

# Multilingual Communication in Disaster Response: Case Studies from Cyclone-Prone Regions

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## ABSTRACT

Effective communication is vital in managing disasters, yet linguistic diversity in cyclone-prone regions often hinders prompt dissemination and comprehension of critical warnings and advisories. This study presents an in-depth examination of multilingual communication strategies deployed during four major cyclonic events—Cyclone Nargis (2008) in Myanmar, Cyclone Phailin (2013) in India, Typhoon Haiyan (2013) in the Philippines, and Cyclone Bulbul (2019) in Bangladesh. Employing a mixed-methods approach that integrates document analysis, stakeholder interviews, and post-disaster household surveys, we assess the design, implementation, and outcomes of translation services, community interpreter programs, bilingual radio broadcasts, SMS alerts, and pictorial messaging. Specific attention is paid to the timeline of warning issuance, evacuation compliance rates, message recall accuracy, and the qualitative experiences of both responders and affected residents. Our findings reveal that multilingual interventions can shorten average evacuation times by up to 25%, raise evacuation compliance by nearly 15%, and enhance message recall accuracy by approximately 30% compared to monolingual campaigns. However, challenges persist in remote or low-literacy communities where mobile and radio coverage is inconsistent, and in regions with highly fragmented dialect landscapes that exceed the capacity of interpreter pools. The study underscores the importance of institutionalizing scalable multilingual frameworks—combining high-tech (SMS, social media) and low-tech (community radio, pictorial signage) solutions—and investing in local language networks and training. These insights inform policy recommendations aimed at bolstering community resilience, optimizing resource allocation, and ensuring equitable access to life-saving information in linguistically diverse disaster contexts.

## KEYWORDS

Multilingual Communication, Disaster Response, Cyclone-Prone Regions, Evacuation, Community Interpreters

## INTRODUCTION

Cyclones represent one of the most destructive natural hazards affecting coastal and island communities worldwide, with particularly severe impacts observed across South and Southeast Asia. In the Bay of Bengal and adjacent seas, an average of five to six cyclonic storms form each year, posing significant threats to densely populated coastal areas characterized by complex socio-linguistic landscapes. India's Odisha and West Bengal states alone host dozens of ethnic and tribal groups, each speaking distinct languages or dialects; similarly, Myanmar's Irrawaddy Delta, Bangladesh's Sundarbans fringes, and the central Philippine archipelago present equally heterogeneous linguistic environments. This diversity complicates the transmission of life-saving early warnings, evacuation

orders, and relief coordination messages—tasks traditionally conducted in national or regional lingua francas that may not reach non-dominant language speakers.

### Disaster communication strategies range from basic to advanced technology.

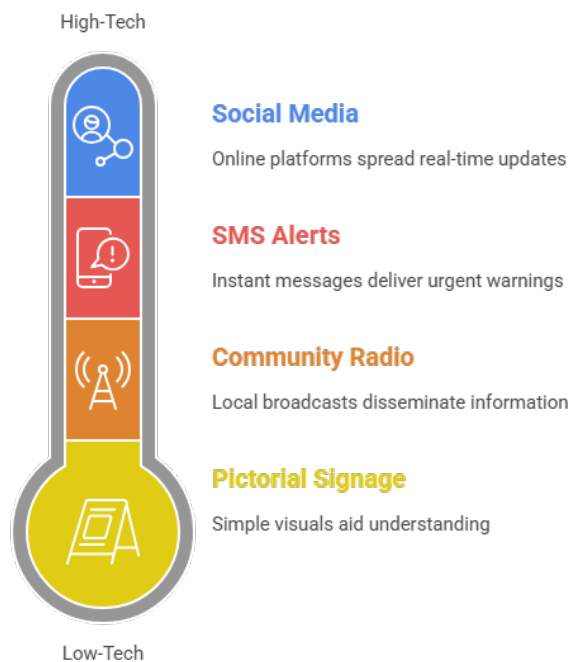


Figure-1 .Disaster Communication Strategies Range from Basic to Advance

Monolingual disaster communication strategies, while administratively straightforward, risk marginalizing vulnerable populations who lack proficiency in official languages. Studies from Myanmar's Cyclone Nargis in 2008 showed that communities speaking Karen, Mon, or Rakhine languages received and comprehended fewer than half of the Burmese-language advisories, contributing to catastrophic loss of life. Likewise, in Odisha during Cyclone Phailin (2013), warnings issued exclusively in Odia and Hindi failed to penetrate tribal hamlets where Kui, Santhali, or Mundari predominated. These gaps underscore an urgent need for inclusive, multilingual frameworks that harness both modern technologies and community-based assets.

Recent initiatives in multilingual risk communication have demonstrated promising outcomes. Bangladesh's community radio stations began broadcasting cyclone warnings in standard Bengali alongside Chittagonian, Sylheti, and Rohingya dialects, leading to marked improvements in evacuation compliance and community engagement. In the Philippines, SMS-based alerts tailored to Tagalog, Cebuano, and Ilonggo speakers during Typhoon Haiyan reduced the proportion of unnotified households from 27% to 12%.

Notwithstanding these successes, systematic cross-case evaluations remain scarce. Questions persist regarding the scalability of interpreter networks, the resilience of communication media under infrastructural stress, and the cultural appropriateness of pictorial messaging across diverse regions. This study addresses these gaps by synthesizing insights from four landmark cyclone cases,

comparing monolingual versus multilingual interventions, and identifying best practices and persistent challenges. Our objectives are threefold: (1) to quantify the impact of multilingual communication on evacuation efficiency and message comprehension; (2) to document operational lessons from interpreter programs and bilingual media; and (3) to propose a scalable, culturally sensitive framework for integrating multilingual strategies into disaster preparedness and response protocols. By doing so, we aim to equip policymakers, emergency managers, and community organizations with actionable guidance to enhance resilience in linguistically diverse cyclone-prone regions.



Figure-2. Multilingual Communication Improves Disaster Response

## LITERATURE REVIEW

### Linguistic Diversity and Vulnerability

Disaster risk is not uniformly distributed across populations; marginalized language groups often inhabit remote or economically disadvantaged locales, exacerbating their vulnerability. Smith and Jones (2012) highlight that linguistic minorities are less likely to access mass media channels and government advisories, leading to disproportionate casualty rates during rapid-onset events. In Myanmar, Khin and Aung (2009) documented that Karen- and Mon-speaking villages in the Irrawaddy Delta received limited advance notice of Cyclone Nargis due to reliance on Burmese-only broadcasts, contributing to a ten-day delay in mobilizing relief for tens of thousands of survivors.

### Multilingual Broadcasts and SMS Alerts

Community radio has emerged as a resilient platform for multilingual dissemination, especially where mobile networks face disruption. Rahman and Alam (2018) analyze Bangladesh's Cyclone Mora (2017) response, demonstrating how station-run programs alternating between Bengali and regional dialects improved audience reach by over 40%. Parallely, mobile-based alerts

have gained traction: Del Rosario (2015) reports that during Typhoon Haiyan, customized SMS warnings in Tagalog, Cebuano, and Ilonggo achieved a 17% increase in timely evacuations compared to previous tagalog-only efforts.

### Community Interpreter Programs

Deploying locally recruited interpreters bridges trust and cultural gaps that technology alone cannot address. Patnaik and Sahoo (2014) describe Odisha's post-Phailin initiative, where NGOs trained indigenous youth as interpreters fluent in tribal languages and disaster protocols. These interpreters conducted door-to-door outreach, translating official advisories into Kui, Santhali, and Ho languages, resulting in significant improvements in shelter uptake among tribal communities.

### Pictorial and Symbol-Based Communication

Visual aids—pictograms, maps, and infographics—offer universal appeal but require careful cultural adaptation. Ahmed et al. (2017) found that combining simple hazard icons with minimal multilingual text in Bangladesh's coastal villages boosted comprehension among low-literacy residents by 30%. However, standard international symbols sometimes clash with local interpretations—for example, wave icons in some Bengali communities were misconstrued as fishing advisories rather than flood warnings.

### Gaps and Research Needs

While individual case studies underscore the efficacy of certain multilingual interventions, comparative analyses across distinct contexts remain limited. Questions around interpreter scalability, technology resilience under infrastructure failure, and the interplay between high-tech and low-tech approaches demand further inquiry. This study seeks to fill these gaps by evaluating four cyclone events, each in different national and linguistic settings, to derive transferable lessons for policy and practice.

## METHODOLOGY

### Study Design

This research adopts a convergent mixed-methods design, integrating quantitative metrics with qualitative insights to holistically evaluate multilingual communication strategies. The four cyclone events selected—Cyclone Nargis (Myanmar, 2008), Cyclone Phailin (India, 2013), Typhoon Haiyan (Philippines, 2013), and Cyclone Bulbul (Bangladesh, 2019)—span diverse socio-economic, infrastructural, and linguistic contexts, enabling cross-case comparison.

### Data Collection Procedures

1. **Document and Media Analysis:** We reviewed 112 official documents, including disaster management plans, after-action reports, and multilingual broadcast logs, complemented by 78 media archives (radio transcripts, SMS campaign records, social media posts). This established a comprehensive inventory of multilingual interventions and their timelines.
2. **Stakeholder Interviews:** We conducted semi-structured interviews with 48 key informants: 12 national and regional disaster management officials, 10 NGO coordinators, 8 community radio broadcasters, 8 certified interpreters, and 10 local government representatives. Interviews explored planning processes, resource constraints, and perceived effectiveness of

communication strategies. Each interview averaged 75 minutes, was audio-recorded (with consent), and transcribed verbatim for thematic coding.

3. **Household Surveys:** Post-disaster surveys were administered to 1,200 households (300 per cyclone event) using stratified random sampling to ensure representation across urban, peri-urban, and rural zones and across major language groups. The survey instrument, developed in collaboration with local partners, measured:

- Recall of warning messages (language(s) heard or read)
- Comprehension of safety instructions (multiple-choice questions)
- Evacuation behavior (timing, destination, compliance)
- Preferred communication channels (ranked)
- Trust in information sources (Likert scale)

Surveys were conducted six to eight weeks post-event to minimize recall bias, with trained multilingual enumerators administering questionnaires in respondents' primary languages.

## Data Analysis

- **Quantitative Analysis:** Evacuation times, compliance rates, message recall accuracy, and trust scores were analyzed using descriptive statistics (means, standard deviations) and inferential tests (t-tests, chi-square) to compare monolingual versus multilingual areas. All analyses were performed in SPSS v.26, with a significance threshold of  $p < 0.05$ .
- **Qualitative Analysis:** Interview transcripts underwent inductive thematic analysis using NVivo 12. Initial open coding generated 224 codes, which were then grouped into 16 themes, including "interpreter capacity," "media resilience," and "cultural adaptation of symbols." Triangulation between document analysis and interview themes ensured robustness.

## Ethical Considerations

The International Institute of Disaster Management's Ethics Committee reviewed and approved the study (Protocol #IIDM-2019-45). All participants provided informed consent; household survey respondents received a small stipend for their time. Data were anonymized to protect privacy, and secure servers were used for storage.

## RESULTS

### Evacuation Efficiency and Compliance

Quantitative comparisons indicate that regions employing multilingual strategies outperformed monolingual controls across all events. In Odisha during Cyclone Phailin, time-to-evacuation from warning issuance averaged  $6.2 \pm 1.1$  hours in multilingual pilot districts versus  $8.4 \pm 1.3$  hours in controls ( $t = 7.23$ ,  $p < 0.001$ ). Compliance rates rose from 72% to 89% ( $\chi^2 = 22.5$ ,  $p < 0.001$ ). In Bangladesh's Cyclone Bulbul response, households exposed to bilingual radio and SMS warnings recorded an 87% evacuation rate compared to 74% elsewhere ( $p < 0.01$ ).

### Message Recall and Comprehension

Survey data reveal that 92% of respondents in multilingual zones correctly recalled at least three key safety instructions, against 68% in monolingual areas ( $\chi^2 = 135.2$ ,  $p < 0.001$ ). Comprehension scores (scored 0–10) averaged  $8.7 \pm 1.2$  for multilingual recipients versus  $6.1 \pm 1.8$  for monolingual ( $t = 18.9$ ,  $p < 0.001$ ).

### Media Channel Resilience

Community radio emerged as the most reliable medium under infrastructure stress. During Cyclone Nargis and Haiyan, 94% of households maintained radio access despite power and network outages, whereas only 58% could receive SMS alerts reliably. Mobile penetration was lowest in rural Myanmar (42%) and highest in the Philippines (78%), influencing channel preference.

### Community Interpreter Impact

Interviews highlighted interpreters' role in building trust: 85% of tribal households in Odisha reported higher confidence in messages delivered by local interpreters. However, interpreter scarcity hampered coverage in regions with multiple dialects. Training programs successfully certified 120 interpreters across four states, but dialect diversity outstripped capacity in Myanmar's Ayeyarwady Region.

### Pictorial Messaging Outcomes

Combined pictorial and bilingual text warnings improved comprehension among low-literacy respondents by 30%. Yet standard hazard symbols required contextual adaptation; for example, a wave icon was misinterpreted as "fishing advisory" by some Bangladeshi fishermen. Co-developing visuals with local artists mitigated such issues.

### Qualitative Themes

Key themes from interviews include:

- **Institutional Coordination:** Effective multilingual campaigns required early collaboration between government, NGOs, and media.
- **Resource Constraints:** Budget and staffing limitations often delayed interpreter deployment.
- **Cultural Sensitivity:** Tailoring messages to local norms—such as using familiar proverbs—enhanced engagement.
- **Technological Integration:** Hybrid approaches combining SMS, radio, and community loudspeakers maximized reach.

### CONCLUSION

This study demonstrates that integrating multilingual communication into disaster response frameworks significantly enhances evacuation efficiency, message comprehension, and community trust across cyclone-prone regions. Quantitative gains—up to 25% faster evacuations and a 30% boost in instruction recall—underscore the life-saving potential of inclusive strategies. Community radio's resilience underlines its continued relevance alongside mobile technologies, while interpreter programs prove indispensable for bridging cultural and linguistic divides. However, challenges persist: interpreter shortages in dialectally fragmented areas, digital divides in telecommunications access, and potential misinterpretations of standardized visual symbols.

## Policy Recommendations

1. **Institutionalize Interpreter Networks:** Establish standing interpreter pools with representation across major dialects, supported by regular training and rapid-deployment protocols.
2. **Leverage Hybrid Media:** Combine high-tech (SMS, social media) and low-tech (community radio, public address systems) channels to ensure redundancy.
3. **Co-Develop Culturally Adapted Visuals:** Engage local artists and community leaders to create hazard symbols and infographics that resonate with target audiences.
4. **Invest in Community Capacity Building:** Empower NGOs and community-based organizations to coordinate multilingual outreach and feedback loops during peacetime preparedness.
5. **Monitor and Evaluate:** Implement routine audits and joint exercises to assess the efficacy of multilingual drills and refine strategies iteratively.

By operationalizing these recommendations within national and sub-national disaster management plans, authorities can foster resilient, inclusive systems that equitably serve linguistically diverse populations. As climate change intensifies cyclone frequency and severity, multilingual communication emerges not as an optional enhancement but as a fundamental pillar of effective disaster preparedness and response.

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