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Effective risk communication in environmental disasters: Strategies and challenges

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Abstract

Effective risk communication is very important in the management of environmental disasters, especially in India, which boasts varieties of ecosystems and socio-economic factors that enhance the impacts of such events. This paper reflects on strategies and challenges of risk communication in the context of environmental disasters in India. Environmental disasters are some of the greatest threats to communities and infrastructure, especially through floods, cyclones, and droughts. All of these events should be accompanied by effective communication to achieve timely publication of information and response coordination and public awareness promotion. The purpose of this paper is to discuss strategies of risk communication that consider the use of traditional media, social media platforms, as well as community engagement initiatives. The challenges in implementing these strategies are the presence of language barriers, misinformation, and the need for messaging to be culturally sensitive. It features case studies from recent environmental disasters in India as a basis of illustration of these challenges and proposing practical solutions to address issues. This paper is going to try as well to come out with recommendations for improving risk communication practices in India. This implies the induction of local knowledge, building confidence between the authorities and the communities, and adaptive communication strategies that will enhance the resilience of people to environmental disasters. Conclusion This paper reports on the point that for more effective preparation and protection of those vulnerable, a comprehensive risk communication approach must be adopted, and its considerations go hand in hand with the environmental and socio-cultural settings within India.

Keywords: Public awareness, crisis management, adaptive communication, environmental disasters

1. Introductions

India, with diverse geology and climatic conditions, is very vulnerable to various environmental disasters like floods, droughts, cyclones, landslides, and heatwaves. Such disasters cause social, economic, as well as environmental effects, which grow worse by fast-growing urbanization, increasing population, and climate change. A recurrence and increased intensity of such events only highlighted the urgency under which effective risk communication needs to be invested to reduce damage and build more resilience. It is in this view that the aspect of risk communication plays a critical role in the management of environment-related disasters: it enables information to be conveyed to the at risk populations as quickly as possible, enabling awareness efforts, preparedness efforts, as well as emergency response efforts, long-term impacts with minimal damage. Success in risk communication also emanates from the fact that it informs all its audiences including marginalized communities that are less likely to get access to technology, information, and inputs to grasp what it says and take action on it.

The paper has two fold objectives. It first provides an overview of major environmental disasters in India and their impacts on people, as well as on the ecosystems. It then discusses the issue of risk communication, pointing out how that is integrated into the process of maximizing public safety and recovery from disasters. Third, it deals with risk communication strategies and the challenge in implementing them, such as misinformation, language barriers, and the lack of trust in authorities. It then attempts to analyze these challenges so as to provide ideas on how to evolve risk communication in making India's disaster management efforts more resilient and prepared to face the threat of disasters. This paper finally drives home the message of how an improvement on the frameworks of risk communication will help to better counter this rising threat in India of environmental disasters.

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2. Risk Communication Framework

2.1 Definition and scope of risk communication

The flow of information, advice or opinion from experts and authorities to the public regarding hazards and actual or potential menaces is understood by risk communication. In the context of environmental disasters, this means timely information release, which clarifies what happened and can help reduce harm and improve preparation. Thus, the main purpose of risk communication is to enhance awareness, direct emergency response efforts, promote preventive measures, and-most importantly-build trust among the general public before, during, and after disaster events. Effective risk communication enables people to understand the gravity level of risk, how to moderate it, and what measures should be taken to mitigate such risks, with the goal of lessening uncertainty and thereby enhancing decision-making capabilities.

For example, in a country like India, natural disasters such as floods, cyclones, and landslides are a routine occurrence. The difference between life and death is the ability to communicate risks. The effective risk communication strategy must involve clear, relevant, and actionable information which has taken into account the cultural, social, and linguistic diversity of the population.

2.2 Key Principles and Elements of Risk Communication

Whether or not risk communication is successful depends on the fulfillment of a set of key principles. These principles ensure the information shared is understood, trusted, and acted upon:

- **Accuracy and Timeliness:** The information served must rely on credible sources, so that people are given enough time to prepare or respond. Such delays or inaccuracies bring confusion, mistrust, and panic.
- **Clarity and Simple:** Information that is complex needs to be translated into language that is simple, clear, and free of technical jargon. In multilingual societies like India, translation in local languages is critical.
- **Transparency and Openness:** The openness about the nature of the risk, its possible impacts, as well as uncertainties, promotes trust. Covering up or playing it down makes it difficult to win cooperation from the public.
- **Two-way Communication:** Risk communication should not be one-way. It should allow the public to give it feedback, after which authorities can then tackle such concerns, answer questions to the best of their abilities, and even go a step higher by adjusting strategies according to community needs.
- **Targeted and Inclusive:** The communication needs to be targeted at various audiences, including vulnerable persons, particularly children, older people, and disabled, who may be more vulnerable in the face of a disaster. Such approaches need to be transmitted through all possible media.

2.3 Key Components of Risk Communication

- **Risk Identification and Evaluation:** The beginning of developing an effective communications strategy is through identifying and assessing the nature and potential degree of the risk.
- **Message Development:** Formulation of messages that are clear, simple to understand, and actionable. To these ends, the cultural environment of the target audiences;

the technological access available to the target audiences; and their literacy levels are crucial.

- **Channel Selection:** The selection of communication channels, like television and radio, social media, and mobile messaging for higher coverage.

2.4. Contribution in Disaster Management

Risk communication is a very critical area that applies to all steps of disaster management: preparedness, response, and recovery.

- **Preparedness stage:** Risk communication builds up the awareness of potential threats and encourages preventive measures before a disaster. For example, providing people with notice of an incoming cyclone will enable them to evacuate or protect property in time. The aim at this stage is to motivate communities to begin involved actions of resilience building in advance, such as the practice of a disaster drill or the preparation of an emergency kit. In the course of the disaster, real-time information guides the immediate action taken during the event, which may include evacuation routes or the location of emergency shelters. This stage calls for great accuracy and promptness from information since misinformation leads to chaos and raises the number of casualties.
- **Recovery:** The process of risk communication after disaster supports the recovery efforts by making communities aware about the availability of medicines, rehabilitation facilities, and rebuilding programs. It also helps in rebuilding trust with the public, especially in case people have criticized the response effort to the disaster. The most recent cyclones in India that struck the country, Amphan and Tauktae, saw how effective communication during disaster response is worth. Among which early warnings through all media channels such as radio, television, and social media really helped save more lives. Nonetheless, circumstances such as misinformation, language barriers, and even lack of communication tools in remote areas do still exist and must be addressed. A sound risk communication framework will be of paramount importance in mitigating the effects of environmental catastrophes. Ensuring that key principles and elements are followed, together with realizing the prominent role risk communication plays in the setup and implementation of disaster relief, makes the authorities in charge enhance public safety as well as resilience against rising environmental hazards.

3. Strategies for Effective Risk Communication

Effective risk communication in cases of environmental disasters depends on a number of strategies that ensure that information is given correctly, promptly, and appropriately. The use of traditional media, social media platforms, and community involvement provides a multi-pronged approach to hitting different populations. Each has its advantages and disadvantages, so the need arises to manage an all-rounded approach with different methods.

3.1 Traditional Media

Television, Radio, and Print Media

Traditional media, consisting of television, radio, and print, has always been the backbone of risk communication in the event of natural disasters. Television and radio broadcasts

enable immediate airing of information to many people. In India, the NDMA (National Disaster Management Authority) and the IMD (India Meteorological Department) normally make use of different means to communicate early warnings to people concerning cyclones, floods, and many other calamities.

Benefits

Wide Reach: Television and radio reach wide into the countryside where internet connectivity is minimal. This will ensure that even the most vulnerable populations receive timely disaster alerts and emergency instructions.

Trustworthiness: Traditional media outlets have traditionally been considered trusted sources of information, which helps garner public trust during a disaster.

Limitations

Minimal Interactivity: These media support one-way communication that do not allow for quick feedback or addressing issues by the community.

Access Barriers: In disaster situations, there is likely to be either a blackout or destruction of infrastructure that denies access to television and radio programmes. Furthermore, print media may not be able to provide information in real time to mitigate the situation.

3.2. Social Media Sites

Leveraging Twitter, Facebook, and WhatsApp

Recently, there has been a surge in the use of social media as an important tool for risk communication. These enable fast information dissemination and provide for interactive spaces whereby government agencies, media, and communities can share updates and emergency instructions.

Benefits

Speed and Reach: Social media channels can instantly disseminate information to millions of users. Twitter hashtags, Facebook posts, and WhatsApp group messages can quickly notify the public about evacuation routes, shelter locations, and other vital information.

Interactivity: These platforms offer two-way communication. Users may ask questions, share concerns, and gain access to official responses, which enhances the flow of accurate and timely information.

Problems

Misinformation: The high speed of information spread on social media could lead to spreading wrong or misleading content, creating confusion or even panic. Misinformation in the case of disasters can exacerbate the situation whereby people rely more on unverified sources.

The digital divide: Not everyone is able to access social media, especially in rural or low-income places where internet access might be limited. Again, here, a gap that exists is who has the ability to read news promptly and who does not.

3.3. Involvement of the Community

Grass-root awareness campaigns

Community engagement is one of the essential risk communication approaches toward disaster preparedness

and management. They generate programs which hope to make communities aware of dangers possible so as to involve them before as well as during the onset of a disaster. Some of these include organizing workshops on preparation for disasters, evacuation drills, and providing information about safety procedures.

Strengths

Localized Awareness: Local awareness programs can be streamlined according to the specific needs, cultural context, and risks of a community. This creates an information system that is effective in relation to action for the concerned community.

Empowerment: Such programs empower communities by preparing them for the same by provision of knowledge and toolkit-based response mechanisms. The motive behind this is local preparedness towards potential disasters.

Involving Community Leaders and Organizations: Engaging community leaders, NGOs, and local institutions who are well-known and respected by the public ensures that there will be trusted voices for communicating critical information. In the long run, these community leaders can help to bridge the gap between the public and the government agencies, therefore, reducing misinformation and improving trust about the official disaster response.

Challenges

Resource Limitations: Limited budget and other logistical challenges can affect the implementation of local awareness programs, particularly in scarce resource settings. Without sufficient resources and support, not all members of the community can be reached by such programs.

Reach: It becomes hard to reach everybody within the population in densely populated or high-transient populations.

3.4. Integrated Approaches to Communication

Media and Community Campaigns

An integrated approach combines the features of traditional media, social media platforms, and community engagement toward achieving a more comprehensive and effective risk communication strategy. That way, information actually reaches all segments of the population that may not be as likely to access any one medium.

Benefits

Greater Reach: Using various means of communication will heighten the possibility that all the necessary information will reach different audiences-rural and urban, digital and non tech-savvy.

Strengthening Information: Utilizing various channels, key messages can be reinforced across the platforms of communication. An emergency broadcast on television can be further supported in real-time with social media while community leaders can verify the same information independently on the ground.

Challenges

Coordination: Control over a number of multiple communication sources and maintaining information consistency must be coordinated amongst the different

government agencies, media organizations and community bodies.

Misinformation: In a multi-platform approach, controlling misinformation becomes more difficult because the same false information, in this case, is allowed to spread across different channels.

This multi-dimensional approach entertained the use of traditional and social media combined with community engagement in imparting risk communication during environmental disasters. Understanding both the strengths and weaknesses of the strategy, by integrating these approaches, disaster management efforts can become more effective in reaching and protecting the vulnerable during these disasters.

4. Challenges in Risk Communication

Effective risk communication in environmental disasters means the difference between life and death or saving property damage. However, there are problems throughout the process by which correct and timely and actionable information reaches pertinent stakeholders. Here, challenges have ranged from language and literacy barriers to the spread of misinformation to concerns in culturally sensitive message delivery. It will take strategic solutions and best practices to bring these goals to fruition.

4.1 Language and Literacy Barriers

Problem of Multilingual Communication

One of the biggest problems India faces is the linguistic diversity of the country. There are hundreds of languages and dialects, and so communicating risk information is a task that may not reach everybody in general. The local populations, for example, may speak only regional languages or local dialects, yet official warnings and alerts issued in Hindi or English are less possible in disaster-prone areas.

Challenges

Lack of Translation: Many government agencies and disaster management authorities forget that not everyone in the same community speaks the same language when it comes to risk communication materials, thus denying whole communities information.

Low Literacy Levels: Literacy levels vary from one region to the other, and in many rural settings, the literacy level might be rather low, hence an inability to read or understand a written warning. In this scenario, interpretation becomes confusing, misinterpreted, or else ignorance about very crucial safety instructions.

4.2. Solutions and Best Practices

Rumors and Misinformation

Rumors and misinformation breed panic and confusion and lead to a lack of trust during a disaster. Social media sites that can be helpful in transmitting immediate information often devolve into false information. Unverified reports and wrong predictions give rise to overstatement, resulting in unhealthy choices. People might refuse to evacuate or take shelter in unsafe areas.

Sources of Misinformation

Social Media: In regards to unverified report news, social media information through WhatsApp, Facebook, and

Twitter might be distributed, producing a lot more confusing messages.

Oral Tradition: In scenarios where official communication systems are missing or weak, distortion to the intended message may come about through hearsay.

Tactics for Countering False Information

Fact-checking and verification: The governments have to be closely coordinated with the social and traditional media sources to verify and debunk the false information immediately. Facts-checking organizations, for instance, may become very active in dismantling and providing the public with correct data.

Official Channels: Government agencies should have active verified social media accounts and websites from where people get trusted facts. Periodically, they should update clear messages and keep a particular individual concerned about any miscommunication.

Community Mobilization: Partnering with respected leaders and local community groups could be instrumental in combating misinformation. The more local leaders are involved in the process, the more trusted or accepted the information; this affects less the spread of false reports.

4.3. Cultural Sensitivities

Craft Messages to Cultural Context

India has other cultural diversities that prove to be challenging for risk communication. Different regions have different social norms, religious beliefs, and cultural practices that affect the response of those people indirectly toward messages on disaster warnings and safety protocols. Inclusion of such contexts into the communication may lead to poor communication and resists the given safety guidelines.

Challenges

Religious Beliefs: In some areas, people might believe that the occurrence is due to the will of God; this could be the cause for antecedent unwillingness to heed evacuation orders or preventive measures.

Social Norms: Such cultures may also involve some kind of influence of traditional gender roles. For instance, in certain communities, some women are restricted from moving from one place to another; thus, their quick response to evacuation orders is not easy.

Examples of Culture-Sensitive Communication:

Localization of Messaging: Effective risk communication must be localized and framed in terms that can resonate with community values. For example, disaster preparedness messages may need to be interpreted in terms of saving homes or families in a cyclone-prone coastal region. Involving religious leaders in communication regarding the disaster can be highly effective because some of them were involved in promoting health protocols during the COVID-19 era in some of the regions. The same strategy can be used in disaster preparedness to convince people to adhere to safety measures.

Community-Centered Approaches: In areas where there is a strong cultural or religious tradition, work through the local leaders, NGOs, and community group members to ensure the messages of disasters are heard and received. Messages can be devised to communicate with the values that are celebrated and cherished at the local level, thus making them more believable and effective.

Gender-sensitive messaging: Risk communication should be sensitive to gender issues as well, ensuring that information reaches women and marginalized groups. In certain risk communicative areas, prominent women's organizations or female leaders could be approached to ensure women receive appropriate, timely, and accurate information.

Effective risk communication during environmental disasters faces numerous challenges, including those of language, misinformation, and sensitivity to culture. Over and above strategies and best practices, a combination of these has to be employed in order to effectively deal with the challenges. Multilingual communication, fact-checking, collaboration with community leaders, and culturally sensitive messages are important for better disaster preparedness and response. Only after realizing and preventing these barriers will authorities have more resilient and well-informed communities to respond effectively towards environmental risks.

5. Recommendations for Improvement in Risk Communication

Risk communication after environmental disasters should be aimed at preventing loss and salvaging lives. However, there are other barriers to communication such as misinformation, language issues, and lack of mutual trust between authorities and members of the public on most occasions. Other recommendations for improving risk communication involve improvements in coordination between media and community, adaptable strategies, public trust, and local knowledge. With these recommendations, authorities are better placed with more efficient and inclusive disaster preparedness and response.

5.1. Strengthening Media and Community Coordination

- **Risk communication is multi-channel :** It sends traditional messages and digital ones, as well as engaging the community on a very grassroots level. Media coordination with community organizations can improve the scope of dissemination and the precision of information for disaster warnings and preparedness.
- **Enhance Partnership:** The government must engage with media houses, community-based organizations, and local influencers for uniform messaging. This includes creating a planned publicity ahead of a disaster event by coordinated communication. Provide regular briefings to the media and community leaders by government agencies to make sure that they are all 'speaking from the same page.'
- **Localized Messages:** Media houses should be localized to respond to and address various communities' needs and perceptions. The regional media will report in mother tongues, while community-based radio stations focus on the localized threats - the message thus becomes more relevant to different populations.

- **Empower Community Leaders:** Community leaders, NGOs, and local influencers are of pivotal importance in order to disseminate risk communication to the populations who may not reach and follow mainstream media or social media. Empowering these leaders with the necessary information through training and available resources can help these leaders become reliable sources of information for their communities within an emergency situation.

5.2 Develop Adaptive Communication Strategies

Adaptive communication strategies should therefore be developed within a dynamic disaster environment. This makes adaptive risk communication about real-time updates in message issues, a mix of platforms, and targeting specific groups based on the evolving nature of the disaster.

- **Multi-Channel Approach:** Authorities should use both the traditional and new media tools, including the mainstream media, like television, radio, as well as social media applications like Twitter, Facebook, mobile messaging Apps such as WhatsApp. This will ensure that all diverse demographic categories, from urban users of technology to rural communities, have access to the information. Flexibility in all these forms of communication allows authorities to easily modify the situation and make updates up to date.
- **Real-Time Update:** The situation might change with lightning speed during disasters. Updating communication is, therefore, viewed as critical to the situation. It should be achieved through real-time communication protocols in government agencies where the whole public receives changes in evacuation orders and weather forecasts promptly through various channels.
- **Tailored Messaging:** Different segments insist that different means be used. Delicate categories-the elderly, children, or disabled-would insist on communication channels distinct from the public. For example, specific evacuation procedures will be needed for a physically challenged individual, and perhaps a general straightforward message is needed by a child. Adaptive strategies have to take these into account and improvise accordingly.

5.3 Building Trust between the Authorities and the Public

Public trust is a very important ingredient for communication in disaster-related risks. If there's no trust in the authorities or the information being delivered, then most people will shy away from evacuating the premises or taking any other precautions. Trust has to be built through transparency, consistency, and engagement.

- **Transparency:** The authorities have to be transparent about risks, uncertainties, and limitations of their information. The uncertainty mentioned could help to establish credibility rather than eroding it. When the public perceives that the authorities are transparent and honest, it is more likely that they will trust and act on the respective information provided.
- **Consistency and Accountability:** Consistency in communications coming from credible sources is essential. Mixed messages or previous errors in communications will alienate trust. All stakeholders, from government agencies down to local media, need to

be on board to deliver consistent messages. Committing to follow through and rectifying mistakes can also enforce restoration of lost public trust.

- **Engagement and Dialogue:** Authority must adopt two-way communication with the public. In that channel, the authority can listen to the voice of the public, clarify their questions, and try to reduce the concerns of the people. Local forums, community meetings, and social media may help strengthen this point of interaction, thereby increasing public participation and trust.

5.4 Tap into local knowledge and expertise

Local communities have local knowledge and experience that could really supplement official strategies in risk communication. That is very doable; by incorporating local experts, community leaders, and traditional knowledge systems into the risk communication process, it could really be made very relevant and effective.

- **Local Knowledge:** For instance, in terms of practice weather forecasting procedures or even knowledge of local topography, local knowledge can be brought into formal disaster communication. In coastal areas that are prone to frequent cyclones, insights from local fishermen about wind patterns or sea conditions can be useful in micro-tuning those forewarnings and preparedness. Cultural sensitivity Cultural context is very important to tailor the risk communication for a region. By engaging with the local leadership and organizations who are knowledgeable about the cultural and religious beliefs within that population, messages can be better framed for communication. In some jurisdictions, religious leaders have more influence on community members, and in some cases, the endorsement of religious leaders might be very influential in raising public compliance with disaster preparedness activities.
- **Co-creation of solutions:** Local communities should be involved in disaster planning and communication activities. This can be done through participatory workshops, community-led disaster drills, and training sessions. If local people are brought on board, they are likely to own the preparedness measures and communicate them in their networks. For effective management of environmental disasters, it requires a coordinated, adaptive, and inclusive approach to risk communication. Coordination with the media and community can be enhanced alongside developing adaptive strategies for communication that has good trust building between authority and public and harnessing local knowledge. Disaster management authorities will have more effective systems for communication, preparing better for risks, quicker response to dangers, and more resilient communities.

6. Conclusion

Effective risk communication is a major step in disaster preparedness, response, and recovery, especially in a country as diverse as India. For such an extensive country, the issue of language, cultural, and social dynamics complicates information dissemination. This paper has discussed the different approaches for enhancing risk communication in environmental disasters, including media and community coordination, adaptive communication methods, trust-building with the public, and exploiting local

knowledge. This is interesting because the two media streams performed equally well, but combining community engagement with culturally relevant communication greatly amplified the reach and impact of risk messages. Effective risk communication is highly important as it enables the community to be adequately informed to make decisions, heed evacuation orders, and take preventive measures, hence saving more lives and property. It also solidifies public trust and harnesses local experts in a way that would make communication meaningful and better for the intended audience as well as enhances disaster resilience.

Future development studies should strive more towards adaptive and inclusive frameworks of communication, considering the technological levels of advancement and shifting the social dynamics. Real-time misinformation management practices, engagement of vulnerable groups, and integration of emerging technologies into communication are going to be very important fine-tuning efforts on risk communication. Continued work in these directions would convert communities into better-prepared faces in the future incidence of environmental challenges.

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