



Disaster Risk Reduction as a Pillar of National Security: An Analysis of Indian and Global Experiences

¹Ekta Panday, ²Dr. Vipin Kumar

¹Student of Bachelor of Arts and Security Management, Rashtriya Raksha University, Lucknow Campus, UP

² Assistant Professor Rashtriya Raksha University Lucknow Campus, Uttar Pradesh

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ABSTRACT

Disaster Risk Reduction (DRR) has traditionally been treated as a component of disaster management, humanitarian assistance and sustainable development. However, the increasing frequency, scale and interconnectedness of natural, technological, biological and climate-related hazards demonstrate that DRR is also an important component of national security. Disasters can destroy national security critical infrastructure, disrupt energy and communication networks, weaken public institutions, generate displacement, affect food and water security, disrupt supply chains and create conditions that may intensify social instability and conflict. This research paper examines the role of DRR in strengthening national security through a secondary and descriptive research design. The study analyses information from UNDRR, the World Bank, Government of India, Ministry of Home Affairs, NDMA-related government documents and other authoritative sources. Current UNDRR data indicate that more than US\$1 trillion in direct disaster-related economic losses were reported globally during 2016–2025, while the broader annual cost, including indirect and ecosystem impacts, is estimated by the Global Assessment Report 2025 at approximately US\$2.3 trillion. The paper analyses 12 case studies, that justify the

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relevance of disaster risk reduction in securing the national security. The cases demonstrate that early warning, resilient infrastructure, institutional coordination, community participation, risk-informed development, disaster financing and continuity of government can significantly strengthen national resilience and security.

Introduction

National security is no longer limited to protecting a country's territorial integrity from military threats. Contemporary national security encompasses human security, economic security, energy security, food security, health security, cyber and technological security, infrastructure security and institutional stability. Disasters can affect virtually all of these dimensions simultaneously. A major earthquake can destroy government buildings, hospitals, communication networks and transportation infrastructure. Floods can interrupt food production and supply chains. Cyclones can damage electricity networks and ports. Pandemics can affect health systems, economic activity and national productivity. Climate change can increase the frequency or intensity of several hazards and amplify existing vulnerabilities. Consequently, disaster risk should increasingly be understood as a national security risk rather than simply an emergency-management issue. The United Nations Office for Disaster Risk Reduction (UNDRR) reports that between 2016 and 2025 countries reported more than US\$1 trillion in direct economic disaster losses, while 92,947 critical infrastructure units and facilities were reported damaged or destroyed and more than 1.6 million disruptions to basic services were recorded. The Global Assessment Report (GAR) 2025 goes further by estimating that when indirect economic and ecosystem effects are included, the annual global cost of disasters approaches US\$2.3 trillion. It identifies disaster risk as an increasingly systemic threat to economic and financial stability. Therefore, reducing disaster risk before an event occurs is increasingly important for maintaining the continuity, stability and resilience of the state.

Meaning of Disaster Risk Reduction

Disaster Risk Reduction refers to systematic efforts to prevent new disaster risks, reduce existing risks and manage residual risks, thereby strengthening resilience and reducing disaster losses. DRR is broader than disaster response. It involves action before, during and after disasters, with particular emphasis on prevention, mitigation and preparedness. The Sendai Framework for Disaster Risk Reduction 2015–2030 provides the internationally accepted framework for DRR and identifies four priorities: Understanding disaster risk, strengthening disaster risk governance, investing in disaster reduction and resilience,



enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

Disaster Risk Reduction and National Security

The relationship can be represented as the Exposure of Hazard leads to Vulnerability during Disaster causes National Security Consequences. Where DRR intervenes as Risk assessment will leads to Prevention with better Mitigation by Preparedness with the help of Early warning which directly affect Response capacity, Recovery, & Resilience of that country. A resilient country is better able to maintain components like territorial and border security, critical infrastructure, food and water supplies, energy systems, healthcare system, communications network, better transportation, economic activity, public order & peace, government functions and social stability. Thus, Disaster resilience is an important component of national resilience, and national resilience is a foundation of national security.

Objectives of the Study

The major objectives are:

1. To examine the relationship between DRR and national security.
2. To analyse how disasters affect national security.
3. To analyse selected national and international disaster case studies.

Research Methodology

The study follows a **descriptive and qualitative research design** based on secondary data. It examines the relationship between **disaster risk reduction and national security** using documented evidence and selected case studies. Data have been collected from reliable sources, including **UNDRR reports, Sendai Framework data, World Bank reports, Government of India and MHA documents, NDMA publications, UN reports, and other credible institutional sources**. The data are analysed through **descriptive, thematic, and case-study analysis**. No primary survey or interviews were conducted in this study.

Global Disaster Risk: Important Data

Recent UNDRR data demonstrate the scale of the problem.

Indicator	Finding
Direct disaster losses, 2016–2025	> US\$1 trillion
Damaged/destroyed infrastructure units, 2016–2025	92,947
Disruptions to basic services	>1.6 million
Countries reporting national DRR strategies	151 by 2026
Countries reporting multi-hazard early-warning systems	128
Disaster mortality decline	65% compared with 2005–2014
Global disaster-affected population	Increased substantially

Source: *Disaster Risk Reduction (2026) Sendai Framework Monitor*

UNDRR's latest monitoring indicates that average disaster-related mortality per 100,000 people declined by approximately 65%, from 2.12 during 2005–2014 to 0.75 during 2016–2025. However, the number of people affected by disasters increased substantially, showing that improvements in mortality do not mean that disaster risk itself has disappeared. This distinction is important for national security: a disaster may cause relatively few deaths but still severely disrupt electricity, telecommunications, transportation, finance, food systems and government operations.

Important for Disaster Risk Reduction in National Security

Critical infrastructure includes: electricity, telecommunications, roads, bridges, ports, airports, railways, hospitals, water systems, financial infrastructure, government facilities. Failure of such infrastructure can create secondary security crises. For example, the 2011 Great East Japan disaster simultaneously involved an earthquake, tsunami, nuclear accident, power disruption and supply-chain disruption, demonstrating how one disaster can cascade across multiple sectors. Disasters reduce: production, employment, government revenue, exports, investment, agricultural output, infrastructure availability. Governments may have to divert funds from development, defence and social programmes toward emergency response and reconstruction. GAR 2025 identifies disaster risk as an increasingly systemic threat to financial stability. Floods, droughts, cyclones and heatwaves can damage: crops, livestock, fisheries, storage, irrigation, transportation. Food shortages can lead to inflation, migration and social instability. Disasters may contaminate drinking-water systems or damage water infrastructure. This becomes particularly significant in densely populated areas and during prolonged droughts. Power grids are highly vulnerable to: cyclones, floods, heatwaves, earthquakes, landslides. Therefore, disaster-resilient energy infrastructure is a national-security requirement. Large disasters can overwhelm hospitals and public-health systems. This is particularly significant when disasters generate: injuries, infectious disease, displacement, sanitation

problems, psychological trauma. Large-scale displacement and destruction of livelihoods can contribute to: unemployment, poverty, migration, competition over resources, social tensions. DRR therefore contributes to social stability. Disasters can affect border areas where infrastructure and government presence may already be limited. Floods, earthquakes, landslides and extreme weather can: damage border roads, isolate security forces, disrupt communications, damage border infrastructure, create population displacement. Consequently, DRR should be integrated into border-management planning.

Role of Disaster Risk Reduction (DRR) in Tackling National Security Problems Linked with SDGs

Disaster Risk Reduction (DRR) is an important component of India's comprehensive national security because disasters can cause deaths, displacement, economic losses, food and water insecurity, infrastructure damage and disruption of essential services. These effects directly affect several Sustainable Development Goals (SDGs) and can weaken national resilience. India is particularly vulnerable: more than 80% of India's population lives in districts at risk from climate-induced disasters, while economic losses from extreme weather events have doubled over the last decade. DRR supports national security and SDGs

SDG	National security problem	How DRR helps
SDG 1 – No Poverty	Disasters destroy homes, assets and livelihoods, pushing vulnerable people into poverty.	Risk mapping, insurance, resilient housing and social protection reduce economic shocks.
SDG 2 – Zero Hunger	Floods, droughts and cyclones damage crops, livestock and food supply chains.	Drought-resistant agriculture, irrigation planning, crop insurance and early warning systems strengthen food security.
SDG 3 – Good Health & Well-being	Disasters can cause deaths, injuries, disease outbreaks and disruption of hospitals.	Emergency medical preparedness, resilient hospitals and early warning reduce casualties.
SDG 6 – Clean Water & Sanitation	Floods and droughts can contaminate or reduce water supplies.	Water conservation, resilient water infrastructure and flood management strengthen water security.
SDG 8 – Decent Work & Economic Growth	Disasters interrupt businesses, employment, transport and supply chains.	Business continuity planning and resilient infrastructure protect economic activity.
SDG 9 – Industry,	Damage to roads, bridges, power	Disaster-resilient infrastructure and risk-

Innovation & Infrastructure	and communication systems can disrupt national functioning.	sensitive planning protect critical infrastructure.
SDG 11 – Sustainable Cities & Communities	Unplanned urbanisation increases exposure to floods, heatwaves and other hazards.	Risk-sensitive land-use planning, drainage, building codes and resilient cities reduce urban vulnerability.
SDG 13 – Climate Action	Climate change increases risks from extreme heat, floods, droughts, cyclones and sea-level rise.	Climate adaptation, risk assessment and early-warning systems improve national resilience.
SDG 16 – Peace, Justice & Strong Institutions	Large disasters can overwhelm government institutions and emergency services.	Strong disaster-management institutions, coordinated response and accountable governance improve state capacity.

Source- Disaster Risk Reduction (UNDRR). (2016), (2015). Implementing the Sendai Framework to Achieve the Sustainable Development Goals. Disaster Risk Reduction and Resilience in the 2030

Some important facts and figure show that between 1990 and 2020, India recorded 1,408 natural disasters, which affected more than 1.8 billion people, caused approximately 541,245 deaths, and resulted in nearly US\$213 billion in damages. The World Bank reports that over 80% of India's population lives in districts vulnerable to climate-induced disasters. India's SDG 13 score increased from 54 in 2020–21 to 67 in 2023–24, according to NITI Aayog. However, its reported Disaster Resilience Index preparedness score is 19.20, showing that resilience remains an important area for improvement. Globally, UNDRR reports that from 2015–2023, disasters caused more than US\$1.1 trillion in direct economic losses, while more than 92,000 critical infrastructure facilities were damaged or destroyed each year on average. Therefore, DRR is not only a disaster-management activity; it is also a national security mechanism. By protecting people, food and water supplies, critical infrastructure, economic activity and government capacity, DRR supports the achievement of SDGs 1, 2, 3, 6, 8, 9, 11, 13 and 16. In this sense, achieving sustainable development and strengthening national security are mutually reinforcing objectives for India.

Disaster Risk Reduction and India's National Security

India is exposed to multiple hazards because of its geography, population density, long coastline, Himalayan region, river systems and rapid urbanisation. The World Bank notes that more than 80% of India's population lives in districts at risk from climate-induced disasters. India therefore requires a comprehensive disaster-resilience approach.



Disaster Management Act, 2005

The **Disaster Management Act, 2005** provides the legal and institutional framework for disaster management in India. It establishes key institutions such as the **National, State and District Disaster Management Authorities (NDMA, SDMA and DDMA)**, the **National Executive Committee (NEC)** and the **National Disaster Response Force (NDRF)**. The Act also provides for disaster management planning at national, state and district levels. The **Ministry of Home Affairs (MHA)** serves as the nodal ministry and coordinates disaster management activities with NDMA, NDRF, NIDM, the Armed Forces and other concerned agencies.

Institutional Framework in India



The NDMA was established under the Disaster Management Act and is mandated to formulate policies and guidelines and promote integration of disaster-risk reduction into development plans. India's National Disaster Management Plan also assigns responsibilities for hazards including earthquakes, landslides, avalanches, nuclear/radiological emergencies, rail accidents, road accidents and urban floods.

CASE STUDIES

Case Study 1: Nepal–China Border Flood, 2026



On 26 August 2026, a catastrophic flash flood struck the Bhote Koshi River in Rasuwa District along the Nepal–China border. The disaster caused extensive loss of life. UNDP identified the event as a major reminder of the growing risks faced by mountain communities from climate change, glacier-related hazards and extreme events. A preliminary government assessment reported huge critical infrastructure loss damage to roads, motorable bridges, suspension bridges, 13 hydropower projects, one solar power plant and two transmission lines, affecting approximately 783 MW of hydropower-generation capacity. According to Nepal's Ministry of Foreign Affairs, Chinese tunnel-rescue specialists worked alongside the Nepali Army, together with teams from India and South Korea, to search for people trapped in tunnels at affected hydropower projects. Nepal also received rescue equipment and relief materials from China. The case demonstrates that disaster risk reduction and border security can overlap. An important lesson emerging from the disaster is the need for stronger transboundary disaster-risk cooperation, particularly for Himalayan hazards. Reporting after the disaster indicated that Nepal was considering rebuilding and strengthening an early-warning system along the China border, including seismic sensors, cameras and satellite-based communications, while seeking greater real-time information sharing concerning glacier movement and upstream water levels.

Case Study 2: Pakistan Floods, 2022

The 2022 floods demonstrated how climate-related disasters can threaten economic and human security. The World Bank and partners estimated that the floods caused more than US\$14.9 billion in damages, approximately US\$15.2 billion in economic losses, more than US\$30 billion combined damages and losses that reconstruction needs exceeding US\$16 billion. Another World Bank assessment notes that approximately 33 million people were affected. National-security consequences- The disaster affected: agriculture, transport, housing, public health, employment, fiscal stability, food security. Security lesson - Climate resilience must be incorporated into economic and national-security planning.

Case Study 3: Cyclone Fani, Odisha, 2019

Cyclone Fani provided another test of Odisha's DRR model. UNDRR reported that approximately 1.2 million people were evacuated to nearly 4,000 shelters before landfall. Another UNDRR account notes that more than 45,000 volunteers supported evacuation efforts. Although economic and infrastructure damage was substantial, mortality was dramatically lower than during the 1999 cyclone. Fani demonstrated that DRR: reduces mortality, maintains government legitimacy, protects vulnerable communities, enables faster recovery, reduces humanitarian pressure.

**Case Study 4: Kerala Floods, India, 2018**

Kerala experienced one of its most severe disasters in 2018. The World Bank reports approximately 5.4 million people affected and approximately 1.4 million displaced with economic losses of about US\$3.74 billion. The disaster exposed vulnerabilities involving: land-use planning, infrastructure, water management, settlements, river-basin management, fiscal resilience. The post-disaster approach led to the Resilient Kerala programme, incorporating disaster-risk financing, resilient infrastructure, improved water management, social protection and risk-informed land-use planning. Security lesson - Economic and fiscal resilience are integral to national and sub-national security.

Case Study 5: Nepal Earthquake, 2015

Nepal's 2015 earthquake highlighted the vulnerability of mountainous countries and densely populated urban areas. UNDRR's assessment examined: historical disaster losses, probable maximum loss, average annual loss, critical infrastructure, health facilities, cultural heritage, disaster-risk financing, urban risk. Nepal has since developed increasingly sophisticated risk-information systems. Its BIPAD portal, managed by the National Disaster Risk Reduction and Management Authority, integrates disaster-risk information and damage-and-loss data at different governmental levels. Security lesson - Reliable risk information improves government decision-making and therefore national resilience.

Case Study 6: Cyclone Phailin, Odisha, 2013

Cyclone Phailin demonstrated the value of long-term investment in DRR. Approximately 1 million people were evacuated before the cyclone, while direct deaths were reported at very low levels compared with the 1999 cyclone. The World Bank reports that Phailin affected approximately 4.5 million people within the cyclone-force wind path, but casualties were comparatively low because of early-warning systems, evacuation shelters and strengthened institutional capacity.

Case Study 7: Typhoon Haiyan, Philippines, 2013

Typhoon Haiyan was one of the most destructive tropical cyclones to affect the Philippines. The disaster exposed weaknesses in evacuation infrastructure. UNDRR reported that many designated evacuation centres were severely damaged during Haiyan. Consequently, the Philippines developed safer, hazard-adaptive evacuation facilities. The country subsequently strengthened preparedness and promoted a zero-casualty approach in several areas. In Bantayan municipality, mass evacuation helped limit deaths to 15 among a population of approximately 90,000 despite the typhoon's severity. The World Bank committed almost



US\$1 billion in support for reconstruction following Haiyan. Security lesson - Safe evacuation infrastructure is part of national resilience.

Case Study 8: Great East Japan Earthquake and Tsunami, 2011

On 11 March 2011, Japan experienced a magnitude 9.0 earthquake, followed by a devastating tsunami and the Fukushima nuclear accident. The World Bank describes it as an unprecedented cascading disaster involving: earthquake, tsunami, nuclear accident, power failures, supply-chain disruption. Japan's experience demonstrates that national security planning must consider cascading and compound disasters. Key lessons are - Redundancy in infrastructure, Business continuity, nuclear safety, Supply-chain resilience, Emergency communication, public preparedness, Government continuity.

Case Study 9: Bangladesh Cyclone Preparedness Programme, 2007

Bangladesh is one of the strongest examples of community-based disaster risk reduction. During Cyclone Sidr in 2007, Bangladesh activated approximately 44,000 volunteers and evacuated approximately 3 million people, with around 1.5 million accommodated in cyclone shelters. The country subsequently demonstrated further success during Cyclone Bulbul in 2019, when approximately 2.1 million people were evacuated and the reported death toll was only 19. UNDRR has highlighted Bangladesh's transition from a conventional relief-oriented model toward comprehensive disaster-risk management. Security lesson - Community-based DRR can act as a national resilience multiplier.

Case Study 10: Indian Ocean Tsunami, 2004

The 2004 Indian Ocean tsunami exposed major weaknesses in regional tsunami preparedness. One of the most important post-disaster developments was the creation of an Indian Ocean tsunami-warning system. UNDRR records that the system was established for countries around the Indian Ocean within approximately 18 months after the disaster. The World Bank highlights the importance of early warning, institutional coordination and community participation following the disaster. It reports that the Indian Ocean warning system subsequently incorporated seismometers, sea-level gauges and other monitoring infrastructure. National-security significance - The tsunami showed that low-frequency, high-impact disasters can become major national-security events. It also demonstrated the importance of: regional cooperation, scientific information sharing, communication systems, coastal preparedness, international coordination.

Case Study 11: Gujarat Earthquake, 2001

The Gujarat earthquake of 26 January 2001 caused enormous destruction. The World Bank records around 13,805 deaths & approximately 167,000 injured, around 1.2 million homes damaged or destroyed and more than 2,000 health structures damaged with approximately 12,000 schools damaged or destroyed. The reconstruction programme introduced - owner-driven reconstruction, improved urban planning, land readjustment, stronger building regulations, infrastructure reconstruction. The World Bank identifies the Gujarat Emergency Earthquake Reconstruction Project as involving disaster-risk management, preparedness, risk reduction and resilient infrastructure. Security lesson - Resilient reconstruction can prevent the recurrence of vulnerabilities and protect state capacity.

Case Study 12: Odisha Super Cyclone, 1999 – The Beginning of a Zero-Casualty Approach

The 1999 Odisha Super Cyclone was a major turning point in India's disaster-management history. The cyclone killed approximately 9,843 people according to the official figure cited by UNDRR. The disaster revealed severe weaknesses in early warning, evacuation, shelters, emergency communication, institutional coordination. DRR measures after 1999, Odisha subsequently - established OSDMA, developed cyclone shelters, strengthened early-warning systems, improved evacuation, established specialised response forces, promoted community participation, adopted a zero-casualty approach. National-security significance - The Odisha experience demonstrates that disaster governance can protect human security, economic assets, infrastructure and government capacity simultaneously.

Comparative Analysis of Case Studies

Case	Major hazard	Major DRR measure	National-security lesson
Odisha 1999	Cyclone	Institutional reform	Disaster governance matters
Gujarat 2001	Earthquake	Resilient reconstruction	Infrastructure resilience
Indian Ocean 2004	Tsunami	Warning system	Regional cooperation
Bangladesh 2007	Cyclones	Community volunteers	Community security
Japan 2011	Earthquake/tsunami/nuclear	Multi-hazard preparedness	Cascading-risk management
Odisha 2013	Cyclone	Mass evacuation	Early warning saves lives
Philippines 2013	Typhoon	Evacuation infrastructure	Critical infrastructure resilience



Nepal 2015	Earthquake	Risk information	Risk-informed governance
Kerala 2018	Flood	Resilience programme	Economic resilience
Odisha 2019	Cyclone	Early warning + shelters	Preparedness reduces mortality
Pakistan 2022	Flood	Resilient recovery	Climate-economic security
Nepal 2026 – Bhotekoshi– Trishuli Flood	Flash flood/mudflow associated with glacial collapse	Real-time information sharing + satellite-based damage assessment	Cross-border cooperation.

DRR as a National Security Multiplier

The relationship can be represented as: Disaster Risk Reduction Reduced mortality, Protected infrastructure, maintain Continuity of essential services, protect Economic & Social stability, cause Government continuity which Enhanced National Security. This means DRR does not replace conventional national security. Rather, it strengthens the resilience on which conventional security depends.

Conclusion

Disaster Risk Reduction has evolved from a humanitarian concern into an important component of national resilience and national security. The evidence from India and other countries demonstrates that disaster losses are not determined solely by the intensity of a hazard. They are strongly influenced by preparedness, exposure, vulnerability, governance, infrastructure quality, early-warning systems and community capacity. The Odisha experience is particularly significant for India. The transformation from the catastrophic 1999 cyclone to the comparatively low mortality associated with later cyclones illustrates how sustained investment in early warning, evacuation, shelters, institutional capacity and community participation can fundamentally change disaster outcomes. Similarly, Japan demonstrates the importance of preparing for cascading disasters; Bangladesh demonstrates the effectiveness of community-based preparedness; Nepal demonstrates the value of risk information; Pakistan demonstrates the relationship between climate disasters and economic security; and Kerala demonstrates the need to integrate disaster resilience into development and fiscal planning. At the global level, UNDRR's latest data show that disaster mortality has declined significantly, but the number of people affected and the economic consequences remain substantial. Therefore, national security strategies should move from a predominantly response-oriented model toward a



risk-informed resilience model. The fundamental policy principle should be: “A country that reduces disaster risk before a crisis occurs is better prepared to protect its people, economy, infrastructure, institutions and sovereignty when a crisis occurs.” DRR should consequently be treated not merely as an emergency-management function but as a strategic investment in national security, sustainable development and national resilience.

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