IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

The Role of Geography in Disaster Risk Reduction Education in India

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Abstract

Geography plays a pivotal role in Disaster Risk Reduction Education (DRRE) in India by imparting spatial awareness, risk analysis, and context-sensitive responses essential for resilient communities. Its interdisciplinary lens—spanning physical processes, human impacts, and technological tools such as GIS—facilitates comprehension of hazards like floods, earthquakes, landslides, cyclones, and heat waves. India's alignment with frameworks like the Sendai Framework, the NDMP, and the Disaster Management Act (2005) enhances DRRE integration into geography curricula. Examples include "Surakshit Shanivar" safety training in Bihar, community-based early warning innovations in Wayanad, traditional Himalayan knowledge, and infrastructure resilience in Kedarnath. Despite advancements, challenges persist in curriculum coverage, access to technology, and institutional coordination. Recommendations include curriculum integration, experiential learning, inclusion of indigenous knowledge, technology access, and localized partnerships. Geography education thus emerges as a transformative tool for fostering disaster resilience in India's complex and hazard-prone landscape.

Keywords

- Disaster Risk Reduction (DRR)
- Geography Education
- India
- Sendai Framework
- National Disaster Management Plan (NDMP)
- Eco DRR
- GIS in Education
- School Safety
- Indigenous Knowledge
- Community Resilience

1. Introduction

India's vast and diverse geography—ranging from the seismically active Himalayan belt to the cyclone-prone eastern coast, from the floodplains of the Ganga to the drought-affected regions of Rajasthan—makes it one of the most disaster-vulnerable countries in the world. Natural hazards such as earthquakes, floods, cyclones, landslides, droughts, and increasingly frequent heat waves pose significant risks to life, property, and development. These recurring threats demand a comprehensive and proactive approach to Disaster Risk Reduction (DRR).

Geography, as an academic discipline, provides essential tools for DRR education (DRRE). It cultivates spatial awareness, analytical thinking, and a deep understanding of human–environment interactions. Concepts like hazard zoning, risk mapping, land use planning, and population vulnerability assessments are central to geography and directly applicable to disaster preparedness and response.

The Sendai Framework for Disaster Risk Reduction (2015–2030), endorsed by India, outlines four priority areas: understanding disaster risk, strengthening risk governance, investing in DRR for resilience, and enhancing disaster preparedness. India has embedded these principles into national frameworks such as the Disaster Management Act (2005) and the National Disaster Management Plan (NDMP), along with various educational reforms.

2. Conceptual Foundations of Geography in DRRE (India)

Geography contributes to DRRE by:

- **Spatial Awareness**: Understanding the distribution of hazards (e.g., floodplains, seismic zones, cyclone belts) and human vulnerability.
- **Process Comprehension**: Teaching geophysical phenomena (monsoon dynamics, river behavior) and human-induced changes (deforestation, urban sprawl).
- **Human–Environment Interaction**: Identifying how socio-economic factors influence risk and resilience.

3. Indian Frameworks & Policy Support

India's institutional partnership with global DRR agendas is evident:

- **Sendai Framework Implementation**: India operationalized it through the 2016 release of NDMP, aligning national planning with Sendai priorities.
- **DRR Policies**: The Disaster Management Act mandates NDMA and SDMAs, curriculum integration, and disaster risk education.
- **G-20 & CDRI**: India formed a DRR Working Group and initiated the Coalition for Disaster Resilient Infrastructure (CDRI) to promote risk-sensitive development.
- **Budgeting and Nature-based Solutions (NbS)**: Initiatives such as floodplain restoration in Pune (Mula-Mutha) and DRR financing reflect Sendai-aligned priorities.
- **School Safety & Local Planning**: Plans like the Uttar Pradesh State Disaster Management Plan-2023 embed DRR into education and infrastructure.

4. India-Centric Case Studies in Geography-Based DRRE

a) Bihar – "Surakshit Shanivar"

The Bihar Education Project Council introduced "Surakshit Shanivar" (Safe Saturday) to train students in disaster preparedness bi-weekly. Teachers are centrally trained and replicate programs in schools, empowering students to become safety ambassadors. This exemplifies how geography education fosters preparedness and awareness.

b) Wayanad, Kerala – Early Warning & Schools

A 2025 study on the 2024 Wayanad landslide exposed weaknesses in early warning systems—limited data, institutional delays, and communication breakdowns. Recommendations included school-based DRR education, participatory drills, and tech solutions like IoT and AI.

c) Pune District – Village-level Preparedness

Pune allocated INR one crore for disaster kits and volunteer training across 179 high-risk villages. This decentralized planning boosts local resilience. Geography education supports such grassroots initiatives by teaching students how spatial planning impacts vulnerability.

d) Uttarakhand Himalayas – Traditional Knowledge

Mountain communities in Uttarakhand use terracing, quake-resistant housing, and traditional cropping systems that mitigated the 2013 floods. Integrating this knowledge into geography curricula can build appreciation for sustainable, indigenous DRR practices.

e) IIT Gandhinagar – Flash Flood Hotspots

An IIT study identified new flash-flood hotspots in the Himalayas and Central India due to changing rainfall patterns. Students learning geography can analyse such data to understand emerging risk zones.

f) Kedarnath – Resilient Redevelopment

After the 2013 disaster, Kedarnath was rebuilt with retaining walls, green infrastructure, and open evacuation spaces. Geography students studying this case understand how land use and hazard awareness intersect.

5. Technological & Institutional Tools in Indian Geography DRRE

India increasingly leverages technology in DRRE:

- **GIS & Remote Sensing**: Used for hazard mapping, resource planning, and real-time risk monitoring.
- **IoT & AI**: Applied in predictive modelling and early warning systems, especially in regions like Wayanad.
- **Institutional Capacity Building**: Organizations such as AIDMI and OSDMA conduct training and simulations.
- **School Safety Programs**: Geography education underpins school-based DRR frameworks—through mock drills, safety audits, and disaster clubs.

These tools reinforce geography's role in equipping learners with modern DRR tools.

6. Challenges in Geography-Based DRRE (Disaster Risk Reduction Education) in India

- **Curriculum Gaps**
  DRR topics are often included only as side notes in geography textbooks, without sufficient depth or real-world application, reducing student engagement and understanding.
- **Resource Inequality**
  Many schools, particularly in remote and underfunded areas, lack basic infrastructure like computers, internet access, or GIS tools that are essential for geography-based DRR learning.
- **Limited Teacher Training**
  A large number of geography teachers are not adequately trained in DRR pedagogy, disaster mapping, or in using digital tools, which weakens the delivery of DRR concepts.

- **Institutional Fragmentation**
  Lack of coordination between schools, disaster management authorities, and local governments leads to poor integration of DRR initiatives within education systems.
- **Urban–Rural Divide**
  While urban schools may have access to better technology, many urban slums are excluded from formal education systems. Conversely, rural schools often lack both tech and trained staff.
- **Loss of Indigenous Knowledge**
  Traditional, location-specific disaster coping strategies are often ignored or dismissed in mainstream geography education, leading to a loss of valuable, culturally relevant practices.
- **Infrequent or Inadequate Drills**
  Mock drills and simulations are rare or symbolic in many schools, reducing practical preparedness among students and staff.
- **Overemphasis on Theory**
  DRRE is often taught through memorization and theory, with little use of interactive tools like field surveys, community mapping, or participatory activities.
- **Language and Accessibility Barriers**
  DRR materials are often published in English or Hindi, excluding students who speak regional or tribal languages, especially in disaster-prone tribal regions.
- **Lack of Monitoring and Evaluation**
  There is no consistent system to assess how well DRR is being taught in schools or to track improvements in student preparedness over time.

7. Recommendations for Enhancement

To improve geography-based DRRE:

- **Curriculum Integration**: Embed DRR topics deeply within geography textbooks and projects.
- **Experiential Learning**: Use simulations, hazard mapping, and field visits to reinforce theory.
- **Technology Access**: Provide schools with GIS tools, real-time hazard maps, and teacher training.
- **Value Indigenous Knowledge**: Include local practices from Himalayan, coastal, and tribal communities in teaching materials.
- **Policy & Budget Alignment**: Integrate DRR programs with NDMA and SDMA funding streams.
- **Institutional Collaborations**: Partner with NGOs and disaster response institutions for workshops and drills.
- **Local Case Study Usage**: Use relatable examples like Kedarnath, Wayanad, and Pune for classroom engagement.
- **Inclusive Planning**: Ensure DRR programs address gender and regional inequalities.
- **Monitoring & Evaluation**: Conduct regular audits and drills to assess school preparedness.

8. Conclusion

In India's hazard-rich geographic landscape, geography-based Disaster Risk Reduction Education is vital for building resilient futures. By embedding spatial thinking, local hazard awareness, indigenous wisdom, and technological tools into education, geography becomes a catalyst for preparedness and adaptation.

Current initiatives—from Bihar's "Surakshit Shanivar" to Pune's village readiness, Wayanad's early warning lessons, and Kedarnath's resilient redevelopment—reflect promising integration of DRR into geography teaching. Nonetheless, challenges remain in equity, coordination, curriculum depth, and resource access.

Strengthening geography education through policy alignment, localized case-based learning, technology access, and community engagement can transform DRRE into a robust tool for disaster resilience. Aligned with global frameworks like Sendai and supported by national structures like NDMP and AIDMI, geography education holds the key to empowering informed, prepared, and resilient citizens across India.

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