

INEQUALITY IN THE CLIMATE CRISIS: PUBLIC HEALTH VULNERABILITY IN WEST ACEH

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Abstract: Climate change is recognized as both an environmental and social process, exacerbating structural inequalities and creating new public health vulnerabilities. This study examines how climate-related ecological risks intersect with social vulnerabilities in rural and coastal West Aceh. Using a qualitative case study in Samatiga, Johan Pahlawan, and Woyla sub-districts, data were collected through in-depth interviews, participatory observation, and secondary analysis of health and disaster reports. Results show that climate-induced disasters—flooding, extreme rainfall, and rising temperatures—are linked to increased communicable diseases (e.g., diarrhea, dengue, malaria) and non-communicable diseases (e.g., respiratory illness, psychosocial stress). Vulnerabilities are heightened by poverty, inadequate sanitation, low climate literacy, and fragmented institutional responsibilities. The findings highlight the need for community-based risk management, climate-resilient sanitation, culturally grounded climate education, and cross-sectoral collaboration rooted in social and ecological justice.

Keywords: climate change; social vulnerability; public health; structural inequality; community-based adaptation

1. Introduction

Climate change is a complex environmental and social phenomenon with profound implications for human health. In Indonesia, coastal areas like West Aceh are increasingly exposed to climate-induced hazards such as floods, extreme rainfall, and rising sea levels. These hazards not only cause direct physical harm but also exacerbate existing social inequalities, creating disproportionate health risks for vulnerable groups (1,17). While environmental sciences have extensively documented the physical processes of climate change, less attention has been given to the intersection between ecological risks and social determinants of health at the local level. This study addresses this gap by investigating how climate-related risks interact with social vulnerabilities to shape public health outcomes in West Aceh.

2. Literature Review

2.1 Climate Change and Public Health Risks

Climate change impacts human health through direct pathways (extreme temperatures, altered rainfall patterns, sea level rise, extreme weather events) and indirect pathways (changes in air, water, and food quality, ecosystem degradation, and loss of biodiversity) (17). These changes contribute to increased prevalence of vector-borne diseases, waterborne diseases, respiratory illnesses, malnutrition, and mental health disorders (17).

2.2 Social Vulnerability in Climate-Related Health Impacts

Social vulnerability refers to socio-economic, political, and environmental conditions that heighten a community's susceptibility to harm. Poverty, inadequate infrastructure, limited health services, and low climate literacy exacerbate health impacts from climate events

(1,11). In West Aceh, vulnerability is shaped by both environmental exposure and unequal access to adaptive resources.

2.3 Ecological Risks and Inequality

Coastal ecological risks—such as flooding, coastal erosion, and saltwater intrusion—disproportionately affect marginalized populations (10,17). Field data indicate that the distribution of health risks is uneven, with those living closer to hazard zones facing greater threats, compounded by weak cross-sectoral coordination (10).

2.4 Adaptive Strategies in Health Sector

The Indonesian Ministry of Health outlines strategies including early warning systems, climate-resilient health infrastructure, community empowerment, and integrated vector control (17). However, in Aceh Barat, limited monitoring equipment, budget constraints, and insufficient trained personnel impede these measures (10).

2.5 Additional Literature Review

Data from BMKG (2023) indicate a change in the seasonal zones in Aceh from five to fifteen, a strong indication of a shift in rainfall patterns affecting agriculture, health, and food security (43). Rising air temperatures accompanied by erratic rainfall have been reported by local communities and media, exacerbating the risks of climate-related diseases (43). In addition, long-term observations have recorded a rise in sea level along the Meulaboh coast of 1.3–1.8 mm/year over the past 25 years, threatening coastal settlements and infrastructure (43).

Forest degradation in Aceh due to illegal logging and development without environmental assessments has reduced the ecosystem's capacity to absorb carbon, further worsening the effects of global warming (43). This degradation also diminishes nature's protective functions against hydrometeorological disasters such as floods and landslides. A study by Walhi Aceh (2024) highlights that deforestation impacts include increased microclimate temperatures and decreased air quality, which may trigger respiratory diseases.

Findings in West Aceh align with IPCC (2021) and Boer et al. (2019), which emphasize that tropical coastal regions, such as in the Philippines and Thailand, face similar risks: sea-level rise, increased storm frequency, and coastal ecosystem degradation (43).

3. Method

This study applied a qualitative case study approach focusing on three flood-prone sub-districts in West Aceh: Samatiga, Johan Pahlawan, and Woyla.

3.1 Data collection:

1. In-depth interviews with the Head of West Aceh Health Office and the Division of Disease Prevention and Control (P2P) (10).
 2. Participatory observation in affected communities.
 3. Review of secondary data from health and disaster management agencies.
- Analysis: Thematic analysis was conducted to identify patterns in climate-health interactions, framed within the social vulnerability framework.

4. Findings and Discussion



Figure 1. Research permit letter issued for fieldwork in West Aceh.



Figure 2. Interview with Head of West Aceh Health Office (August 11, 2025).



Figure 3. Interview with Division of Disease Prevention and Control, West Aceh Health Office (August 11, 2025).

Climate-Related Health Risks in Coastal West Aceh

Field data revealed a correlation between climate events (flooding, extreme rainfall, rising temperatures) and increases in communicable diseases (diarrhea, DBD, malaria) and non-communicable diseases (respiratory illness, psychosocial stress) (10,17).

Social Determinants of Vulnerability

In addition to inadequate sanitation infrastructure, although several villages have declared Open Defecation Free (ODF) status, the implementation of the Community-Based Total Sanitation (STBM) principles has not been optimal. The Ministry of Health's Five Pillars of STBM — which include stopping open defecation, handwashing with soap, safe management of drinking water and food, proper household waste management, and safe management of household wastewater — have been proven effective in reducing environmentally related diseases such as diarrhea and skin diseases (Kesmas-ID, 2024). However, the community's limited understanding of all these pillars increases health vulnerability during floods or seawater intrusion.

Vulnerability was heightened by poverty, limited sanitation despite ODF achievements, low climate literacy, and institutional barriers where responsibilities are fragmented across agencies (10,11).

Adaptation Challenges

Despite awareness of climate-health links, adaptive responses remain fragmented. Limited equipment (e.g., air quality monitors), insufficient SDM, and budget restrictions hinder effective health sector adaptation (10).

Integration of Climate Justice

The study highlights the importance of embedding climate justice in health policy, ensuring that adaptation measures prioritize marginalized groups most at risk (1,17).

Additional Analysis

☐ Seasonal Uncertainty: Significant changes in seasonal zones affect agricultural cycles and food availability, which in turn impact community nutrition and vulnerability to disease (43).

☐ Sea Level Rise: The threat of seawater intrusion reduces access to clean water, triggering the risk of waterborne diseases such as diarrhea, as evidenced by field findings and literature (10,43).

☐ Extreme Weather and Mental Health: Increased occurrences of floods and land fires raise the risk of post-disaster mental health disorders, as also noted by Susilawati (2021) (17).

☐ Habitat Fragmentation and Disease: Climate change drives species migration and increases human–wildlife interactions, potentially heightening the risk of zoonotic diseases (43).

5. Conclusion and Recommendation

Conclusion

Climate change in West Aceh amplifies existing social inequalities, resulting in uneven distribution of health risks. Vulnerable coastal communities face compounded threats due to environmental hazards and structural socio-economic disparities.

Recommendations

1. Strengthen community capacity for climate risk management.
2. Invest in climate-resilient sanitation and health infrastructure.
3. Implement culturally grounded climate education programs.
4. Enhance cross-sectoral collaboration guided by social and ecological justice principles.

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