3.2 Synergizing Disaster Risk Reduction with Efforts to Build Climate Resilient Viksit Bharat 2047

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Abstract

As planet earth braces up for a world impacted by climate induced disaster ranging from Californian wildfire, Glacial Lake Outburst Flooding (GLOF) in Sikkim to growing intensity of heatwaves in north India, developing climate resilience becomes imperative to achieve the targets of Sustainable Development Goals (SDGs) 2030 and the long-term goal of Viksit Bharat by 2047. The integration of both Disaster risk reduction and climate change adaption at various stages of governance is key to break the administrative silos for an effective, efficient, and sustainable future. This paper addresses the gap in our present developmental processes and underscores the importance of inter-departmental coordination, decentralised governance, and grassroot initiatives to create climate resilience frameworks in our policy planning.

Keywords

Disaster Risk Reduction, Landslides, Flooding, Heatwaves, Policy framework, Risk Assessment, Nature-Based Strategy, Glacial Lake Outburst Flooding (GLOFs), Payment of Ecosystem Services, Ecotourism

Introduction

India's unique geographic diversity subject itself to varied nature of disaster-landslides in Himalayan states of India, frequent flooding of Assam floodplains and heatwaves in northern states of India. To tackle such challenges, the Disaster Management Act, 2005, brought a paradigm shift to move from post disaster to proactive, multi hazard and preparedness model of governance. However, weak integration of climate change projections and vulnerability in developmental planning has led to facing major challenges in forms like prolonged drought cycles in regions of Maharashtra and Karnataka's adverse impact on agriculture productivity, heat stress set to reduce labour productivity, post flood impact on health sector in the form of water borne diseases like malaria and dengue, urban flooding due to poor planning of drainage system, and rapid intensification of cyclones like *Fani* or *Tauktae*, which caught existing preparedness off-guard, increasing human toll. This demands a need to fully analyse disaster risk reduction planning through a climate lens to reduce cost and create a unique roadmap of

Viksit Bharat which is more people-centric, rooted to Indian traditions and scientific understanding. Climate resilience is key for achieving the Sustainable Development Goals (SDGs), particularly SDG 11, that is, Sustainable Cities and Communities, SDG 13, that is, Climate Action, followed by SDG 15, that is, Life on Land.

Challenges of Disaster Risk

India faces multi-dimensional climate induced risks, particularly flooding, landslides, and heatwaves, which increasingly demand looking into the gap areas in the present hazard management**.** In the present state of affairs, flooding mitigation is mostly an embankment-centric approach, which creates a false sense of security as it encourages human settlement along floodplains. The problem is further impacted by weak implementation of floodplain zoning where wetlands and natural riverbeds are protected. Moreover, in some cities like Mumbai, Chennai, and Gurugram, infrastructural development without due consideration of micro drainage system profiling has caused urban flooding havoc, where severe waterlogging issues are visible even after short duration of intense rainfall. Lastly, accelerated glacial melting combined with limited inventories and monitoring of glacial lake has increased the risk of Glacial Lake Outburst Floods (GLOFs) across the Himalayan states of Sikkim, Uttarakhand, and Himachal Pradesh.

The threat is further exacerbated by increasing incidence of landslides. While the Geological Survey of India (GSI), the nodal agency of landslide is responsible for mandatory landslide susceptibility mapping, the need for more granular data is key for planning of local governance disaster mitigation planning. Moreover, poor building code enforcement followed by lack of slope modification policy in various states have led to improper land use alteration, and indiscriminate quarrying creating challenges of anthropogenic induced landslides in parts of Himalayan states and particularly the Western Ghats. Lastly, operational and technical deficiencies like fragmentation of landslide coordination due to overlapping functions of GSI, Border Roads Organization (BRO), and State Disaster Management Authorities (SDMAs) has led to delay in sharing of critical data and timely slope stabilisation work.

Concurrently, heatwaves have emerged as a major climate related hazard too. According to World Health Organization (WHO) report, heatwave is a key variable as it has an important bearing upon occupational health hazard and the environment. It is a key cause of weather-related deaths which includes mental health, heart related diseases, asthma, diabetes and can also result in increased transmission of other infectious disease. Heatstroke is a medical emergency with a high-case fatality rate. In India, the frequency and intensity of these compound

extremes are expected to increase as global temperatures continue to rise. This will pose a complex and escalating challenge for the country. It is also estimated that around 3.5 Crore full-time jobs and reduction of labour productivity of 4.5 percent by 2030 will be attributed to heat stress only (Kjellström et al., 2019). At this juncture, India should rapidly scale up its heat resilience through data-driven understanding of the heat risk faced by every district to improve granularity of data set.

Key Interventions for a Climate Resilient Viksit Bharat

A coordinated effort by bridging the gaps of Climate Change and Disaster Risk Reduction (DRR) is key to address the systemic risk and enhance resilience across various sectors and scales. These approaches are key for long-term adaptive planning which is aligned with the targets of Sustainable Development goals and Sendai Framework for Disaster Risk Reduction.

Nature-Based Strategy (NBS)

Nature-Based Strategy (NBS) provides dual role in risk mitigation and ecosystem enhancement. For instance, in Indian cities, integrating urban forestry within the Heatwave Action Plan is key to reduce the impact of urban heat islands. Moreover, to promote sustainable agricultural practices, promotion of zero tillage, crop rotation, crop residue retention, and crop diversification will play key role to improve carbon sequestration and lower N_2O emission. From the policy perspective, exploring new financial mechanisms like green carbon credits through coordinated implementation of PES schemes will allow private players' participation in NBS initiatives. Lessons from programmes like "Room for the River" of Netherland model, can be applied in India as pilot projects that restore riparian zones, reduce flood risk, enhance water security, support sustainable fisheries, and provide recreational benefits, provided there is strong enforcement of environmental regulations.

Ecosystem-Based Strategy (EBS)

EBS harnesses ecosystem services for adaptation, particularly benefiting indigenous and rural communities. In states like Meghalaya, since more than 90 percent of the forest is owned by community, a unique model of payment of ecosystem services under GREEN Meghalaya provide financial incentives for conservation activities which is key for biodiversity conservation, carbon sequestration, and carbon financing projects in sectors like agriculture and livelihood mission plans. Similarly, regular quantification of the ecosystem services through estimation of payment for ecosystem services (PES) will have a key role to provide comprehensive economic

value to depleting natural resources. The recent study of IIT Bombay on Sanjay Gandhi National Park's PES is valued to be around 15 lakh crores, which includes morbidity costs due to respiratory ailments that the city saves is around Rs 514 crores per annum alongside providing 128 million litres of drinking water per day.

Therefore, the trilogy of ecosystem health, local governance empowerment, and people participation is imperative for formulating a national PES policy with a coordinating agency to oversee PES schemes and guidelines are implemented across all states to ensure conservation activities translate into visible green growth.

Community-Based Solutions (CBS)

CBS emphasizes localized planning, co-production of knowledge, and participatory methodology which is evident in states like Sikkim where community-based early warning systems for landslide has been developed by the GSI. Thus, in Himalayan states, the community-based societal attributes can be tapped through CBS projects which can focus on climate resilient agriculture and inclusive microfinancing to achieve food security and household resilience. For instance, the Biodiversity Management Committee, formed under the Biodiversity Act 2002, has played a positive role in Chamoli and Pauri district of Uttarakhand, where documentation of local species and micro-management of the forest areas have led to maintaining watershed health, curbing soil erosion, and protecting the native medicinal species of plants. This has created conducive environment for tapping the ecotourism potential of the region.

Unified Risk Governance

Unified Risk Governance seeks to integrate climate change adoption into the budgetary framework across the various line departments. For instance, the *Ahmedabad Heat Action Plan* model incorporates early warning systems, vulnerable group focus, health preparedness, access to water, community education outreach, and urban planning, cutting across varied departmental mandates. Moreover, a unified risk data platform which can integrate the data of Indian Meteorological Department, Geological Survey of India, and climate projections which is accessible to all stakeholders will be key game changer for risk screening before formulating any projects in the future. Lastly, by tapping the private players through green credit schemes, it can help achieve models like the German "Resilient City" which is based on using blue green infrastructure (permeable surface to absorb excess rainwater, green roofing, etc.) through multi hazard approach which is disaster proofed with stable financing, varied stakeholder participation, and vertical coordination. This is key for achievement of SDG 11, that is, Sustainable Cities and Communities for India, too.

Cross-Sectoral Collaboration

Collaborative approaches ensure the holistic integration of health, water, land use changes, and food security. Thus, joint monitoring is key to break the administrative silos which can be driven by AI-supported decision models integrating IOT, 5G, blockchain technology for transparency in data management and real time monitoring of hazards at local level planning. Embedding these technologies enable early detection, quick response coordination, and accurate climate risk projection. To operationalise this, institutional linkages between the scientific and technical institutions like Indian Institute of Remote Sensing, ICMR, ICAR, IITs, ISRO, and NIDM ensure the latest data of climate change is revised as per the requirements. However, without capacity building at the local level (district, municipal, panchayat), the technical outputs may remain underutilised.

Conclusion

Thus, true synergy requires mandatory integration of future climate projections in various facets of development planning-from urban infrastructure to rural livelihood. This ensures that every investment for developed India is hedged against the future climatic shocks. Decentralised empowerment at the level of panchayat raj, Fifth schedule, and Sixth schedule areas need to be funded with technical support by Centre. Policy support must prioritise Nature-based Strategies (NBS), where it can restore our degraded forest, wetlands, and promote afforestation for landslide prevention followed by conserving our mangroves for coastal protection. Thus, building resilience which is region-centric, into our DNA of development will ensure that the Viksit Bharat is not only developed but also local, secured, sustainable, and adaptive in the face of 21st century's greatest challenge. Lastly, it's key to recall our Hon'ble Prime Minister's call for "Building Local Resilience in a Changing Climate" which is inherent in Indian tradition. This is key for ensuring local participation for driving local climate resilient initiatives.

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Author's Profile

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He served in GSI from 2016, working across Southern India and the North-Eastern Region, including Telangana, Tripura, and Mizoram. His contributions span major national geoscientific programmes such as National Geochemical Mapping (NGCM), Macro-scale Landslide Susceptibility Mapping (NLSM), and diverse geo-environmental assessments in challenging terrains.

With expertise in geochemical mapping, landslide susceptibility analysis, river geomorphology, and systematic geological mapping, he is known for his rigorous fieldwork and scientific clarity. He continues to bring this technical proficiency to the North-Eastern Region, one of India's most geologically dynamic zones.