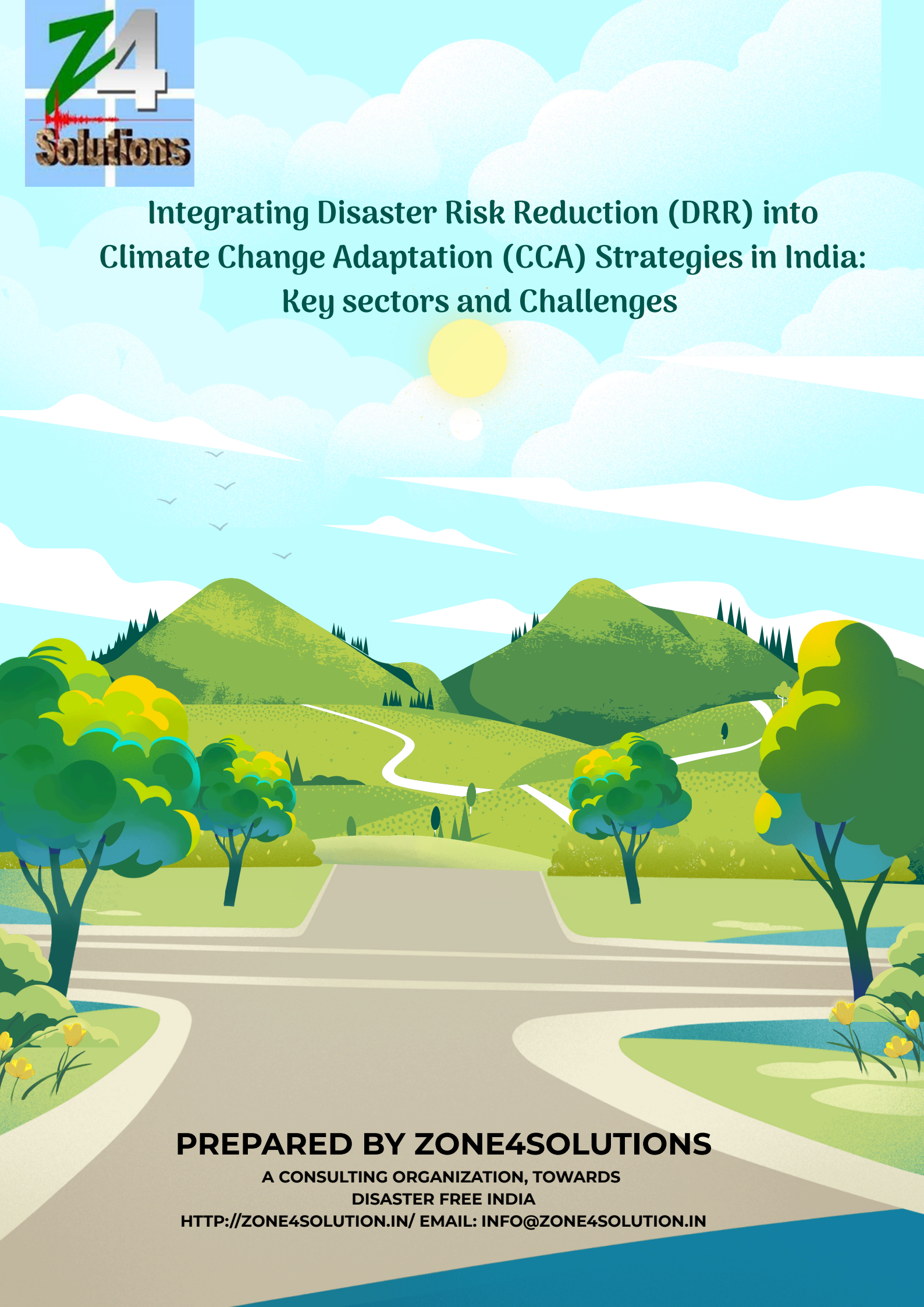
# Integrating Disaster Risk Reduction (DRR) into Climate Change Adaptation (CCA) Strategies in India: Key sectors and Challenges

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# Preface

The growing intensity and frequency of climate-induced hazards in India highlight the urgent need to integrate **Disaster Risk Reduction (DRR)** with **Climate Change Adaptation (CCA)**. While DRR focuses on reducing existing and future disaster risks, CCA aims to adjust natural and human systems in response to actual or expected climate impacts. Their integration ensures a comprehensive approach to resilience-building.

This means not only assessing how development interventions can be protected from natural hazards and climate change impacts, but also ensuring that such activities do not inadvertently increase vulnerability to specific hazards.

It is a systematic process through which DRR and CCA measures are fully embedded and institutionalized within development policies, plans, and practices across all sectors and levels of governance. Rather than being treated as standalone or reactive measures, risk reduction and climate adaptation become integral components of decision-making.

In this approach, disaster risks and climate change considerations are mandatorily incorporated from the earliest stages of planning and design. This ensures that development initiatives are sustainable, resilient, and capable of withstanding current and future environmental stresses. Ultimately, mainstreaming DRR and CCA contributes to reducing long-term risks while promoting safer and more adaptive development pathways.

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Director, Zone4solutions

# Integrating Disaster Risk Reduction (DRR) into Climate Change Adaptation (CCA) Strategies in India: Key Sectors and Challenges

## 1. Introduction

Increasing natural, hydro-metrological disaster are leading to greater variability in the geo-hydrological cycle and the emergence of new hazards. Such changes are manifested in the form of sea level rise, coastal degradation, floods, receding of glaciers, water resources, forest & ecosystems, drought, etc. It is already showing wide implications on food security and health with new socio-economic vulnerabilities across the globe. Therefore, all the regions and countries need to stress upon integrating the DRR and CCA to mitigate the effects of a changing climate.

India's unique geophysical location makes it highly vulnerable to a wide range of climatic hazards. The presence of the Himalayas plays a crucial role in shaping the dynamics of the Indian monsoon across the subcontinent. These mountains act as a climatic barrier, influencing rainfall patterns and weather variability. Moreover, the melting glaciers in the Himalayas serve as the lifeline of major river systems, forming the backbone of the region's hydrological network. These rivers sustain agriculture, economy, livelihoods, and cultural practices, making the region highly sensitive to climate change and associated disaster risks. As experience with both disaster risk reduction (DRR) and climate change adaptation (CCA) grows, there is increasing recognition that these two fields share a common focus: reducing the vulnerability of communities and contributing to sustainable development.

## 2. Background

A critical analysis of climate data over the past two decades reveals that the occurrence of disaster events shows an uneven distribution across different parts of the world. This variation indicates that the frequency and intensity of disasters are influenced by a combination of factors, including the extent of disaster-prone areas, active geological and seismological conditions, and prevailing hydro-meteorological regimes. Additionally, sudden temperature changes–pressure systems within specific regions further contribute to the increasing variability of extreme events.

**Key Statistics (2000–2019)**

- **7,348 major disasters recorded globally**
- **1.23 million deaths**
- **4.2 billion people affected (UNDRR)**

However, it has also been observed that regions with smaller geographical areas, especially those located near high-risk zones, tend to suffer disproportionately. This heightened vulnerability is largely due to limited preparedness, inadequate infrastructure, and lower adaptive capacity in the face of rapidly changing climatic conditions.

# 3. Rising Temperature and its Impact: Trends, Challenges, and Implications

Average temperature in India is projected to increase by 1.1°to 4.1°celcius over the 1986–2005 baseline, with the rate of warming dependent on the 21st-century emissions pathway in India[1]. Projected temperature rises are strongest in the northern regions of India, and annual minimum and maximum temperatures are expected to increase at a greater magnitude than the national average temperatures. At the end of the twenty-first century, steric sea level in the North Indian Ocean is projected to rise by approximately 300 mm relative to the average over 1986–2005 under the RCP4.5 scenario of the Intergovernmental Panel on Climate Change (IPCC)[2].

Each year across the world, including India, natural disasters result in billions of dollar damages and losses. Climate projections indicate that under the RCP8.5 scenario, a high likelihood of an increase in the frequency of more than 2 drought events per decade i.e. intensity and area under drought conditions in India by the end of the twenty-first century (World Bank, 2020).

## 3.1 Disaster Losses and Trends

Natural and man-made disasters resulted in global economic losses of USD 280 billion in 2021, the sixth highest on sigma records, and the 16$^{th}$ highest since 1970 after normalizing for GDP growth effects. Insurance covered USD 119 billion of last year's economic losses, the fourth highest on record, of which USD 111 billion was compensation for damage resulting from natural catastrophes. India's monsoon seasonal flooding in 2021 resulted in economic losses of 2.3 billion USD, however there is no figures available for the insured amount.

According to the National Disaster Management Authority (NDMA), "around 40 million hectares of land in India is exposed to floods (around 12 per cent of the total land area), 68 percent of land is vulnerable to droughts, landslides and avalanches, 58.6 per cent landmass is earthquake-prone, and tsunamis and cyclones are a regular phenomenon for 5,700 km of the 7,516-km long coastal line." Between 1971 and 2009, India experienced 371 major natural disasters which killed 1, 51,000 people and affected 1.86 billion people. The most

[1] https://reliefweb.int/sites/reliefweb.int/files/resources/15503-WB... · PDF file

[2] https://reliefweb.int/report/india/assessment-climate-change-over-indian-region-report-ministry-earth-sciences-moes

recurrent disaster in India is floods, which account for more than 50 percent of the calamities (Parida and Goel, 2020). Figure 1 shows that India is amongst the top five countries of the world in economic losses by Hydro metrological hazards like floods.

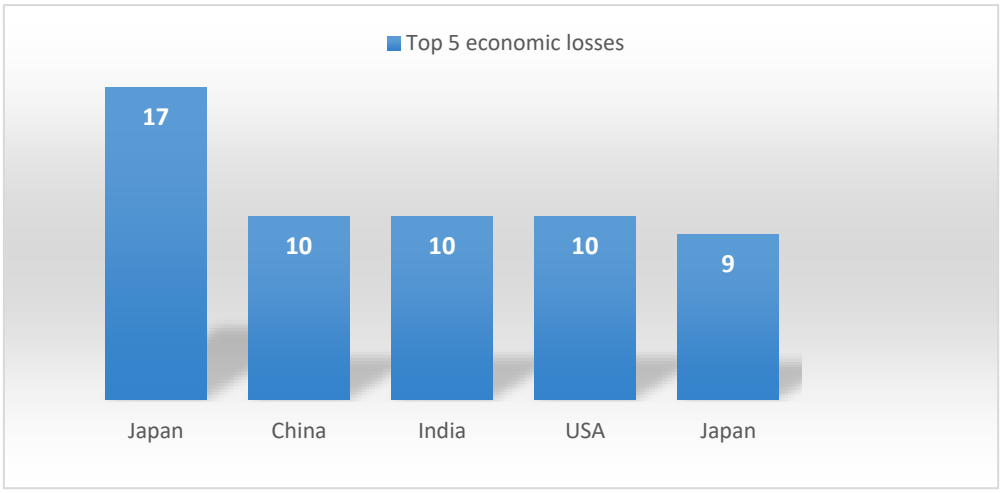



*Figure 1:Top 5 countries suffered economic losses in billion US$, 2019*

Economic losses (billion US$) by disaster type shows that in 2019 compared to 2009-2018 annual average losses in countries like Japan (*one of the most hazard prone and prepared country of world shows)* 17 billion US$, China, India and USA incurred 10 billion US$. It may be observed that though India is able to reduce the human loss after the enactment of the DM Act, 2005 and many initiative been taken by GoI to reduce the impact of hazards on human life but still economic loses are increasing.

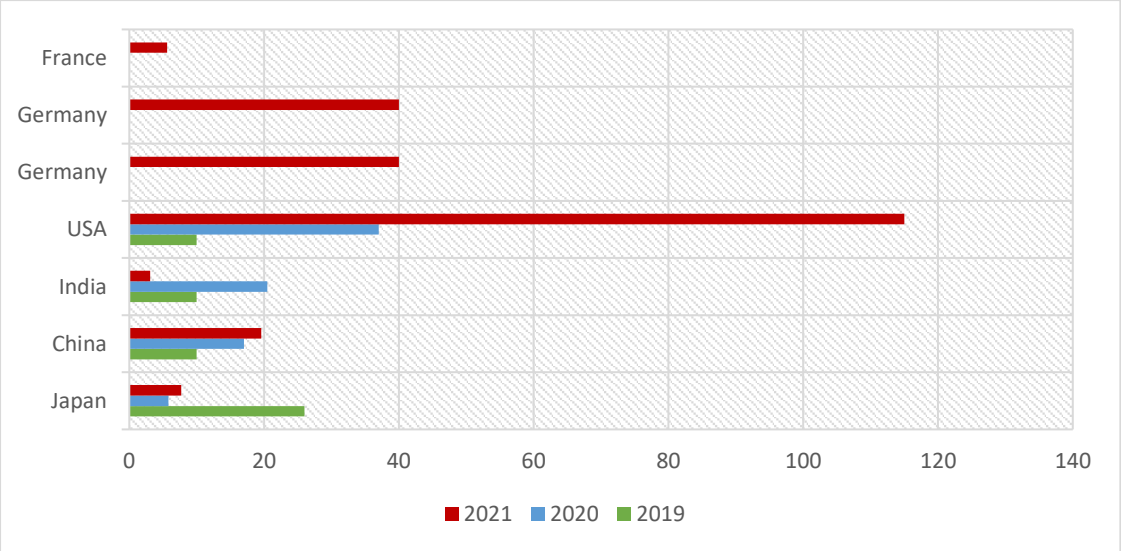



*Figure 2: Countries suffered highest economic losses due to disasters during 2019 to 2021 (CRED- EMDAT[3])*

Figure 2 depicts that India is in the list of "Top 10" countries who suffered economic losses during the 3 consecutive years i.e. 2019, 2020 and 2021 with second highest in the year 2020.

[3] Extreme events defining our lives, Disasters in numbers (2021) CRED, USAID.

## 3.2 Disaster Risk and Climatic stress- Indian Context

India is ranked 127th out of 182 countries in the 2020 ND-GAIN Index[4], which calculates a country's vulnerability to climate change and other global challenges as well as their readiness to enhance resilience. India is one of the most vulnerable country to climate change, not only because of its physical exposure to climate-related disasters, but also due to the economic dependency of the majority of its population on climate-sensitive sectors, especially agriculture and allied activities. India's 65 % of landscape is drought prone, 12 % is flood prone, and 8 % is susceptible to cyclones[5]. Adapting to climate change and dealing with loss and damage is going to be the most difficult for small landholders who forms the bulk of India's agricultural, livestock and marine products producers with women shouldering much of the work burden but without the assets and knowledge to deal with worsening disasters and climate shocks.

As per the Global Climate Risk Index, in 2018, India lost US$ 37 billion due to climate events such as cyclones battering the east coast and flooding and landslides in Kerala. During 1998-2017 these losses added up to US$ 79.5 billion.

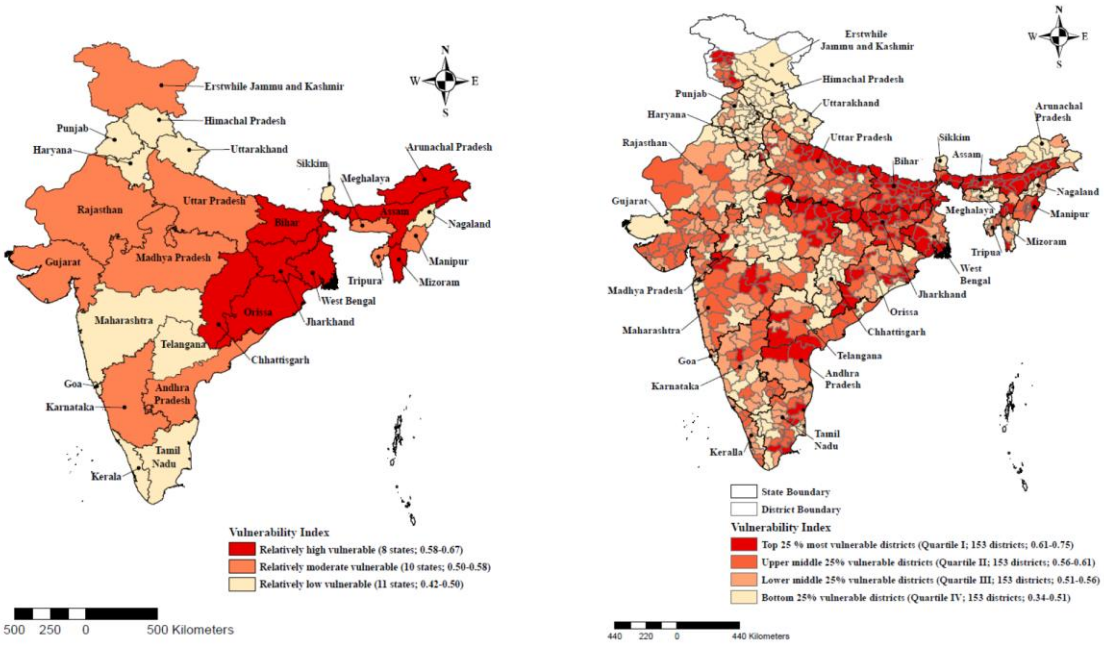



*Figure 3 State-wise and district-wise climate vulnerability of India*

The report titled 'Climate Vulnerability Assessment for Adaptation Planning in India Using a Common Framework', which identifies the most vulnerable states and districts in India with respect to current climate risk and key drivers of vulnerability. The report shows that

[4] https://gain-new.crc.nd.edu/

[5] https://www.adaptation-undp.org/sites/default/files/downloads/undp-alm_casestudy_india_oct2012.pdf

Jharkhand, Mizoram, Orissa, Chhattisgarh, Assam, Bihar, Arunachal Pradesh, and West Bengal as states that are highly vulnerable to climate change[6].

Globally there is an increase in frequency of disasters i.e. in the year 2000 the total number of events reported was 991, while during the year 2010 it was 1100 (CRED). The IPCC studies also acknowledged that this increasing frequency of disasters is likely to continue in future (IPCC, 2012[7]).

According to the UN International Strategy for Disaster Reduction and Centre for Research on the Epidemiology of Disasters (UNISDR and CRED[8]) (2018), between 1998 and 2017 climate-related and geophysical disasters killed 1.3 million people and left a further 4.4 billion injured, homeless, displaced, or in need of emergency assistance. Figure 4: Frequency of Natural Hazard in 2019 & 2009-18 (CRED) clearly depicts that there is an increasing frequency of climatic hazards like flood, wildfire, storm etc. in 2019 as compared to decadal average of 2009-2018.

Associated with this, the cost inflicted by disasters is also increasing. The real cost to the global economy from disasters every year is estimated to be about US$ 520 billion, which pushes more than 26 million people into poverty every year (Hallegatte et al., 2017). May of the recent disasters in India, triggered by climate and weather hazards resulted in colossal damages and losses to livelihood and infrastructure. In 2012, the world's largest blackout in the power sector hit India, affecting 600 million people across 22 States, thus exposing the vulnerability of the power sector to drought[9].

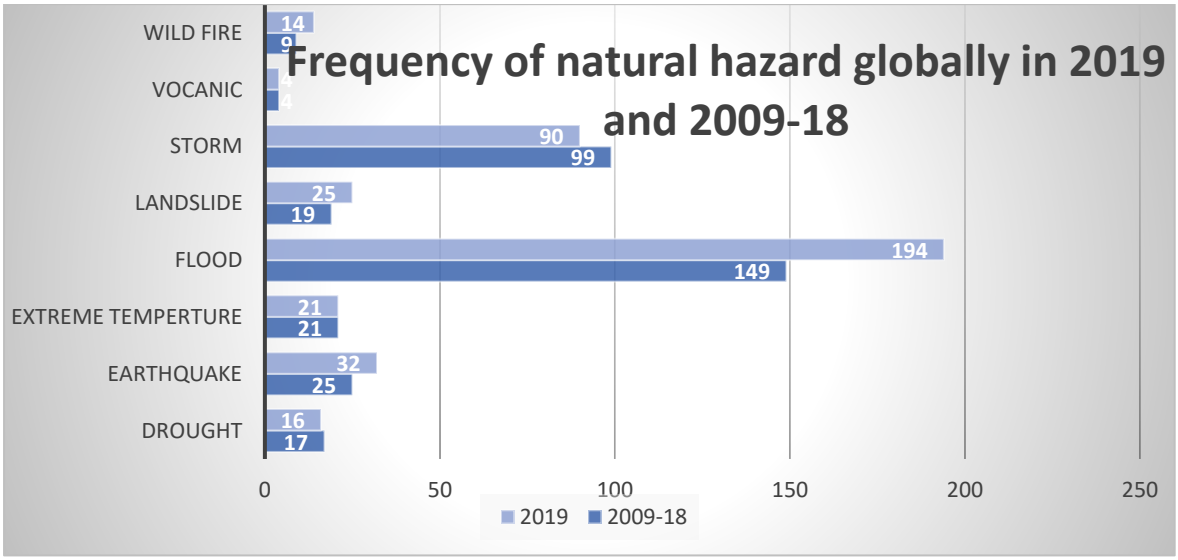



*Figure 4: Frequency of Natural Hazard in 2019 & 2009-18 (CRED)*

[6] https://dst.gov.in/sites/default/files/Full%20Report%20%281%29.pdf

[7] IPCC (2012): Climate change 2014: synthesis report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate

[8] Centre for Research on the Epidemiology of Disasters (CRED)

[9] https://www.ijert.org/power-blackout-a-black-day-in-north-india-power-outage-in-2012

## 4. Disaster Risk Reduction and Climate change Adaptation-

DRR and CCA represent policy goals, one concerned with a widely known problem in the field of disasters and the other with emerging issues related to climate change-induced disasters. DRR has focused on addressing existing risks related to all categories of hazards. Therefore, DRR looks at risks more broadly than just those related to climate. There are several geophysical hazards (e.g. Earthquakes, Landslides) that are unrelated to climate change, at least in the short to medium term. For this reason, there can never be a total convergence of DRR and CCA.

While DRR expands beyond weather and climate-related disasters, adaptation includes not only climate extremes but also the more slowly evolving risks posed by systematic trends such as increasing mean temperatures and glacier melts.

However, they overlap a great deal through the common factor of weather and climate therefore, it is important to implement them in a systematic and integrated manner. With the paradigm shift from relief and rehabilitation to risk reduction by making efforts towards institutionalizing several activities for preparedness, mitigation, and prevention, states have also started parallel activities of CCA as many of the risk reduction measures especially related to hydro-meteorological events are found to have similarities with CCA programs.

## 5. Disaster Management and Climate Change Governance in India

Until the 1990s, disaster management in India was primarily handled by the Ministry of Agriculture, reflecting its focus on droughts and food security. However, a major institutional shift occurred after the Bhuj Earthquake, leading to the transfer of disaster management responsibilities to the Ministry of Home Affairs (MHA) in 2002.A comprehensive legal and institutional framework was subsequently established through the Disaster Management Act in 2005. This Act provided a structured mechanism for disaster management at national, state, and district levels, including provisions for planning, preparedness, mitigation, and response. It led to the creation of key institutions such as the National Disaster Management Authority, State Disaster Management Authorities (SDMAs), and District Disaster Management Authorities (DDMAs).The Act also established specialized bodies like the National Disaster Response Force for emergency response and the National Institute of Disaster Management for training and capacity development. Over time, India has further strengthened its disaster management framework through the National Disaster Management Plan (updated periodically, most recently aligned with the Sendai Framework).

Parallelly, India's focus on climate change evolved through its engagement with international environmental agreements such as the Vienna Convention, Montreal Protocol, United Nations Framework Convention on Climate Change, and the Kyoto Protocol. These commitments shaped domestic environmental governance and policy frameworks.India has enacted several key legislations to address environmental and climate concerns, including the Forest Conservation Act, the Air Prevention and Control of Pollution Act, and the Energy Conservation Act. The Ministry of Environment, Forest and Climate Change (MoEFCC) serves

as the nodal agency for climate-related policies and programmes.A significant policy milestone was the establishment of the Prime Minister's Council on Climate Change in 2008, which guides national climate strategy. In the same year, India launched the National Action Plan on Climate Change, outlining eight national missions focusing on solar energy, energy efficiency, sustainable agriculture, water, and ecosystem conservation.

In recent years, India has further strengthened its climate commitments through its Nationally Determined Contributions (NDCs) under the Paris Agreement (updated in 2022), targeting:

- Reduction in emissions intensity of GDP by 45% by 2030 (from 2005 levels)
- Achieving 50% cumulative electric power capacity from non-fossil fuel sources
- Progress toward net-zero emissions by 2070

Additionally, there has been increasing convergence between disaster management and climate change adaptation through initiatives such as:

- State Action Plans on Climate Change (SAPCCs)
- Climate-resilient infrastructure programs
- Integration of early warning systems with disaster response mechanisms

In the year 2015, the Government of India adopted three landmark international agreements having bearing on Disaster Risk Reduction viz; Sendai Framework for Disaster Risk Reduction (SFDRR) March 2015, Sustainable Development Goals (SDGs) (2015-2030) in September 2015, and Paris Agreement on Climate Change at the 21st Conference of Parties (COP21) under the United Nations Framework Convention on Climate Change in December 2015. Thus, special emphasis has been given to carry out activities that would enhance outcomes based on coherence between the three international agreements. Various initiatives are taken up by many countries both in policy and practical action for Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) focus upon reducing the vulnerability of local community thereby enhancing resilience for minimizing the adverse impact of Disaster Risk and Climate Change. A new chapter has been added in NDMP 2019 (NDMA, 2019).

- **Chapter – 3**: Coherence and Mutual Reinforcement for DRR of Post-2015 Global Frameworks – Sendai, SDG and COP21

- **Section 6.2.6** – Mention about Climate Change Risk Management with emphasis that planning for DRR must be done in view of climatic risk and projected scenario. However, it also mentioned that there is major knowledge and data gap concerning climate change impacts, impact scenarios and its effects on various hydro-metrological hazards

# 6. Convergence of Climatic Risk with Natural and Man-made hazards

The regions already exposed to climate-related hazards and effects will be at greater risk due to a projected increase in the frequency and/or intensity of those hazards and effects because of global climate change. There is however consensus among experts that both CCA and DRR approaches have an objective of reducing factors that contribute to climate-related risk under the influence of existing and changing natural, environmental and anthropogenic factors while enabling sustainability in social and economic development. It is realized that several mitigation and prevention measures taken to blunt the potential of any hazard in the DRR exercise overlap with the measures taken under CCA in terms of their nature, contents and methodology which are employed to reduce the adverse effect of the potential hazard emanating from the climatic change.

Essentially, DRR has focused on addressing existing risks related to all categories of hazards. Therefore, DRR looks at risks more broadly than just those related to climate.There are several geophysical hazards (e.g. Earthquakes, Landslides) that are unrelated to climate change, at least in the short to medium term. For this reason, there can never be a total convergence of DRR and CCA. While DRR expands beyond weather and climate-related disasters, adaptation includes not only climate extremes, but also the more slowly evolving risks posed by systematic trends such as increasing mean temperatures and glacier melts. Analysing the differences between Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) projects is inherently complex, as many initiatives operate across multiple scales and sectors. These projects often range from community-based interventions to regional and national-level programmes, making clear distinctions challenging due to their overlapping objectives and integrated approaches.

It has been observed that the portfolio of DRR and CCA activities has expanded significantly in recent years. These efforts now encompass diverse sectors, including enhanced forecasting and early warning systems, improved water resource management, and increased efficiency in irrigation practices. Additionally, adaptation measures are being implemented across both urban and rural settings to address climate variability and disaster risks.

Furthermore, integrating adaptation strategies within thematic areas of disaster risk management—such as floods, droughts, coastal hazards, avalanches, and Glacial Lake Outburst Flood (GLOFs)—as well as watershed management, can substantially improve the effectiveness and sustainability of national and regional development planning. Such integration not only reduces vulnerability but also enhances long-term resilience and productivity.Thus, while there are clear synergies that must be exploited, there are also some mutually exclusive elements that need to be addressed separately.

## 6.1 Key sector for convergence and integration

The immediate task, is to capitalize on the common concerns of adaptation and disaster risk reduction, both in policies and practical action, and to seek the triple win of lower disaster

risks, adaptation to climate change, and sustainable development outcomes. In India agriculture is crucial for ensuring the food and livelihood security of the country and hence it is important that this sector becomes resilient to increasing climatic variability and changes. A resilient agricultural production system is the pre-requisite to sustain productivity in the event of extreme climatic variability. Although Indian farmers have evolved many coping mechanisms over the years, these have fallen short of an effective response strategy in dealing with recurrent and intense forms of extreme events on the one hand and gradual changes in climate parameters including rise in surface temperatures, changes in rainfall patterns, increase in evapo-transpiration rates and degrading soil moisture conditions on the other.

Indian agriculture sector due to climatic variability and extreme events would be accentuated at multiple levels including at the levels of crop or livestock, farm or cropping system and the food system. Adverse impacts on agricultural production would be severe in the absence of appropriate adaptation and mitigation measures with far reaching consequences in terms of shortages of food articles and rising prices which could endanger the food and livelihood security of our country. The need of the hour is, to develop a sound policy framework should address the issues of redesigning social sector with focus on vulnerable population, introduction of new credit instruments with deferred repayment liabilities during extreme weather events, and weather insurance as a major vehicle of risk transfer. Concerned institutions at national, state and local levels (SHGs, Rural Credit Institutions, Agricultural Cooperatives and Producers' Companies) should be strengthened towards enhancing the overall resilience (NAAS, 2013). The Government of India should move from reactive (relief payments) to practice (promoting insurance) approach in dealing with climate variability. Government should facilitate access to information and institutional support by expanding Automatic Weather Stations (AWS) networks to the Panchayat level and linking them to existing insurance mechanisms including Weather Based Crop, Insurance Scheme (WBCIS) and National Agriculture Insurance Scheme (NAIS), scaling the returns at that level.

## 6.2 Rationale for convergence of DRR and CCA

The convergence of Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) is essential for achieving efficient and sustainable development outcomes. The key reasons include:

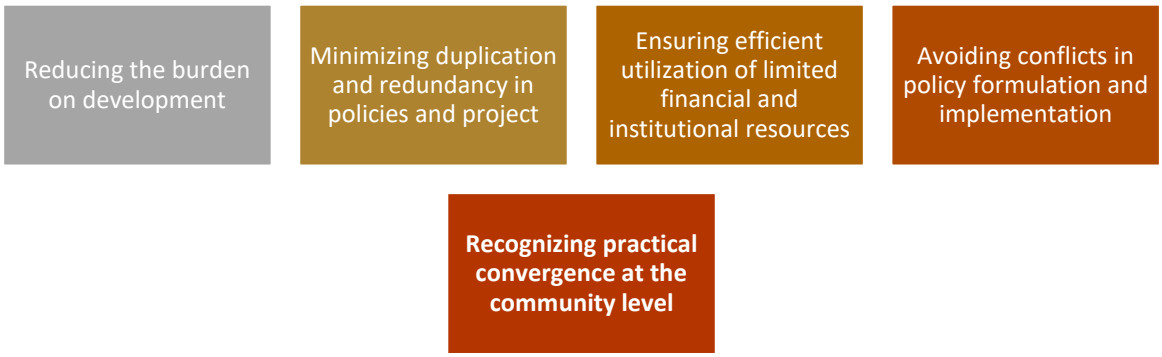



*Figure 5: Rationale of convergence of DRR and CCA*

Despite the clear benefits of integrating Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA), several challenges continue to hinder effective implementation. A major constraint lies in limited institutional and technical capacity, reflected in weak coordination mechanisms, inadequate communication, lack of political commitment, insufficient financial resources, and gaps in technical expertise. Additionally, DRR and CCA are often governed by separate policy frameworks and institutional structures, leading to fragmentation and reduced coherence in planning and execution. Perceptual barriers also exist, as some development practitioners may not fully recognize the value or necessity of integration. Furthermore, the difficulty in quantifying and demonstrating the long-term benefits of integrated approaches makes it challenging to justify investments and secure sustained funding, thereby slowing progress toward effective convergence.

An effective approach to integrating Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) lies in identifying relevant and strategic entry points within existing development processes. Environmental and health impact assessments serve as critical entry points for fostering inter-sectoral cooperation, as they are often aligned with high policy priorities. Similarly, initiatives aimed at enhancing food, water, and human security provide strong opportunities for integration, given their sensitivity to climate variability and their central role in disaster risk management.

These entry points also help establish clear linkages between current vulnerabilities and broader development goals, such as poverty reduction and global targets like the Millennium Development Goals (MDGs) and subsequent Sustainable Development Goals (SDGs).Other important entry points include:

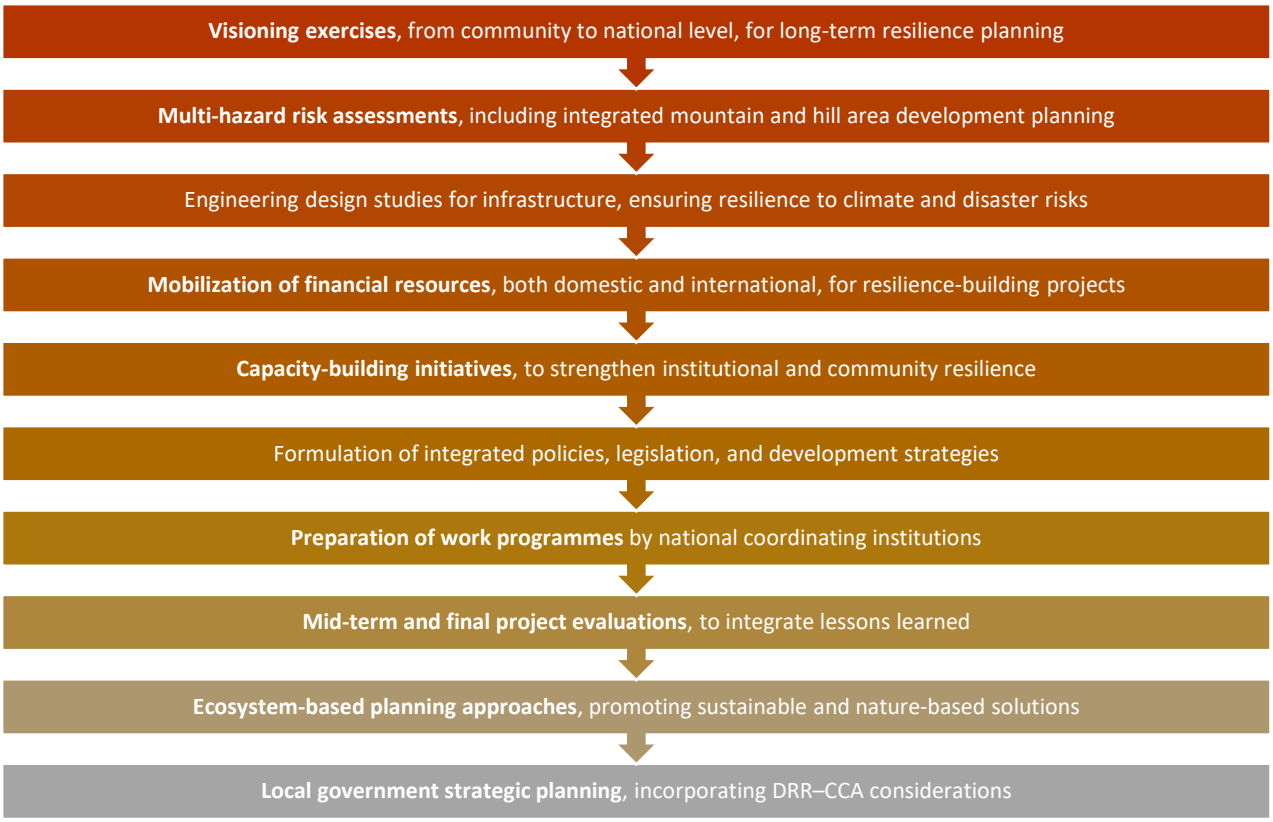



*Figure 6: Entry points for convergence of DRR and CCA*

# 7. Mainstreaming DRR and CCA into Development Planning

Mainstreaming DRR and CCA into development planning involves systematically incorporating risk and climate considerations into all stages of policy and project cycles. This requires critically evaluating each development activity—not only to reduce its vulnerability to natural hazards and climate impacts but also to ensure that it does not inadvertently increase risk.In this process, DRR and CCA measures are fully institutionalized within policies, plans, and practices across all sectors and governance levels. Disaster risks and climate change impacts are mandatorily integrated from the planning stage itself, ensuring that development outcomes are both sustainable and resilient. It means completely institutionalizing DRR within the development and recovery agenda. Accordingly, the following broad objectives of mainstreaming DRR into Development are:

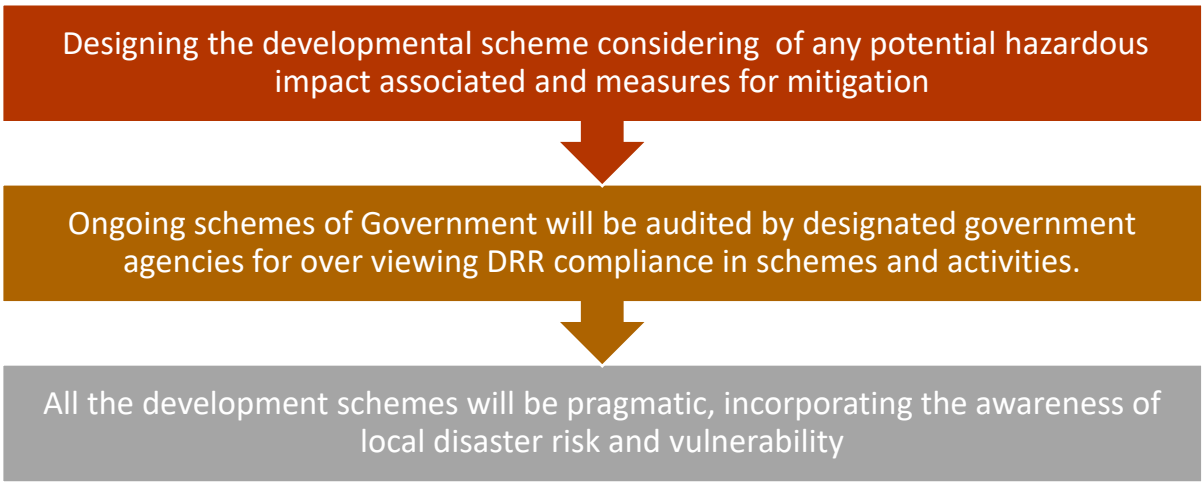



*Figure 7: Objectives of mainstreaming DRR and CCA in Developmental scheme*

Mainstreaming refers to the integration of policies and measures that address DRR and CCA into ongoing sectoral planning and management. Societies need to be able to adapt to both extreme events/disasters, as well as the slower and incremental consequences of climate change. Mainstreaming of DRR has been inhibited due to the fact that large, sudden-onset catastrophes have dominated the attention of the disaster management community, particularly the humanitarian sector. Mainstreaming of climate change is aided by the broad scope of adaptation, which provides a mechanism for reducing the unhelpful dichotomy between the humanitarian and developmental approaches. However, development practitioners tend to ignore both sudden and gradual-onset catastrophes, often seeing them more as interruptions to development. This gap is decreasing as development thinking recognises that risk is at the centre of the human dimensions of poverty and development. This reinforces the need to embrace a risk management approach, where all risks, including those related to climate change and disasters are considered.

## 8. Exploiting the Synergies

The common focus of CCA and DRR is reducing vulnerability and enhancing the resilience of societies to weather and climate hazards. Concepts common to the disciplines of DRR and CCA include:

**Resilience:** A resilient community is well-placed to manage hazards to minimize their effects and/ or to recover quickly from any negative impacts. Resilience varies greatly for different groups within a community. Building resilience at community level involves:

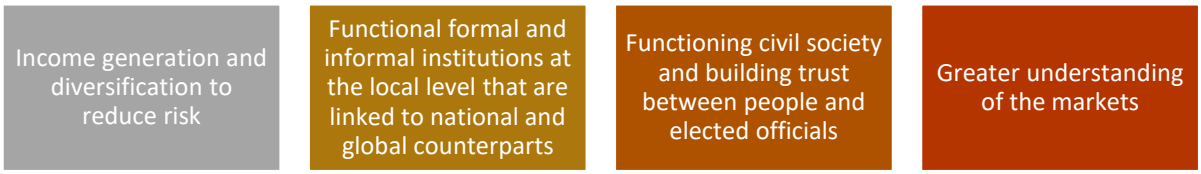
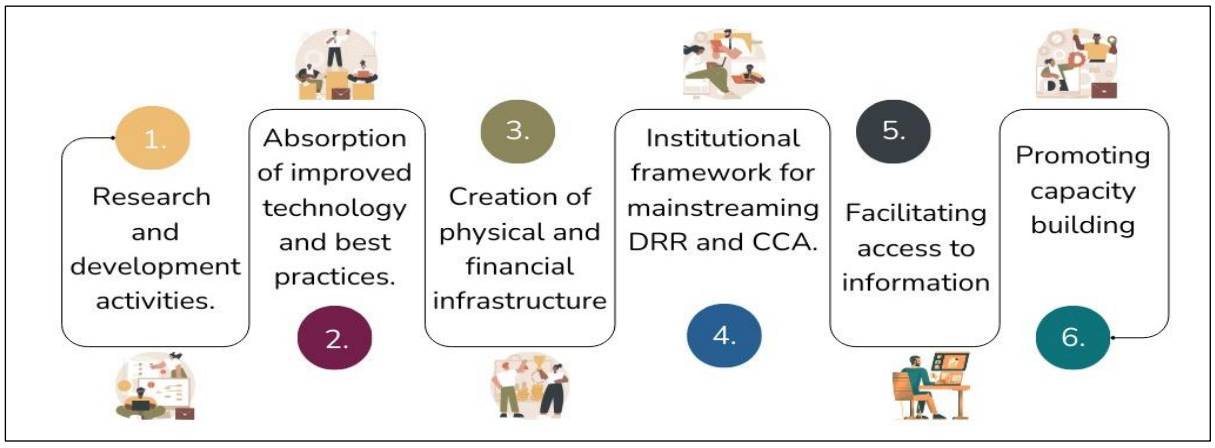



*Figure 8: Building community resilience*

**Risk management approach**: An excellent opportunity for integration of DRR and CAA arises from the fact that both communities of practice pursue a risk management approach. The ultimate goal of risk management is to provide a sound basis for making decisions on whether risks are acceptable or intolerable. It also assists in obtaining reliable information on how existing risks can be dealt with more appropriately. The risk management approach is used widely amongst other disciplines (e.g. infrastructure, business management, natural resource management).

**Risk-informed Policy/actions:** policies and actions are those that are beneficial to implement whether or not the consequences of climate change or a disaster turn out as expected. These interventions would be embedded:




Ultimately, mainstreaming fosters a proactive approach where resilience-building becomes an inherent component of development, rather than a reactive or standalone intervention. Effective mainstreaming of DRR and CCA ensures that development pathways are risk-informed, climate-resilient, and aligned with long-term sustainability goals.

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## Reference


1. Climate Resilient Agriculture in India, Policy Paper, National Academy of Agricultural Sciences, 2013. http://naas.org.in/Policy%20Papers/policy%2065.pdf.
2. Fourth Assessment Report of the Intergovernmental Panel on Climate Change (2012). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 p.
3. Gulati A., Terway P., and Hussain S. 2018. Crop insurance in India: key issues and way forward. ICRIER Working Paper No. 352. Indian Council for Research on International Economic Relations, New Delhi.
4. IPCC (2014): Climate change 2014: synthesis report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Core Writing Team, R.K. Pachauri & L.A. Meyer, eds. Geneva, Switzerland.
5. Iturrioz, R. (2009): Agricultural Insurance. Primer Series on Insurance, The World Bank, Washington, DC.
6. Natural Disasters Report (2019), CRED, USAID.
7. Parida, Y., & Goel, P.A. (2020). India is not prepared for natural disasters. The Hindu Business Line. Accessed from https://www.thehindubusinessline.com/opinion/indiais-not-prepared-for-natural-disasters/article30463153.ece
8. Poddar, K.M. 2018. Pradhan Mantri Fasal Bima Yojana (PMFBY) – Issues inhibiting its big success and probable way forward. IRDAI Journal, Volume XVI, No. 1, Quarterly April–June 2018. Published by Insurance Regulatory and Development Authority of India, Hyderabad
9. Swiss Re. 2020. Swiss Re Institute estimates global insured catastrophe losses of USD 31 billion in first half of 2020, mostly from secondary perils. August 11. Accessed from https://www.swissre.com/media/news-releases/nr-20200811-swiss-re-instituteestimates-global-insured-catastrophe-losses-usd-31-billion-mostly-from-secondary perils.html
10. NDMA (2019). "National Disaster Management Plan Revised, 2019," National Disaster Management Authority, Ministry of Home Affairs, Government of India, viewed on 25 June 2020, https://www.ndma.gov.in/im
11. The Disaster Management Act (2005), Government of India,
12. National Action Plan on Climate Change (NAPCC, 2008)
13. India's Updated NDC (2022) submitted to UNFCCC.