, and engaging with the community to better understand and address their needs and concerns during cyclonic events.

High satisfaction levels are essential for maintaining public trust in local governance and ensuring community cooperation during emergencies. Continuous feedback and improvement based on these satisfaction levels can help enhance the quality of services provided.

Figure 5.8

12. Post- cyclone, how effective is the local governance in rehabilitation and rebuilding efforts

50 responses

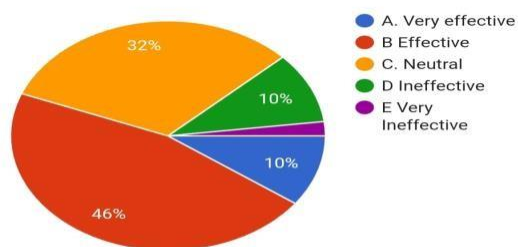


Figure 5.8 : Effectiveness of Local Governance in Post-Cyclone Rehabilitation and Rebuilding

The effectiveness of local governance in rehabilitation and rebuilding efforts post-cyclone shows a varied perception among respondents. While 56% rated these efforts as either very effective or effective, indicating a positive reception to the rebuilding initiatives, 32% remained neutral, suggesting uncertainty or mixed experiences with the outcomes. Another 10% found the efforts ineffective,

highlighting areas where improvements are needed to meet community expectations and ensure comprehensive recovery. These insights highlight the importance of continuous assessment and enhancement of post-disaster strategies to better support affected communities and improve overall disaster resilience.

Figure 5.9

14. Do you feel that the local community is adequately involved in cyclone management decisions ?

50 responses

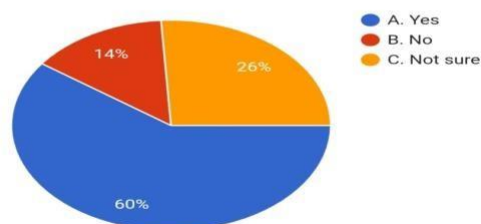


Figure 5.9

Community Involvement in Decision-Making Processes

community perceptions regarding involvement in decision-making processes related to cyclone management indicates that 60% of respondents believe that the local community is adequately involved, reflecting a positive engagement level. However, 26% are unsure, and 14% feel

that the community is not sufficiently involved. This suggests that while a majority perceive adequate involvement, there is a significant portion of the community that either lacks awareness or feels excluded from the decision-making processes. To address this, local governance should focus on increasing transparency and communication, actively seeking community input, and involving residents in planning and preparedness activities. Enhancing community involvement can lead to more effective disaster management by leveraging local knowledge and ensuring that the needs and concerns of all community members are addressed.

Community involvement in decision-making ensures that the needs and perspectives of the community are considered, leading to more effective and acceptable disaster management strategies. Enhancing community engagement can also empower residents and build resilience.

Figure 5.9.1

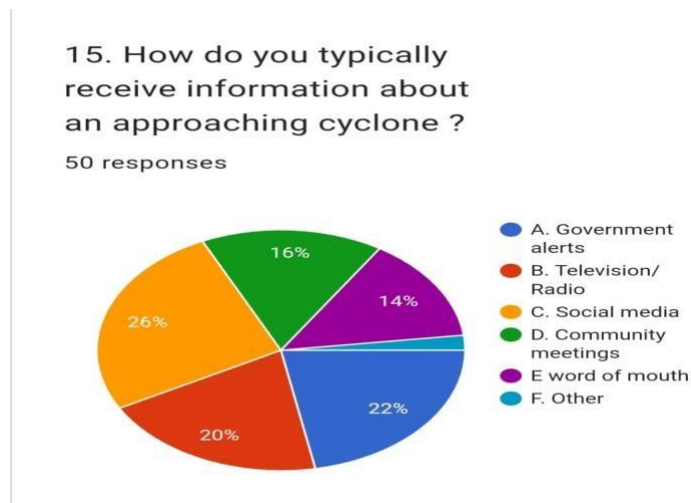


Figure 5.9.1

Sources of Information About Approaching Cyclones

The analysis of how people typically receive information about an approaching cyclone reveals a diverse set of communication channels. Social media is the most relied upon source, with 26% of respondents using it for updates,

followed closely by government alerts at 22% and television/radio at 20%. Community meetings account for 16%, while word of mouth is used by 14% of respondents. No respondents indicated relying on other methods. This diversity in information sources highlights the importance of utilizing a multi-channel communication strategy to enhance disaster preparedness. By ensuring critical information is disseminated through various platforms, local governance can reach a broader audience, thereby increasing the effectiveness of cyclone warnings and response efforts. This approach not only ensures that the message reaches different demographics but also reinforces the information, making it more likely to be acted upon.

Effective communication strategies should leverage multiple channels to ensure that information reaches all segments of the population, considering the diversity in how people access information.

Figure 5.9.2

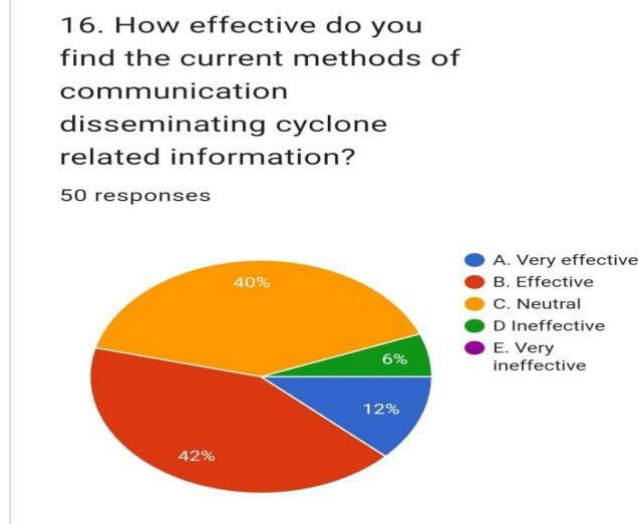


Figure 5.9.2

Effectiveness of Local Governance in Post-Cyclone Rehabilitation and Rebuilding

The evaluation of local governance efforts in rehabilitation and rebuilding following cyclones reveals a mixed perception among respondents. Approximately 54% of respondents view these efforts positively, categorizing them as either very effective (12%) or effective (42%). This indicates a significant portion of the community acknowledges the local authorities' proactive measures in addressing post-disaster challenges,

such as infrastructure damage and community displacement. These positive ratings likely reflect successful initiatives in restoring essential services and facilitating community recovery processes promptly.

However, a substantial 40% of respondents remain neutral regarding the effectiveness of these efforts. This neutrality suggests a lack of clarity or mixed experiences among residents regarding the outcomes of local governance actions post-cyclone. Such sentiments could stem from varying degrees of support received, inconsistencies in recovery timelines, or perceived gaps in communication regarding future rebuilding plans. Addressing these neutral perceptions is crucial to fostering greater community confidence and ensuring that local governance strategies meet the diverse needs arising from cyclonic events effectively. Efforts to engage with the community, solicit feedback, and transparently communicate progress can help bridge these perception gaps and strengthen disaster management strategies moving forward.

Figure 5.9.3

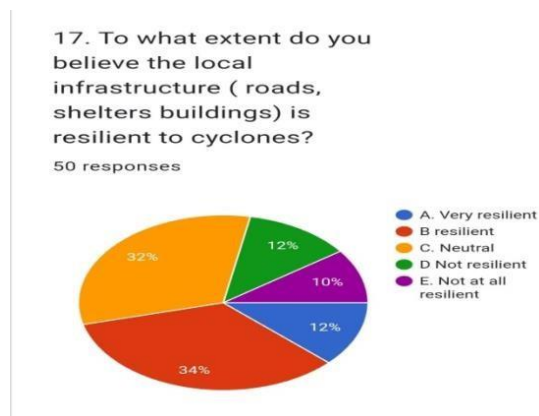


Figure 5.9.3

Resilience of Local Governance in Post-Cyclone Recovery

The evaluation of local governance's resilience in rehabilitation and rebuilding efforts post-cyclone presents a varied perspective among respondents. Approximately 46% of respondents view these efforts positively, categorizing them as either very resilient (12%) or resilient (34%). This suggests a significant acknowledgment of local authorities' capability

to bounce back from cyclonic impacts and effectively manage recovery initiatives. Positive ratings likely reflect successful initiatives in restoring infrastructure, providing essential services, and supporting community resilience-building activities.

A notable 32% of respondents remain neutral regarding the resilience of these efforts. This neutrality signals mixed perceptions or experiences among residents regarding the outcomes of local governance actions in the wake of cyclones. It may stem from varying degrees of impact felt across different communities, uncertainties in long-term recovery plans, or perceived gaps in communication about future resilience strategies. Addressing these neutral perceptions is crucial for enhancing community confidence and ensuring that local governance strategies effectively support comprehensive disaster management and sustainable recovery efforts. Engaging with stakeholders, fostering transparent communication, and adapting strategies based on community feedback can contribute to strengthening local resilience and preparedness in the face of future cyclonic events.

Figure 5.9.4

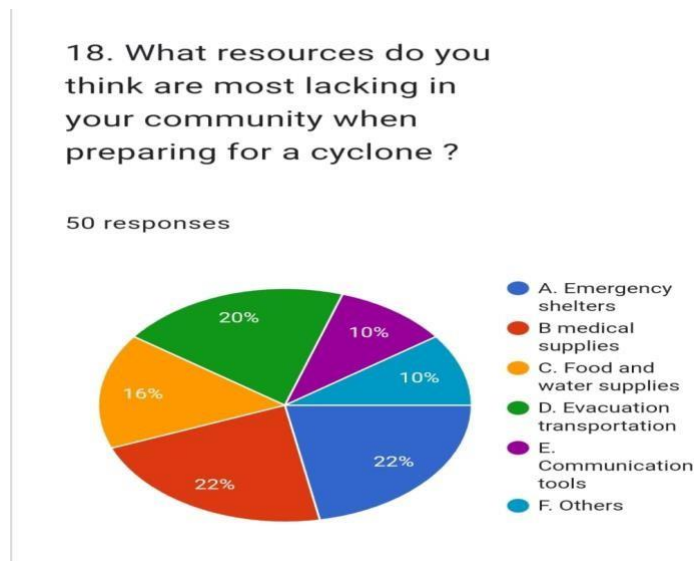


Figure 5.9.4

Resources Lacking for Cyclone Preparedness

Resource preparedness for cyclones indicates that 22% of respondents identified a lack of emergency shelters and medical supplies as the primary concerns, highlighting the need for more robust infrastructure and healthcare readiness. Additionally, 20% pointed to deficiencies in evacuation and transportation tools, which are critical for

ensuring swift and safe evacuations. Food and water supplies were a concern for 16% of respondents, emphasizing the necessity of ensuring these essentials are readily available. Communication tools were identified as lacking by 10% of respondents, highlighting the importance of effective information dissemination during disasters. Addressing these resource gaps is vital for improving disaster preparedness and response, ensuring communities are better equipped to handle the impacts of cyclones.

Identifying the resources most lacking for cyclone preparedness helps in prioritizing areas for improvement. Addressing these resource gaps is critical for enhancing overall preparedness and ensuring that communities can effectively respond to and recover from cyclones.

Figure 5.9.5

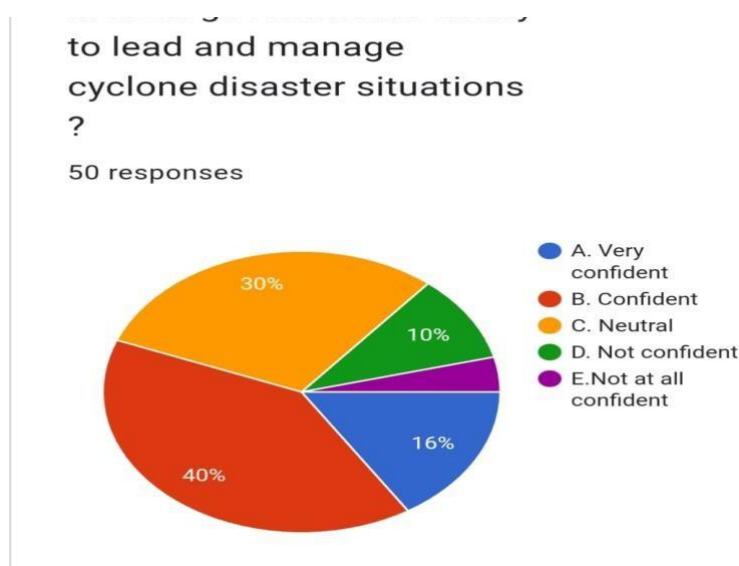


Figure 5.9.5

Local Government's Leadership in Cyclone Disaster Management

The effectiveness of local government leadership in cyclone disaster management is crucial for ensuring community safety and resilience. According to recent survey data, a majority of respondents (56%) expressed confidence in their local government's ability to lead and manage cyclone disasters effectively. This

confidence is reflected in the 16% who are very confident and 40% who are confident in their authorities' preparedness and response capabilities.

The survey also highlights areas for improvement, with 40% of respondents indicating either neutrality (30%) or lack of confidence (10%) in their local government's leadership in cyclone disaster management. This suggests a need for enhanced communication, transparency in disaster planning, and community engagement to address concerns and bolster public trust. By fostering a culture of preparedness, implementing robust disaster response protocols, and actively involving residents in disaster planning and decision-making processes, local governments can effectively mitigate risks and enhance resilience against cyclonic events.

Figure 5.9.6

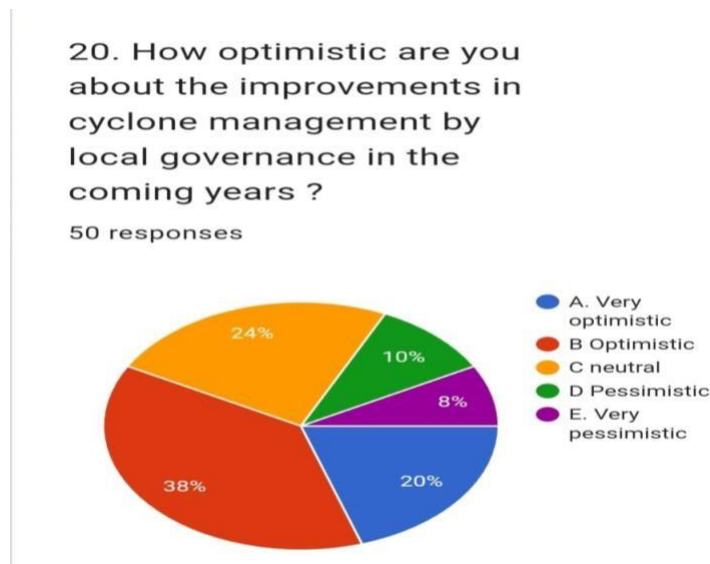


Figure 5.9.6

The breakdown of responses regarding optimism towards improvements in cyclone management by local governance reveals a mixed sentiment among respondents. A notable 58% expressed optimism, comprising 20% who are very optimistic and 38% who are optimistic about potential advancements in cyclone management strategies. This positivity reflects confidence in ongoing efforts and initiatives aimed at enhancing preparedness and response

capabilities.

18% of respondents indicated pessimism, with 10% expressing a pessimistic view and 8% being very pessimistic about future improvements. This segment highlights concerns or doubts regarding the effectiveness of current strategies or the ability of local governance to address evolving challenges associated with cyclones effectively.

Balancing these perspectives is crucial for comprehensive disaster management. Addressing the concerns of pessimistic respondents, fostering greater transparency in governance practices, and continuously refining disaster preparedness plans based on feedback and emerging threats can strengthen overall resilience. By leveraging optimistic outlooks and addressing pessimistic viewpoints constructively, local governments can foster a unified approach towards achieving robust cyclone management outcomes.

The analysis in this chapter reveals critical insights into cyclone preparedness and response in Puducherry. Gender disparities impact vulnerability, while diverse educational backgrounds influence engagement in preparedness activities. Positive perceptions of cyclone warnings

contrast with concerns over resource gaps and community involvement. Communication and inclusive strategies are essential to empower all residents and strengthen community resilience. Enhancing transparency and learning from community feedback will improve disaster response, ensuring Puducherry is better prepared for future cyclonic challenges and fostering a resilient community environment.

6. Conclusion and Suggestions

Effective governance and disaster management are foundational pillars for ensuring societal resilience and sustainable development in any nation. In India, these aspects are particularly critical given its diverse socio-economic landscape and susceptibility to natural disasters like cyclones. This paper explores two key areas: the importance of conducting timely local body elections for effective governance, and strategies for enhancing disaster management through local government empowerment and community participation.

Puducherry's scattered geographical layout, effective local governance is pivotal in enhancing disaster preparedness and response capabilities across its diverse district, encompassing the main town and surrounding enclaves. The dispersed settlements present logistical challenges during emergencies, necessitating coordinated efforts in evacuation planning, timely alert dissemination, and efficient relief operations. Timely elections for local bodies, as mandated by the Panchayati Raj Act, are crucial for fostering participatory democracy and ensuring effective governance at the grassroots level. However, delays in conducting these elections in Puducherry have highlighted governmental indecisiveness and non-compliance with constitutional mandates and court rulings. The prolonged vacancies in local offices over three years emphasize the urgent need to adhere to legal obligations, empowering local governance structures to better serve and protect communities in times of crisis.

The Panchayati Raj Institutions (PRIs) and urban local bodies play pivotal roles in decentralizing power and decision-making, thus bringing governance closer to the people. Their effective functioning depends on regular elections that enable representation, accountability, and responsiveness to local needs. To address the current challenges, it is crucial to amend existing acts, allocate sufficient resources, and enhance capacity-building efforts for PRIs. This can be achieved by integrating electoral reforms that streamline election processes and ensure timely conduct through constitutional amendments.

Disaster management in India requires a comprehensive approach that combines structural and non-structural measures to mitigate risks and enhance resilience. Structural measures involve the construction of cyclone-resistant infrastructure, such as shelters and robust drainage systems. Non-structural measures encompass early warning systems, community-based preparedness initiatives, and public awareness campaigns.

The National Cyclone Risk Mitigation Project (NCRMP), supported by the World Bank, exemplifies India's commitment to enhancing disaster preparedness through strategic investments in infrastructure and capacity-building initiatives. However, to ensure holistic disaster management, there is a pressing need to empower local governments as primary responders. Local bodies are uniquely positioned to understand local vulnerabilities, mobilize resources, and coordinate responses during emergencies.

The Sendai Framework advocates for decentralized disaster risk management, emphasizing the role of local governments in facilitating multi-sectoral collaboration and community

engagement. Strengthening local capacities through training programs, technological support, and financial resources enhances their ability to respond swiftly and effectively to disasters. Moreover, coordination among different levels of government and stakeholders ensures a unified approach to disaster preparedness and response.

As we have found, Local governments serve as the first responders during disasters, necessitating their integration into national and state-level disaster management frameworks. Their proximity to communities enables them to undertake effective risk assessment, vulnerability mapping, and community-based disaster preparedness activities. This grassroots involvement is crucial for developing localized strategies that align with cultural norms and socio-economic realities.

Despite their critical role, local governments often face challenges such as limited financial resources and insufficient capacity for disaster management. Addressing these issues requires legislative reforms that formally recognize PRIs as central to disaster relief and rehabilitation efforts. This entails amending the Disaster Management Act to include specific provisions for local governments' roles and responsibilities in disaster risk reduction (DRR).

The Kerala model serves as a successful example of how integrating DRR into local development planning can enhance community resilience. By embedding DRR principles into urban planning and infrastructure development, local governments can mitigate disaster risks and ensure sustainable development. Moreover, empowering Gram Sabhas and other local institutions to participate in decision-making processes enhances community ownership and resilience-building efforts. Community participation is integral to effective disaster management, as it ensures that interventions are context-specific and responsive to local needs. Public awareness campaigns, educational programs, and community-based early warning systems are essential for fostering a culture of preparedness and resilience. These initiatives empower communities to take proactive measures during emergencies and support local authorities in disaster response efforts.

Timely local body elections and effective disaster management are critical for promoting inclusive governance and resilience in India. The delay in conducting elections in Puducherry highlights systemic flaws that must be addressed through legislative reforms and enhanced administrative capacity. Integrating disaster management into local governance frameworks, as proposed by the Sendai Framework and the 15th Finance Commission, is essential for empowering PRIs and urban local bodies as key actors in disaster preparedness and response. To achieve this, legislative reforms should prioritize electoral reforms to ensure timely elections and streamline governance processes. Furthermore, integrating disaster management into the Panchayati Raj Act and urban planning frameworks enhances the resilience of communities and infrastructure against natural hazards. Allocating sufficient resources, providing technical support, and fostering community participation through awareness campaigns and capacity-building initiatives are crucial steps toward achieving these goals.

The data from these pie charts provides a comprehensive overview of the current state of cyclone preparedness and response within the surveyed community. Key areas for improvement include increasing community engagement in preparedness drills, enhancing the effectiveness and transparency of government efforts, ensuring equitable distribution of recovery support, and addressing gaps in critical resources such as food, medical supplies, and emergency shelters.

Increase Community Engagement: Implement regular and inclusive preparedness drills, with targeted efforts to engage all community members, including those with diverse educational backgrounds and gender identities.

Enhance Government Transparency and Effectiveness: Improve communication and transparency about government efforts, and actively seek feedback from the community to identify and address areas of inefficiency.

Improve Recovery Support Distribution: Ensure that recovery aid is equitably distributed and reaches all affected individuals, with particular focus on those who did not receive any support.

Strengthen Communication Strategies: Utilize a multi-channel communication approach, leveraging government alerts, traditional media, social media, and community networks to disseminate information effectively.

Address Resource Gaps: Prioritize the provision of essential resources such as food, medical supplies, emergency shelters, water supplies, and evacuation transportation tools to enhance preparedness and response capabilities.

By implementing these suggestions, local governance and disaster management authorities can markedly enhance cyclone preparedness, response, and recovery efforts, ultimately fostering more resilient and well-prepared communities. India has the opportunity to fortify its governance frameworks, bolster disaster resilience at the grassroots level, and promote sustainable development in the context of natural disasters and emergencies. Empowering local governments and communities is not merely a strategic necessity but also a moral imperative to safeguard lives.

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References

1. Encyclopedia of the Environment. (n.d.). Tropical cyclones: Development and organization. Retrieved April 20, 2024, from <https://www.encyclopedie-environnement.org/en/air-en/tropical-cyclones-development-and-organization/>
2. United Nations Office for Disaster Risk Reduction. (2009). Local governments and disaster risk reduction. Retrieved May 22, 2024, from https://www.unisdr.org/files/13627_LocalGovernmentsandDisasterRiskRedu.pdf
3. SpringerLink. (2023). Entry title. In Encyclopedia title (pp. 1-10). Retrieved May 6, 2024, from https://link.springer.com/referenceworkentry/10.1007/978-981-19-8388-7_70
4. International City/County Management Association. (2020). Strengthening local government public health emergency response. PM Magazine. Retrieved June 4, 2024, from <https://icma.org/articles/pm-magazine/strengthening-local-government-public-health-emergency-response>
5. Sarda, R., & Bahadure, S. (2023). Disaster vulnerability assessment: A case study of Puducherry. In Book title (pp. 1-15). Routledge. Retrieved June 12, 2024, from <https://www.taylorfrancis.com/chapters/edit/10.4324/9781003342090-47/disaster-vulnerability-assessment-case-study-puducherry-riddhi-sarda-sarika-bahadure>
6. LawBeat. (2023). Puducherry local body election: Urgency no ground to conduct elections unlawfully – Madras High Court. Retrieved June 18, 2024, from <https://lawbeat.in/top-stories/puducherry-local-body-election-urgency-no-ground-conduct-elections-unlawfully-madras>
7. LiveLaw. (2023). Puducherry local body elections: Supreme Court issues notice on plea challenging discontinuing reservations for backward classes & ST. Retrieved April 25, 2024, from <https://www.livelaw.in/top-stories/puducherry-local-body-elections-supreme-court-issues-notice-plea-challenging-discontinuing-reservations-backward-classes-st-200911>
8. ResearchGate. (2020). Community engagement for disaster preparedness: A systematic literature review. Retrieved April 28, 2024, from https://www.researchgate.net/publication/341273596_Community_engagement_for_disaster_preparedness_A_systematic_literature_review
9. National Center for Biotechnology Information. (2013). Article title. Journal title, volume(issue), page range. Retrieved May 24, 2024, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3780560/>
10. CASA India. (2024). Importance of engaging community during disaster risk management with NGOs. Retrieved April 20, 2024, from <https://www.casa-india.org/blog/importance-of-engaging-community-during-disaster-risk-management-with-ngos/>
11. India Today. (2011). Cyclone Thane hits Puducherry, Tamil Nadu. Retrieved April 20, 2024, from <https://www.indiatoday.in/india/photo/cyclone-thane-hits-puducherry-tamil-nadu-366974-2011-12-30>
12. Scholars Research Library. (2023). A study of Thane cyclone and its impacts in Tamil Nadu, India using geographic information system. Retrieved April 20, 2024, from <https://www.scholarsresearchlibrary.com/articles/a-study-of-thane-cyclone-and-its-impacts-in-tamil-nadu-india-using-geographic-information-system.pdf>

13. Government of Puducherry. (2019). Disaster management report. Retrieved April 20, 2024, from <https://www.py.gov.in/sites/default/files/drdm01102019mro.pdf>
14. Government of Puducherry. (2019). Cyclone advisories – NDMA. Retrieved April 20, 2024, from <https://police.py.gov.in/Cyclone%20advisories-NDMA.pdf>
15. Government of Puducherry. (2023). Disaster management. Retrieved April 20, 2024, from <https://puducherry-dt.gov.in/disaster-management/>
16. Government of Tripura. (2024). Ministry of Home Affairs report. Retrieved April 20, 2024, from https://panchayat.tripura.gov.in/sites/default/files/Ministry%2520of%2520Home%2520Affairs_1602054029249.pdf
17. United Nations Office for Disaster Risk Reduction. (2023). Japan: Voluntary national report of the MTR SF | Midterm review of the Sendai Framework. Retrieved April 20, 2024, from <https://www.undrr.org/publication/japan-voluntary-national-report-mtr-sf-midterm-review-sendai-framework>
18. Government of Puducherry. (2023). District disaster plan. Retrieved April 20, 2024, from <https://puducherry-dt.gov.in/district-disaster-plan/>
19. Official Gazette of the Republic of the Philippines. (2024). Official government publications. Retrieved April 20, 2024, from www.officialgazette.gov.ph
20. ALNAP. (2023). Impact evaluation of the community-based disaster preparedness project in Cox's Bazar. Retrieved April 20, 2024, from <https://library.alnap.org/help-library/impact-evaluation-of-the-community-based-disaster-preparedness-project-in-coxs-bazar>
21. MDPI. (2024). Article title. Infrastructure, 7(5), 67. Retrieved April 20, 2024, from <https://www.mdpi.com/2412-3811/7/5/67>
22. Government of Puducherry. (2023). Puducherry green budget report 2023. Retrieved May 6, 2024, from https://beams.py.gov.in/html/Puducherry%20Green%20Budget%20Report_2023.pdf
23. Assam State Disaster Management Authority. (2023). Community-based disaster preparedness: Peripheral level. Retrieved June 4, 2024, from <https://asdma.gov.in/download/modules/Community%20Based%20Disaster%20Preparedness-Peripheral%20Level.pdf>
24. Government of Puducherry. (2024). Latest news. Retrieved June 12, 2024, from https://revenue.py.gov.in/latest_news.htm
25. The Hindu. (2024). Union territory to hold drill on cyclone preparedness on Feb 15. Retrieved June 18, 2024, from <https://www.thehindu.com/news/cities/puducherry/union-territory-to-hold-drill-on-cyclone-preparedness-on-feb-15/article67835453.ece>
26. The Hindu. (2022). Cyclone Mandous: Puducherry gears up, two disaster relief teams on standby. Retrieved April 25, 2024, from <https://www.thehindu.com/news/cities/puducherry/cyclone-mandous-puducherry-gears-up-two-disaster-relief-teams-on-standby/article66242257.ece>
27. ResearchGate. (2023). The impact of volunteerism on community resilience in disaster management. Retrieved April 28, 2024, from https://www.researchgate.net/publication/375096313_The_Impact_of_Volunteerism_on_Community_Resilience_in_Disaster_Management

28. ResearchGate. (2013). Coastal vulnerability of Puducherry coast, India using analytical hierarchical process. Retrieved May 24, 2024, from https://www.researchgate.net/publication/258806003_Coastal_vulnerability_of_Puducherry_coast_India_using_analytical_hierarchical_process
29. ResearchGate. (2013). Coastal vulnerability of Puducherry coast, India using analytical hierarchical process. Retrieved April 20, 2024, from https://www.researchgate.net/publication/258806003_Coastal_vulnerability_of_Puducherry_coast_India_using_analytical_hierarchical_process
30. Observer Research Foundation. (2023). Following the Odisha example for developing community-based disaster management in India. Retrieved April 20, 2024, from <https://www.orfonline.org/expert-speak/following-the-odisha-example-for-developing-community-based-disaster-management-in-india>
31. National Institute of Disaster Management. (2021). Training report. Retrieved April 20, 2024, from https://nidm.gov.in/pdf/trgReports/2021/May/Report_26May2021sc.pdf
32. Government of Puducherry. (2007). GO. (MS). NO.35/LAS/2007 dated 2nd July 2007.
33. Government of Puducherry. (2013). G.O. (MS). No. 9/LAS/A4/2013, dated 22nd May 2013.
34. Raj, J. V. (2010). Local government in Puducherry: A starter. HOPE.
35. Perumal, V. (2011). W.P. No. 17721 of 2011 filed by Mr. V. Perumal.
36. National Disaster Management Authority. (2024). Cyclone. Retrieved April 20, 2024, from <https://ndma.gov.in/Natural-Hazards/Cyclone>