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The Critical Role of Indian Women in Nature-Based Disaster Mitigation, Response, and Recovery: A Review

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Introduction

India is located in South Asia and is known for its wide and diverse geography that ranges from mountains to expanding plains, from arid deserts to lush green forests and from serene coastal beaches to river valleys. India stretches between 8°4' N to 37°6' N latitude and 68°7' E to 97°25' E longitude and is bordered by Pakistan to the Northwest, China, Nepal, Bhutan to the North, Bangladesh and Myanmar to the East. To the South, it is flanked by the Indian Ocean, with the Bay of Bengal to the Southeast and the Arabian Sea to the Southwest. India's geographical diversity also brings about varied climate with hot and humid conditions in the South, cold winters and pleasant summers in the Himalayan regions and arid and semi-arid in North-west especially in the Thar Desert. India's geography plays a crucial role in its cultural and economic diversity, influencing settlement patterns, agriculture, and lifestyle across regions.

The topography of India makes it vulnerable to many natural disasters. The collision of the Indian and Eurasian tectonic plates makes this area highly prone to earthquakes. Approximately 58.6% of India's landmass is susceptible to seismic activity. Indo-Gangetic Plains are prone to flooding due to heavy monsoon rains and river overflow and about 40 million hectares of land is vulnerable to floods and river erosion. India's coastline of 7,516 km is exposed to tropical cyclones, with the eastern coast being more vulnerable. In the Deccan Plateau and arid regions around 68% of cultivable land is prone to droughts due to irregular rainfall. The Himalayan and Western Ghats are the regions that are at risk of landslides and avalanches, especially during heavy rains or seismic activity.

India has a comprehensive disaster management framework which includes National Disaster Management Authority (NDMA), State Disaster Management Authorities (SDMAs) and District Disaster Management Authorities (DDMAs) which focus on disaster preparedness and response. The Disaster Management phases include Prevention and Mitigation, Preparedness, Response, Recovery and Rehabilitation and Technological Integration.

The IPCC's Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) highlights the importance of integrating ecological approaches into disaster risk reduction. The report emphasizes that ecosystems, such as forests, wetlands, and mangroves play a critical role in reducing disaster risks by acting as natural buffers against extreme events like floods, storms, and landslides. The concept of Ecosystem-based Disaster Risk Reduction (Eco-DRR) is discussed as a sustainable strategy that not only mitigates risks but also enhances biodiversity and supports livelihoods. The report also underscores the need for policies that combine ecological conservation with disaster preparedness to build resilience against climate extremes (IPCC SREX) (1,8).

The Sendai Framework for Disaster Risk Reduction (SFDRR) 2015–2030 is a global agreement adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan. It aims to reduce disaster risks and losses in lives, livelihoods, and health, as well as in economic, physical, social, cultural, and environmental assets. The Sendai Framework has four Priorities for action which includes understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience and enhancing disaster preparedness for effective response and recovery, rehabilitation, and reconstruction (SFDRR) 2015–2030 (2,12). Sendai Framework has Global Targets which includes substantially reduce global disaster mortality, reduce the number of affected people globally, reduce direct disaster economic loss in relation to global GDP, reduce disaster damage to critical infrastructure and disruption of basic services, increase the number of countries with national and local disaster risk reduction strategies, enhance international

cooperation to developing countries and increase the availability of and access to multi-hazard early warning systems and disaster risk information (3). The framework emphasizes the importance of collaboration among governments, communities, and stakeholders to build resilience and reduce vulnerabilities. It also aligns with the Sustainable Development Goals (SDGs) and the Paris Agreement on climate change.

Research Methodology

For the natural disasters in India, we used PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method which is a commonly used methodology for review of literature (4). This method focuses on the sections (identification, screening & eligibility, and inclusion) that allow identifying literature in a systematic way.

Data Processing and analysis procedures

The downloaded data was coded manually and organized properly before carrying out their analysis. The first author and second author gathered data related to Sendai Framework and disaster mitigation in India. The other two authors rechecked the process of data coding and organization. All authors reached a consensus after several rounds of discussion and cross-checking.

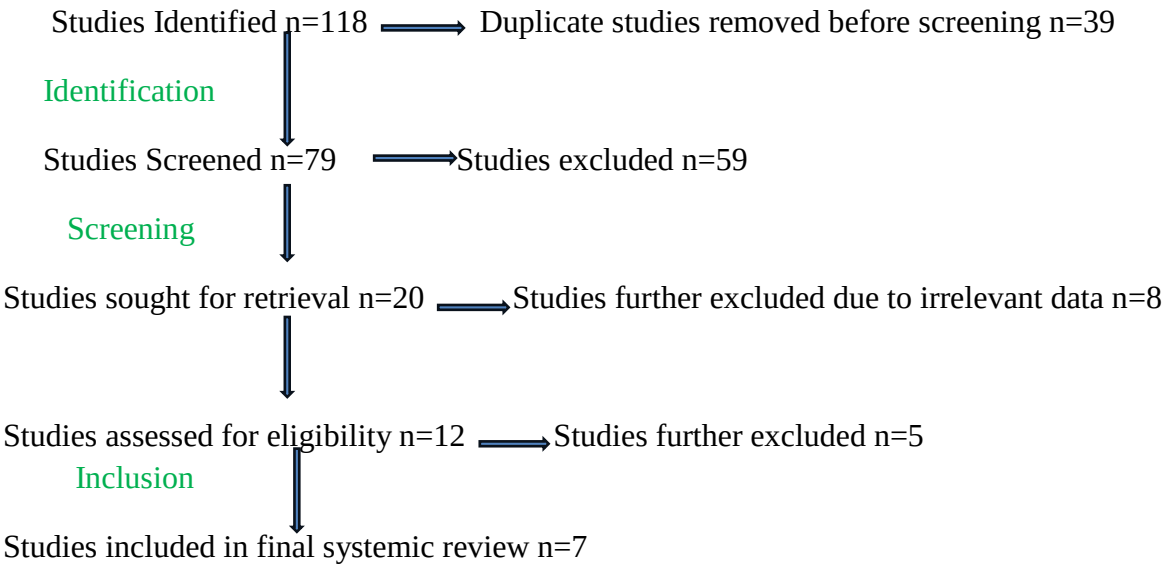


Fig.1. PRISMA Flow diagram of the literature review process

Results and discussion

India experienced numerous natural disasters between 1994 and 2020, each highlighting the country's vulnerability due to its diverse geography and climate. The major disasters include

1999 Odisha Super Cyclone which caused over 10,000 deaths and widespread destruction in Odisha. It highlighted the need for better cyclone preparedness and early warning systems. In

2001 in Gujarat an earthquake of magnitude 7.7 earthquake struck Gujarat, killing over 20,000 people and causing massive infrastructure damage. It led to significant advancements in earthquake-resistant construction practices. Indian Ocean Tsunami in 2004 caused over 10,000 deaths in India, primarily in Tamil Nadu and the Andaman and Nicobar Islands. It emphasized the importance of coastal disaster management and early warning systems. Bihar Kosi river floods in 2008 breached its embankments, displacing millions and causing extensive damage to crops and property. It underscored the need for better river management and flood control measures. Uttarakhand Flash Floods in 2013 caused devastating floods and landslides, killing thousands and affecting pilgrims and locals. It highlighted the impact of climate change and the need for sustainable development in fragile ecosystems. Cyclone Phailin (2013), Cyclone Hudhud (2014), and Cyclone Amphan (2020) caused extensive damage to coastal regions, emphasizing the need for robust cyclone shelters and evacuation plans (5). Heat waves and cold waves are also impacts of climate change which lead to disasters. The health impact of heat waves was studied in many parts of the world, relatively little information is available from the South Asia region (6). Defining heat wave at various threshold levels based on morbidity and mortality is critical for public health policy, interventions and to develop early warning systems. The identification of thresholds is of utmost importance and must include the effect of heat on humans and other living organisms and require a finer balance as it can change the impact considerably (7). The frequency of various types of disasters which shows that the frequency of floods is higher (Fig.2) as compared to heat waves and cold waves.

The percentage of deaths reported (Fig.3) among major disaster type is high in case of cyclones as compared to heat waves and cold waves.

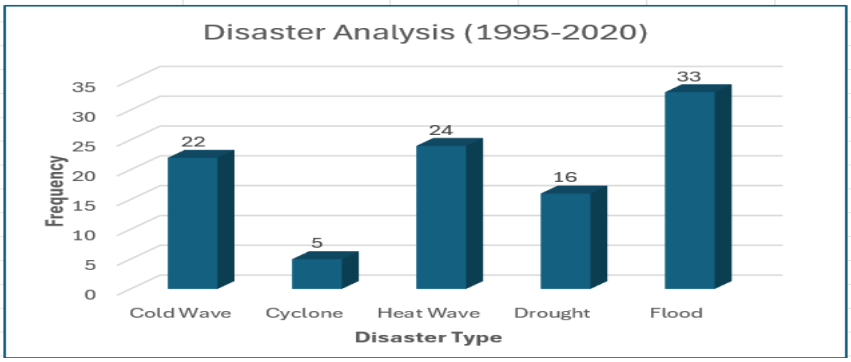


Fig. 2. The disaster type and its frequency

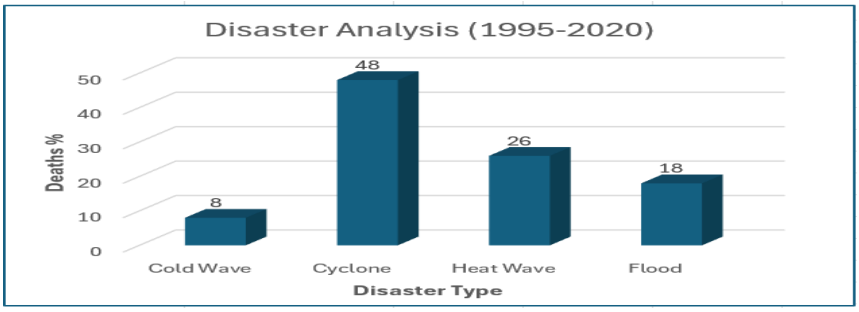


Fig. 3. Major disaster type and percentage of deaths

Role of women in disaster risk reduction

Women play a crucial role in disaster management in India, contributing significantly to preparedness, response, and recovery efforts. Women are increasingly taking leadership positions in disaster risk reduction. Under the Aapda Mitra Scheme, women volunteers are trained to assist in disaster response. Cyclone Shelter Management Committees ensure 50% women participation, emphasizing their leadership in managing shelters. Women often act as primary caregivers and community mobilizers during disasters, ensuring the well-being of families and neighbours. Self-help groups led by women play a vital role in post-disaster recovery,

including rebuilding livelihoods. Programs like those conducted by the National Institute of Disaster Management (NIDM) focus on empowering women with skills for disaster preparedness and response. Women are involved in advocating for gender-sensitive disaster management policies, ensuring that the unique needs of women and children are addressed.

India's approach to integrating women into disaster management has some unique aspects, but there are also lessons to learn from other countries. Women in Bangladesh are actively involved in disaster preparedness, especially in flood-prone areas. They lead community awareness programs, manage cyclone shelters and microfinance initiatives empower Bangladeshi women to rebuild livelihoods post-disaster. Japan focuses on gender-sensitive disaster planning. Women are included in decision-making processes, trained in emergency response and post-disaster recovery plans address specific needs of women, such as childcare and healthcare. United States encourages women to take leadership roles in organizations like FEMA (Federal Emergency Management Agency) and promotes gender equality in disaster management policies and practices. Women in Philippines play a significant role in disaster risk reduction, particularly in community-based programs. The country emphasizes gender mainstreaming in disaster policies, ensuring women's voices are heard.

Role of Indian women in past natural disasters

Indian women have played significant roles in past natural disasters, contributing to relief, recovery, and resilience-building efforts. In 2004, during Indian Ocean Tsunami **w**omen in Tamil Nadu were actively involved in rebuilding their communities. They organized self-help groups to support families and restore livelihoods. Many women participated in relief distribution and ensured that vulnerable groups, such as children and the elderly, received adequate care. In 2013, at the time of Uttarakhand Floods **w**omen in affected villages took charge of managing resources and rebuilding homes. They played a crucial role in community mobilization, ensuring that relief efforts reached remote areas. During 1999 Odisha Super Cyclone women were instrumental in managing cyclone shelters and providing

emotional support to affected families. They also contributed to post-disaster recovery by engaging in agricultural activities and restoring local economies.

Role of Indian women in Disaster Mitigation, Response and Recovery

Despite the fact that the role of women in decision making is crucial, their presence is not evident in most disaster management policies and programmes [9, 10]. Hence, their needs and interests are excluded in disaster management programmes [11]. Women play a vital role in disaster risk reduction globally and serve as agents of change and resilience within their communities. Women should increasingly take leadership roles in Disaster Risk Reduction initiatives and should participate in gender-responsive policies and strategies. Women can also put their efforts to prepare for and respond to disasters, utilizing their knowledge of local resources and needs.

The Policy makers can contribute to raising awareness in women about disaster risks and promoting sustainable practices to mitigate these risks. The policies can enhance participation of women in governance and decision-making processes. The Disaster Risk Reduction policies must address gender-specific vulnerabilities and empower communities in resilience building post-disaster, focusing on sustainable recovery and rehabilitation.

Initiatives in India for Women in Disaster Risk Reduction

The details of key initiatives taken by Government to provide leadership role to women in Disaster Risk Reduction are given below as per the revised National Disaster Management Plan (NDMP), 2019.

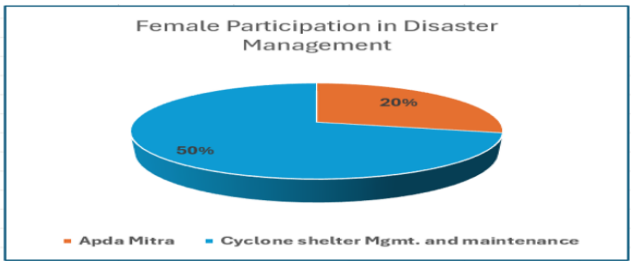
i. Participation of women in disaster response as Aapda Sakhi under Aapda Mitra Scheme. Out of approximately one lakh trained Aapda Mitra Volunteers, 20% are trained women volunteers.

ii. For the maintenance and management of Cyclone Shelter Management & Maintenance Committees (CSMMC) in the country, 50% women participation is ensured.

iii. Key roles to women are given in various Task Force groups related to disaster preparedness and rescue operations, training and mock drills etc.

iv. National Institute of Disaster Management (NIDM) has developed a compendium on best practices of "Women's Role in Disaster Risk Management" and undertake specific training programmes with focus on role of women in disaster risk reduction.

v. Mahila Contingent from Central Armed Police Forces (CAPFs) have also been trained in Disaster Management and deployed in National Disaster Response Force (NDRF), for disaster relief and rescue operation.



Apda mitra is a Central Sector Scheme that was launched in May 2016. It is a programme to identify suitable individuals in disaster-prone regions who can be trained to be first responders in times of disasters.

Challenges

Despite their contributions, women often face barriers such as limited access to resources, exclusion from decision-making processes, and societal biases. Addressing these challenges is essential to fully harness their potential in disaster management.

India's disaster management framework recognizes the importance of women's participation and continues to promote their involvement at various levels. Indian women's resilience and leadership during disasters highlight their importance in recovery efforts.

CONCLUSION

Sendai Framework is just 10 years since inception, we have 5 more years to embrace this framework, and boost the build-up of state and local platforms for Disaster Risk Reduction which will provide window of

opportunity for achieving sustainable development.

This study acknowledges the importance of women in disaster reduction. Policy makers in future should think about inclusion of practical knowledge and skills of women in disaster risk reduction. Knowledge of women is important for governance and has a critical significance in climate-induced disaster reduction. Despite their significant contributions, women face barriers such as limited access to resources, decision-making platforms, and education. Empowering women and integrating gender perspectives into Disaster Risk Reduction frameworks can enhance global resilience and reduce disaster impacts.

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