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Vulnerability Assessment of Coastal Barangays in the Municipality of Lebak: Basis for a Policy Framework

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ABSTRACT

Sultan Kudarat, as a basis for developing a policy framework. The study evaluated the levels of exposure, sensitivity, and adaptive capacity of coastal barangays to hazards including coastal flooding, storm surges, and coastal erosion. A mixed-methods approach was employed, integrating survey data through key informant interviews, group discussions, and the review of relevant secondary sources among 300 households across six coastal barangays. The findings revealed high levels of vulnerability driven by fragile housing conditions, limited livelihood diversification, and inadequate disaster preparedness systems. Coastal flooding emerged as the most significant hazard, with substantial impacts on livelihoods, shelter, and public health. Adaptive capacity was found to be low to moderate due to limited access to protective infrastructure and weak institutional coordination. The findings provide a basis for evidence-based policy formulation to improve resilience in coastal communities.

Keywords: *Coastal vulnerability; Flooding; Storm surges; Coastal erosion; Policy Recommendations*

INTRODUCTION

Coastal communities worldwide are becoming increasingly vulnerable to climate change, rising sea levels, severe weather events, and human-driven environmental degradation. According to the Intergovernmental Panel on Climate Change (IPCC, 2021), global warming intensifies coastal hazards such as storm surges, flooding, and coastal erosion, posing significant risks to ecosystems, infrastructure, and livelihoods. These impacts are more pronounced in countries such as the Philippines, where socio-economic constraints limit adaptive capacity.

The 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs) include SDG 13 – Climate Action, which reduces disaster risks as a crucial part of building climate resilience, and supports SDG 11 – Sustainable Cities & Communities, which focuses on sustainable development, making its community resilient to disasters and to the impacts of climate change. In line with the Sendai Framework for Disaster Risk Reduction 2015-2030, these global commitments call on local governments, barangay officials, and communities to take proactive steps in reducing vulnerabilities and strengthening their ability to adapt to climate-related hazards (UNDRR, 2023). In the Municipality of Lebak, where coastal barangays are increasingly susceptible to environmental risks, conducting a vulnerability assessment is more important in identifying critical areas of concern and formulating policy recommendations. This study supports local disaster preparedness, sustainable coastal management, and community resilience, ensuring that residents are better equipped to face challenges while working towards a safer and more sustainable future.

According to the Intergovernmental Panel on Climate Change (IPCC, 2023), sea levels are climbing at about 3.3 mm a year, worsening problems like coastal erosion and flooding. Research by Nocholls and Cazenave (2022) emphasizes that low-lying coastal communities are particularly vulnerable, with more than 600 million people living in spots at risk of being permanently submerged. To address these issues, countries like the United States, Indonesia, and Bangladesh have adopted Coastal Vulnerability

Assessment (CVA) to better understand environmental risks, social factors, and community resiliency. However, for these efforts to really work, they need to be supported by solid evidence-based policies at the local level – ensuring that the coastal communities are not only aware of the risks but also equipped with the tools and strategies to adapt.

As an archipelago, the Global Climate Risk Index 2023 stated that the Philippines is among the countries susceptible to the impacts of climate change. Coastal communities frequently face typhoons, flooding, and storm surges, making daily life increasingly uncertain. In their 2023 study, Dr Gideon Lasco and his colleagues – Vincern Gregory Yu, Julie Madelo Compra, Phetdavanh Leuangvilay, et al – highlighted how the rise in extreme weather events is exacerbating vulnerabilities in coastal communities, particularly concerning food security, sustainable livelihood, and disaster preparedness.

To address these challenges, the Philippine government has put key policies in place, such as the Climate Change Act of 2009 (RA 9729) and the Disaster Risk Reduction and Management Act (RA10121), both aimed at strengthening resilience in high-risk areas. However, the true impact of these laws depends on how effectively they are implemented at the local level – where real change can make the biggest difference in protecting lives and livelihoods.

A clear example of coastal vulnerability unfolded during Typhoon Egay (Doksuri) in July 2023, when severe flooding devastated coastal provinces, disrupting the lives of countless fisherfolk, and forcing families to evacuate in Northern Luzon, and Western Visayas. The disaster exposed critical gaps in early warning systems, evacuation plans, and long-term adaptation strategies – highlighting the urgent need for stronger, more localized solutions.

A recent reminder of coastal vulnerability came in December 2023, when heavy rains triggered a storm surge and flooding in coastal communities across Sultan Kudarat. Homes were damaged, families were displaced, and livelihoods were disrupted, leaving communities to recover. This event underscored the urgent need for updated risk assessments and policy interventions that truly address the specific challenges these communities face.

While global and national efforts aim to reduce coastal vulnerability, there is still a gap when it comes to localized assessments for Lebak's Coastal barangays. Existing policies may not fully capture the site-specific risks and socio-economic realities of these communities. To build stronger disaster preparedness and long-term resilience, a more evidence-based approach is needed – one that prioritizes the unique needs of those living on the frontlines of climate change.

This study draws inspiration from the work of Md. Enamul Huq, A. Z. M. Shoeb, Mallik Akram Hossain, Shah Fahad, and colleagues (2020), whose theory highlights the complex and layered nature of vulnerability in coastal communities. At its core, the framework investigates key factors—referred to as input variables—that help paint a clear picture of how vulnerable a coastal barangay might be. These factors, in turn, guide the development of practical and meaningful policy recommendations.

The input variables are the Sensitivity Factor, which is made up of three major components: Demographic, Socio-economic Profiles, and Vulnerability Assessment. The demographic side considers details like age, gender, disability, marital status, pregnancy, solo parenthood and more—elements that directly affect how individuals or households experience and cope with coastal hazards. Meanwhile, the socio-economic vulnerabilities look at the strength and type of housing, the household size and the primary source of livelihood which can be affected depending on level of their exposure to environmental risks, and how well they can adapt to changes while Vulnerability Assessment using Risk Perception Theory of Paul Slovic (1987) explains that individuals assess risks based on their experiences, knowledge, and understanding of hazards. Used to assess the overall risk faced by a coastal area. This assessment is measured through three key indicators: how likely a hazard is to occur, how strongly it might affect people and communities, and how well those communities can adapt.

Based on this assessment, as an output of a Policy Analysis that responds directly to the identified needs and risks. These include strategies for better disaster risk management by having a disaster risk reduction strategy, initiatives to protect coastlines through Coastal Protection and Infrastructure Development and may improve infrastructure, and programs designed to support the social and economic well-being of the community by having all Socioeconomic Support Programs—all with the objective of creating safer, more resilient coastal barangays.

MATERIALS AND METHODS

This section outlined the target participants, materials and instruments, research design, and procedures.

Study Area and Participants. The study was conducted in the six coastal barangays of the Municipality of Lebak—Salaman, Taguisa, Tibpuan, Datu Karon, Kinudalan, and Tran—with a total of 1,350 households. Using the Qualtrics Sample Size Calculator at a 95% confidence level and 5% margin of error, 300 households were randomly selected as respondents. Data collected included age, gender, household size, primary livelihood, disability status, pregnancy status, presence of children and elderly, housing characteristics, and years of residency. The selected barangays were chosen due to their dependence on marine resources and their frequent exposure to coastal flooding, storm surges, and erosion, making them highly vulnerable to climate-related hazards.

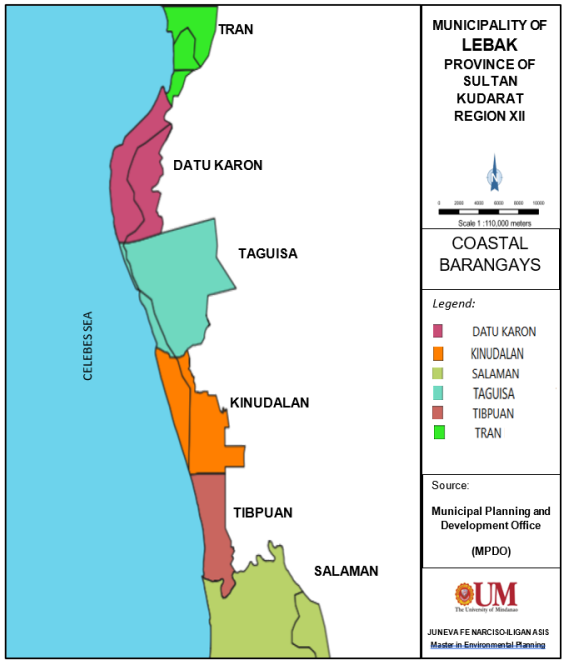

Figure 2. Coastal Barangays Map of the Municipality of Lebak, Sultan Kudarat

Materials and Instruments. The study utilized a modified Community-Based Monitoring System (CBMS) survey to collect demographic and vulnerability data. Key informant interviews with local officials and fisherfolk, together with focus group discussions (FGDs), validated survey findings and provided insights on housing conditions, coastal defenses, evacuation routes, and environmental hazards. A Global Positioning System (GPS) device was used to obtain geographic coordinates, while a camera documented interviews, FGDs, and community conditions. The study also adopted the risk assessment scale of Haimes (2009) to assess hazard likelihood and impacts, classifying vulnerability levels as low, moderate, or high based on exposure, sensitivity, and adaptive capacity.

The likelihood of hazards occurring was measured using the following
scale:
1.00-1.80–Very Low (unlikely to happen)
1.81-2.60–Low (Possible but not expected)
2.61-3.40–Moderate (May occur occasionally)
3.41-4.20–High (Expected to)
4.21-5.00–Very High (Very likely to happen)

Sensitivity to impact was measured using the following scale:
1.00-1.80–Very Low (Well-prepared)
1.81-2.60–Low (Some impact, but manageable)
2.61-3.40–Moderate (Noticeable impact)
3.41-4.20–High (Severe impact)
4.21-5.00–Very High (Extremely vulnerable)

Adaptive capacity was measured using the following scale:
4.21-5.00–Very High (Fully equipped)
3.41-4.20–High (Strong ability to respond)
2.61-3.40–Moderate (Good resources)
1.81-2.60–Low (Some preparedness)
1.00-1.80–Very Low (Struggled)

This approach was adapted from the work of Jocson and Magallon (2018) and was informed by the experiences of long-term coastal residents. By using this scale, the study was able to provide an accurate and practical understanding of the risks faced by these communities. The findings were intended to formulate policy recommendations that could strengthen disaster preparedness and resilience in coastal areas.

Design and Procedure. This study followed a descriptive-quantitative study design, integrating survey-based vulnerability assessment and statistical analysis to examine the issues encountered by the coastal communities in Lebak. It examined the demographic, socio-economic, and environmental factors that influenced their vulnerability to climate-related disturbances.

By measuring exposure, sensitivity, and adaptive capacity, the study provided a clear picture of the risks these communities faced. The findings served as the foundation for policy recommendations aimed at improving resilience and disaster preparedness.

Data Gathering Procedure. Ethical approval was secured from the University of Mindanao Ethics and Review Committee (UMERC) and the Local Government Unit prior to data collection. Ethical approval was secured in compliance with the guidelines established by the Research Ethics Committee (REC) to guarantee that the procedures were carried out responsibly and with respect for participants' rights. The researcher obtained written consent from the Local Government Unit (LGU) and the Barangay Local Government Units (BLGUs). Approval from individual participants was obtained during the interview, and some was obtained during the FGDs conducted alongside the administration of modified questionnaires.

Survey Distribution. Survey questionnaires were personally distributed to selected households in the target barangays. Using the survey, the researcher gathered numerical data on demographics, environmental risks, socio-economic conditions, and the community's adaptive capacity. Interviews were conducted with local officials, fisherfolk, and disaster response officers to gain deeper insights into housing conditions, infrastructure, and natural coastal defenses. FGDs with community members were conducted to cross-check survey results and provide a broader understanding of local experiences.

Survey Collection. All completed survey questionnaires were retrieved on the same day they were administered to maintain data accuracy and avoid delays. Participants were informed that all information they provided would be treated with strict confidentiality and anonymity, fostering trust and openness in their answers.

Ethical Considerations. The study obtained approval from the University of Mindanao Ethics Review Committee (UMERC) and adhered to established ethical protocols. Informed consent was secured from the Municipal Mayor, the Sangguniang Bayan, the Barangay Local Government Units (BLGUs), and all participants after explaining the study's objectives. Participant anonymity and confidentiality were maintained, and all data were used solely for research purposes. The researcher upheld research integrity by avoiding fabrication, falsification, plagiarism, and data misrepresentation, while ensuring clear communication throughout the study. The research also complied with Republic Act No. 10173, or the Data Privacy Act of 2012, to protect participants' personal information.

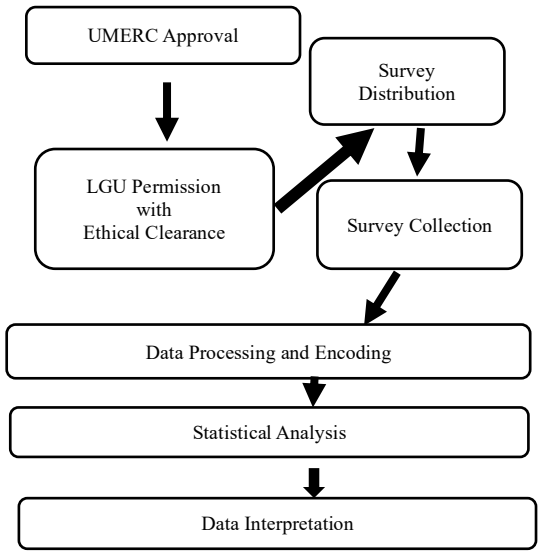

Figure 3. Procedure for conducting the study

Data Processing. The collected data were carefully organized by the researcher and analyzed and interpreted by the statistician to extract meaningful patterns related to coastal vulnerability. Thematic analysis was applied to categorize and interpret interview and FGD responses, identifying patterns in participants' experiences, challenges, and adaptive strategies to coastal hazards.

RESULT AND DISCUSSION

1. Demographic Profile of Coastal Barangays.

The coastal barangays are long-established communities where most residents have lived for more than three years, reflecting a strong sense of place. The population is relatively young, dominated by adults in their 30s and 40s, with many younger residents contributing to the local workforce. Most households are family-oriented, with women slightly outnumbering men and the majority of residents being married.

Most residents have completed secondary education, while only a small proportion attained tertiary education. Fishing is the primary source of livelihood, supplemented by small-scale businesses, labor, and service-related work, whereas farming contributes minimally to household income.

Most respondents were aged 40–49 years (34.67%), followed by those aged 30–39 and 50–59 years (22.67% each). Smaller proportions belonged to the 60–69 years (12.33%), 20–29 years (4.67%), and 70 years and above (3.00%) age groups. This supports Camarda et al. (2017), who identified middle-aged

adults as having the physical capacity, skills, and experience needed for economic productivity.

Table 1. Age Group Distribution of Respondents

Age Group (Years)	Frequency (f)	Percentage (%)
20–29	14	5
30–39	68	23
40–49	104	35
50–59	68	23
60–69	37	12
70 years and above	9	3
Total	**300**	**100**

Table 2. Distribution of Respondents by Disability Status

Disability Category	f	%
Mental/Intellectual Disability	11	4
Hearing Disability	9	3
Psychosocial Disability	2	1
Visual Disability	9	3
Speech Impairment	4	1
Disability due to Chronic Illness	5	2
Orthopedic (Musculoskeletal) Disability	12	4
Multiple Disabilities	0	0
Learning Disability	6	2
No Disability (N/A)	242	81
Total	**300**	**100**

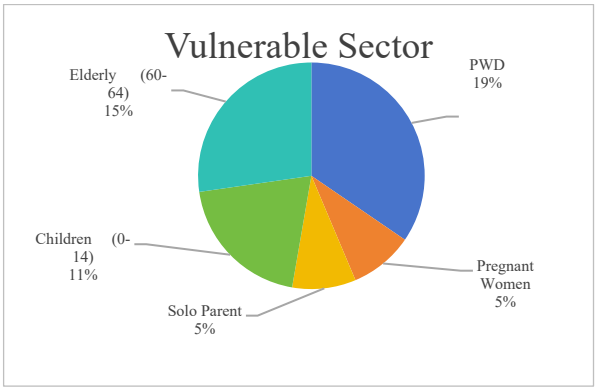

Figure 4. Distribution of Vulnerable Sector

However, vulnerable sectors remain significant. Persons with disabilities (19%) constitute the largest vulnerable group, followed by the elderly (15%), children (11%), and pregnant women (5%). This highlights that socio-economic vulnerability is shaped more by dependency, health conditions, and limited adaptive capacity rather than income alone, reinforcing the need for inclusive disaster risk reduction strategies.

Table 3. Distribution of Respondents by Sex

Sex	Frequency (f)	Percentage (%)
Male	225	75
Female	75	25
Total	**300**	**100**

The findings indicate that male respondents with 75% of the target respondents constituted most of the study population. This distribution may be attributed to the demographic composition of the coastal communities, where male respondents are commonly dependent on fishing, farming, and other occupations directly associated with coastal and environmental resources. Women are engaged in post-harvest activities and household roles, consistent with Harper et al. (2020). Migration among women due to employment and marriage aligns with Quisumbing & McNiven (2006). These patterns highlight the need to strengthen women's inclusion in DRRM, climate adaptation, and livelihood programs.

Table 4. Distribution of Respondents by Educational Attainment

Educational Attainment	Frequency (f)	Percentage (%)
Primary	137	45.67
Secondary	156	52
Tertiary	7	2.33
Total	**300**	**100**

The results show that most respondents had attained secondary education, accounting for 156 respondents (52.00%). This was followed by respondents who completed primary education, comprising 137 respondents (45.67%). Meanwhile, only 7 respondents (2.33%) had attained tertiary education. Wisner et al. (2004) emphasize that lower education levels increase disaster vulnerability by restricting preparedness and adaptive capacity.

Table 5. Distribution of Respondents by Civil Status

Civil Status	Frequency (f)	Percentage (%)
Single	10	3.33
Married	242	80.67
Widowed	34	11.33
Divorced/Separated	1	0.33
Common-law/Live-in	13	4.33
Total	**300**	**100**

The findings reveal that most respondents were married, accounting for 242 respondents (80.67%). This was followed by widowed respondents with 34 respondents (11.33%), while 13 respondents (4.33%) reported being in a common-law or live-in relationship. A smaller proportion of respondents were single, comprising 10 respondents (3.33%), whereas only 1 respondent (0.33%) was classified as divorced or separated. While this supports social cohesion, it also increases vulnerability since fishing-related disruptions directly affect household income and food security (FAO, 2015; Allison & Ellis, 2001).

Single and separated individuals remain a small proportion but may face greater social isolation during disasters (Cutter et al., 2003).

Table 6. Distribution of Respondents by Livelihood

Livelihood	Frequency (f)	Percentage (%)
Small and Medium Enterprise (SME)	51	17
Fishing	228	76
Farming	18	6
Service Labor	3	1
Total	**300**	**100**

Livelihood data show that 76% depend on fishing, making the local economy highly climate-sensitive. Limited diversification increases exposure to environmental shocks such as storms and declining fish stocks (Allison et al., 2009).

Table 7. Length of Residence

Years the Household Has Been Living in the Barangay	Frequency (f)	Percentage (%)
3 years and above	294	98
Not more than 3 years	6	2
Total	**300**	**100**

Lastly, 98% of residents are long-term settlers, reflecting strong place attachment and community cohesion. However, Adger et al. (2005) note that this rootedness may limit willingness to relocate from high-risk areas, posing challenges for long-term adaptation planning.

1. Socio-Economic Vulnerability

The coastal barangays of Lebak are resilient communities whose livelihoods depend largely on the sea. However, light-material housing, heavy reliance on fishing, and limited livelihood diversification increase their vulnerability to coastal hazards and climate-related risks. Survey findings from Tran, Salaman, Kinudalan, Datu Karon, Taguisa, and Tibpuan underscore the need for context-specific policies that strengthen community resilience, improve housing, and diversify livelihoods.

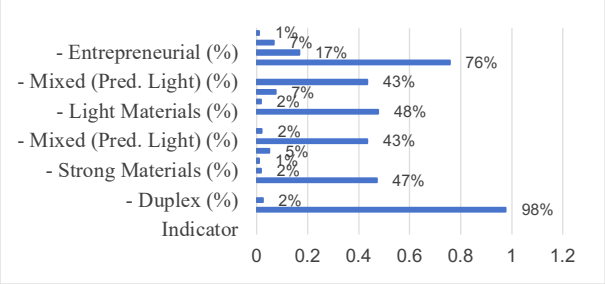

Figure 5. Socio-economic Vulnerability Indicators

The findings indicate that the coastal barangays are socio-economically vulnerable due to the prevalence of light-material housing and heavy reliance on climate-sensitive livelihoods. These conditions increase household exposure to coastal hazards, highlighting the need for resilient housing and livelihood diversification programs. This supports Wisner et al. (2004), who identified poor housing materials as a key indicator of structural vulnerability, often resulting in greater damage and displacement during disasters.

Table 8. Summary of Exposure Level by Socio-Economic Indicator

Socio-Economic Indicator	Exposure to Environmental Hazards	Key Risks
Light Housing Materials	High	Wind damage, roof collapse, flooding, loss of shelter
Fishing as Primary Livelihood	High	Weather dependency, declining catch, marine ecosystem degradation
Limited Income Diversity	High	Economic instability during environmental shocks
Place Attachment	Moderate to High	Resistance to relocation, limited adaptation willingness

The table indicates that coastal households are highly exposed to environmental hazards due to lightweight housing, dependence on fishing, limited income sources, and strong place attachment. These conditions increase vulnerability to severe weather, environmental change, and livelihood disruption, highlighting the need for resilient housing, livelihood diversification, and community-based climate adaptation strategies.

2. Vulnerability Assessment

The study assessed community vulnerability to five coastal and climate-related hazards using three parameters: likelihood of occurrence, sensitivity to impact, and capacity to adapt. Statistical measures (mean and standard deviation) were combined with field observations and relevant literature to interpret hazard occurrence, vulnerability levels, and community resilience.

Table 9. Interpretation Scale

Mean Range	Likelihood of Occurrence
4.21 – 5.00	Very High
3.41 – 4.20	High
2.61 – 3.40	Moderate
1.81 – 2.60	Low
1.00 – 1.80	Very Low

Table 10. Vulnerability assessment in terms of Perceived Likelihood of Occurrence

Type	SD	Mean	Occurrence
Coastal Flooding	0.87	3.98	High
Earthquake	0.1	1.01	Very low
Tsunami	0	1	Very low
Storm Surge	0.77	3.33	Moderate
Tropical Cyclone	1.39	2.35	Low

Table 10 presents respondents' perceptions of the likelihood of coastal hazards in the Municipality of Lebak. Coastal flooding was rated as the most likely hazard (M = 3.98, SD = 0.87; High), reflecting its frequent occurrence and significant impacts on livelihoods, housing, and public health, consistent with Nicholls et al. (2018). Storm surge was rated Moderate (M = 3.33, SD = 0.77), indicating it is recognized as a recurring but less frequent threat, supported by Alongi (2015) on the protective role of coastal ecosystems.

Tropical cyclone received a Low rating (M = 2.35, SD = 1.39), while earthquake (M = 1.01, SD = 0.10) and tsunami (M = 1.00, SD = 0.00) were both rated Very Low, indicating they are not perceived as immediate threats. Overall, coastal flooding emerged as the primary hazard, emphasizing the need to strengthen flood control, coastal protection, and community preparedness to enhance resilience.

Table 11. Vulnerability assessment in terms of Sensitivity to Impact

Type	SD	Mean	Descriptive Level
Settlement	0.94	3.94	High
Environment	0.73	3.53	High
Economic	0.88	3.6	High
Education	1.02	3.61	High
Health	0.91	3.49	High

The findings show high vulnerability across settlement, environment, economic, education, and health dimensions, indicating that respondents perceive their communities as highly exposed to multiple hazards. This supports previous studies (UN-Habitat, 2014; IPCC, 2022; Allison et al., 2009; Shaw et al., 2011; WHO, 2015), which emphasize that vulnerability is multidimensional. The results underscore the need for integrated interventions to strengthen community resilience and reduce disaster risks.

The results show varying levels of adaptive capacity, suggesting that while some measures are perceived to provide protection against hazards, others remain limited or insufficient.

Table 12. Vulnerability Assessment in terms of Capacity to Adapt

Type	SD	Mean	Descriptive Level
Mangrove Forest	1.05	3.31	Moderate
Sea Breaker	1.06	1.54	Very Low
T Break	0.87	1.53	Very Low
Seawall	1.13	1.88	Low
Sand Bagging	1.4	2.63	Moderate

The barangays have low to moderate adaptive capacity, with limited access to protective infrastructure and only partially functional natural defenses (e.g., mangroves). According to Guannel et al. (2016) and Alongi (2008), intact mangroves significantly reduce storm surges and erosion—but degradation and weak policy enforcement reduce their function.

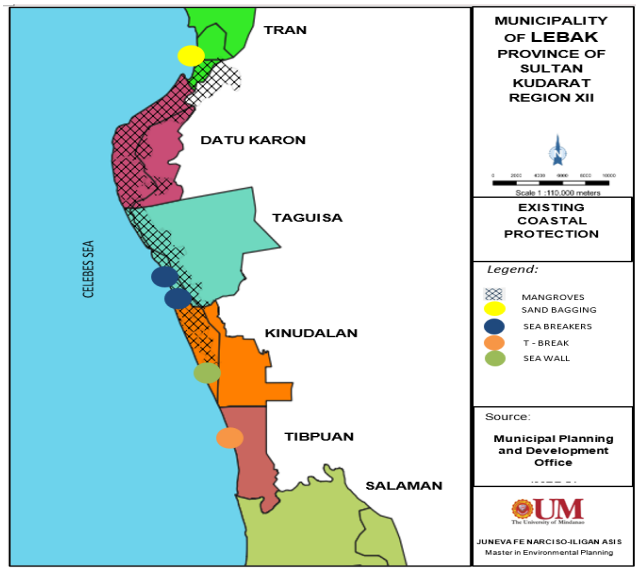

Figure 6. Location of Existing Coastal Protection Map of Lebak, Sultan Kudarat

The map above illustrates the coastal protection measures and natural ecosystems present along the shoreline of the Municipality of Lebak, Sultan Kudarat. It highlights the distribution of sandbagging, sea breakers, T-breaks, and seawalls across key barangays like Datu Karon, Taguisa, Kinudalan, Tibpuan, and Salaman. Areas with significant mangrove cover were also illustrated, emphasizing their role in coastal resilience. These interventions aim to mitigate coastal erosion, protect communities from storm surges, and preserve marine biodiversity. The strategic placement of structures and mangroves reflects the municipality's integrated approach to coastal management, balancing engineered solutions with nature-based defenses.

Strengthening the resilience of the coastal barangays in the Municipality of Lebak begins with understanding community risks and vulnerabilities. The LGU should strengthen community-based DRRM through sustained Information, Education, and Communication (IEC) campaigns and use vulnerability assessment results to guide land-use planning, enforce No-Build Zones, and promote climate-resilient housing.

3. Policy Frameworks

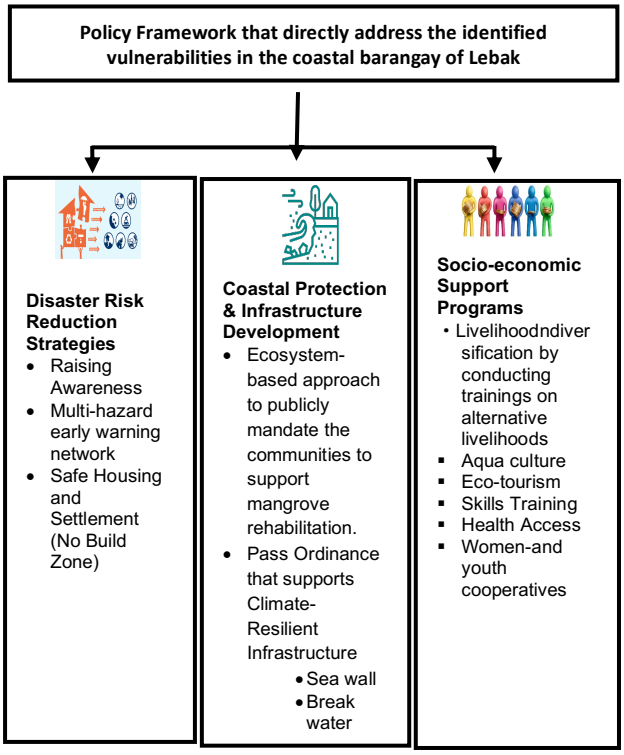

Figure 7. Policy Framework for Climate and Disaster Resilience in Coastal Barangays of the Municipality of Lebak

The Sangguniang Bayan should enact ordinances supporting housing resilience and institutionalizing mangrove protection to reduce coastal hazards and protect fisheries. The LGU should also promote livelihood diversification, particularly for women and youth, strengthen community participation in DRRM, and modernize multi-hazard early warning systems.

These recommendations support the proposed Three-Year Action Plan (2026–2028), focusing on resilient infrastructure, sustainable livelihoods, ecosystem protection, and effective governance to reduce vulnerability and build safer, climate-resilient coastal communities.

Table 13. Three-Year Action Plan C.Y. 2026–2028

Year	Focus Area	Activity	Estimated Cost	Funding Source	Expected Output	Aligned Issues Addressed
2026	Risk Awareness & Community Profiling	Conduct community-wide IEC on flooding, storm surge, and DRR	₱300,000	LDRRMF, NGOs	Increased community risk literacy	Low DRR awareness among elderly and women
		Community-based hazard and exposure mapping (especially for long-staying residents)	₱200,000	LGU, NAMRIA	Barangay-level risk maps	High vulnerability of older population & permanent settlers
	Housing & Settlement Risk Assessment	Inventory of houses made with light materials and identify retrofitting needs	₱150,000	LGU, DSWD, Academe	Detailed settlement risk database	75–94% housing made of light/salvaged materials
	Expand Eco-based Solutions	Launch mangrove rehabilitation in other barangay	₱400,000	DENR, BFAR, CCC	2 ha restored mangrove buffer zone	Low natural protective barriers (e.g., low mangrove cover)
2027	Livelihood Resilience	Training on alternative livelihoods (seaweed, eco-tourism, aqua silviculture, skills diversification)	₱600,000	TESDA, DTI, BFAR	Diversified livelihood for fisherfolk & women	84–90% reliant on fishing, minimal farming, or entrepreneurship
		Launch women- and youth-led livelihood cooperatives	₱400,000	DSWD, DTI, DOLE	Organized vulnerable groups into coops	Socio-economic vulnerability of women & youth
	Housing Support & Infrastructure	Retrofitting support using strong or mixed strong materials	₱3,000,000	NHA, LGU, NGOs	Safer homes for 50 vulnerable HHs	Weak housing structures in high-risk zones
	Health Access	Deploy mobile health units to vulnerable barangays	₱500,000	DOH, PhilHealth, LGU	Improved access to health in flood-prone areas	Health vulnerability in coastal, aging communities
2028	Policy & Institutionalization	Integrate vulnerability data into BDP/CLUP	₱200,000	DILG, LGU	Risk-informed barangay development plans	Aligns planning with actual vulnerability levels
	Protective Infrastructure	Scale seawall and breakwater installations	₱6,000,000	DPWH, CCC, PCSD	Expanded structural protection in high-risk zones	Exposure to coastal flooding, storm surge
	Early Warning Systems	Upgrade sirens, SMS alerts, rain, and tide sensors	₱1,000,000	DOST-PAGASA, OCD, UNDP	Functional multi-hazard early warning systems	Weak early warning & preparedness
	Youth DRRM Engagement	DRRM curriculum integration & climate ambassador program	₱400,000	DepEd, SK, UNICEF	DRR-trained youth and school-level awareness	Engaging young population in long-term resilience
	Monitoring and Index Updating	Update vulnerability index & M&E workshops	₱300,000	Academe, LDRRMF	Yearly reviewed vulnerability metrics	Dynamic adaptation to changing risks

The following proposed policy recommendations are derived from the results of the vulnerability assessment and the three-year action plan, aiming to guide the Municipality of Lebak in strengthening coastal resilience, reducing disaster risks, and promoting sustainable community development.

Proposed Policy Recommendations for the Municipality of Lebak:

1. Implement a Gender-Responsive and Inclusive DRRM Policy
2. Mainstream Eco-Based Coastal Protection
3. Strengthen Housing Resilience Standards in High-Risk Zones.
4. Upgrade Municipal Early Warning and Health Response Systems
5. Youth and Education Integration for Long-Term Resilience

IMPLICATION AND CONCLUSION

The findings indicate that coastal barangays in Lebak exhibit high levels of vulnerability due to the interaction of socio-economic, environmental, and infrastructural factors. The heavy reliance on fishing as a primary livelihood reinforces the community's

exposure to climate-related risks, as supported by Allison et al. (2009).

The researcher believes that the results of this research also open the door for deeper studies: measuring the direct effects of climate change on fish stocks and incomes, assessing the effectiveness of existing protection structures, and understanding gender and generational differences in adaptation.

This work serves as a testament: that the people of Lebak's coastal barangays do not merely endure hardship—they face it with courage, solidarity, and hope. And in honoring their resilience, we must commit to policies that ensure their future is not one of survival alone, but of lasting security, prosperity, and dignity.

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