

Review Paper:

Disaster Management in India: Need for an Integrated Approach

Divi Sriram^{1,2*}, Dorasamy N.³ and Nakum Vipul¹

1. Department of Public Policy and Administration, Pandit Deendayal Energy University, INDIA

2. Faculty of Management Sciences, Durban University of Technology, SOUTH AFRICA

3. Department of Public Management and Economics, Durban University of Technology, SOUTH AFRICA

*sriram_divi@yahoo.co.in

Abstract

It is now widely known that the hazards can be natural, but most disasters are 'human-made'. The failure to properly implement developmental policies and practices with due consideration to disaster risk management is the leading cause of turning a hazard into a disaster.²⁵ This, in return, negatively affects sustainable development which ultimately affects the weakest and the poorest sections of society. Disaster impacts have been felt on a wide range of sectors and sections of the population. They are curbing progress made toward achieving the Sendai Framework targets, and SDGs. Climate and human-induced disaster events have exposed several underlying facets of risks' systemic and cascading nature. There is an urgent need to identify, analyse and better understand the multi-hazard, systemic and cascading nature of the disaster and climate risks, their inter-linkages, and interplay.

A holistic understanding of risk is crucial for furthering the priorities of action laid under the Sendai Framework and the envisioned SDGs and ensuring a better, greener, resilient and sustainable society. We have tried to study the disaster management frameworks, plans and policies of 10 countries including India to understand the institutional mechanisms and integration of critical aspects of dual/multi disaster scenarios. When the traditional disasters hit the community following the COVID-19 pandemic, the need arises to have an integrated model that can assist in the preparation and response to the dual situation simultaneously. Efforts are made to put the experiences into a framework for an integrated approach preparing for dual/multi-disaster scenarios.

Keywords: Disaster Management, Hazard, Climate Change, COVID-19, Institutional Mechanism.

Introduction

A disaster is a calamity that occurs unexpectedly and interrupts society's normal functioning and results in massive harm to people, infrastructure, the economy, and the environment. It makes affected communities incapable of coming out of such losses by using the resources they own, thereby requires an external aid to cope with the situation.

Disaster is “a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability, and capacity, leading to one or more of the following: human, material, economic and environmental losses, and impacts”.²⁵

The Government of India, under the Disaster Management Act, 2005, defined disaster as “a catastrophe, mishap, calamity or grave occurrence in any area, arising from the natural or manmade cause, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area”.¹³

The risk of climate change-induced disasters has increased and posed challenges of cascading risks exposing the inherent vulnerabilities of the systems and communities. At the international level, three frameworks, namely the Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030, Sustainable Development Goals (SDGs), and the Paris Agreement guide the disaster risk reduction efforts. The connection between the global agendas, SDGs, SFDRR, and Paris Agreement is critical to protect development initiatives from the effects of climate change and the dangers associated with disasters.

Figure 1 shows the interconnectedness between three global agendas. Both climate change and disasters have their implications for sustainable development. Hence, DRR has been recognised as an essential component in the pathway toward sustainable development. The strong collaboration of SDGs, SFDRR, and Climate Change Adaptation (CCA) at local levels necessitates greater cooperation and alliances among the various affected stakeholders, not just in making widespread plans and other policies but also has to look into a deeper level of execution and tracking and evaluation by forming alliances with local governments, local experts, NGOs and businesses.²¹ Along with establishing institutions adopting these frameworks, different countries have formulated national-level frameworks, road maps, and action plans to deal with disasters more profoundly. These focal points on a national and subnational scale are the key to mainstreaming and tracking the progress of indicators and targets they seek to achieve in the three frameworks. Convergence of these frameworks takes place on the ground to create a sustainable and resilient society.

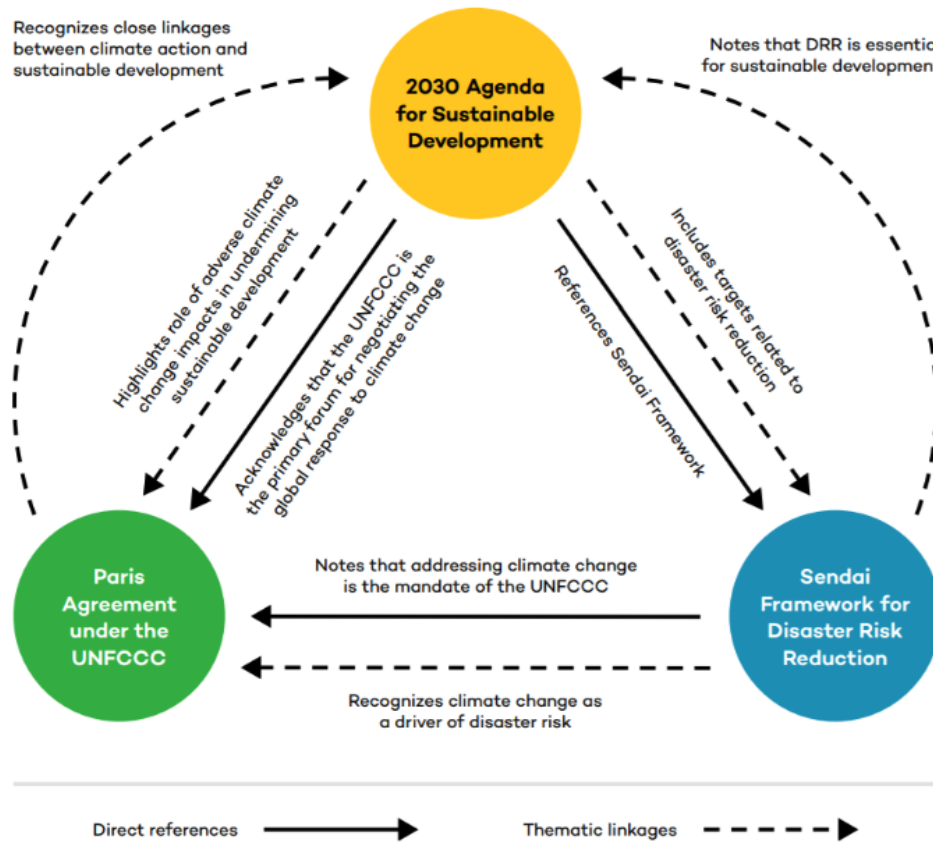


Figure 1: Connections in the context of the global agendas
(Source: NAP Global Network, 2019)

The terminologies: There is a growing concern over calling a disaster a “natural”. It is now believed, and as supported by the NoNaturalDisasters campaign, that whilst some hazards are natural and unavoidable, human actions and decisions lead to man-made disasters. The campaign calls the term ‘natural disaster’ incorrect and misleading. The terms disaster and hazards shall not be used interchangeably. Hazard is “a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation”²⁵ which may or may not result in a disaster. Hence, using correct terminology would provide greater clarity to understand the concepts.

Institutional mechanisms for disaster management in different countries: As per the World Risk Index, 2019, approximately 180 countries are at risk of disasters. China, India, the United States, Japan, Indonesia, and the Philippines were among the countries with the most natural disasters in 2018. These countries have robust institutional mechanisms for disaster management, while some have also developed national level disaster management plans. A few developed and developing countries' institutional machinery and disaster management plans have been reviewed.

United States of America: The USA initiated efforts toward disaster management institution, act and policies after 1930. The Federal Emergency Management Agency (FEMA) was

established in 1979 for financial assistance, coordination and management at the time of disasters. Post the 9/11 attack, Department of Homeland Security was constituted, and FEMA was amalgamated with the same department. Apart from National Response Framework (NRF), the Government also formulated the National Disaster Recovery Framework (NDRF) in 2016 to provide effective recovery support to disaster-affected regions and work concurrently with the NRF. It focuses on the collaborative and inclusive planning processes and emphasises preparing for recovery in advance of a disaster.

The framework noticeably exemplified the role and responsibilities of people involved in recovery and guidance for recovery planning. State, territorial and local governments are directed to respond to small-scale emergencies on their own. If it goes beyond its capacity, the event has been declared a disaster by the federal Government.¹⁹

Japan: Japan has adopted the decentralised approach. Therefore, the responsibilities of all the three levels of Government (national, prefectural, and municipal government) regarding disaster reduction are clearly defined. A Disaster Risk Management (DRM) master plan has also been developed. The Central Disaster Management Council created the Basic Disaster Management Plan, which serves as the foundation for developing Disaster

Management Operation Plans and Local Disaster Management Plans. The role of the central government, public businesses, and local governments in implementing the programmes is outlined in the plan. Specific improvements for disaster management for disasters such as tsunamis and earthquakes have been made in plans, as the country is prone to the risk of earthquakes. The National Development Plan of Japan integrates safety, mitigation and risk reduction. Different plans for respective sectors have also been developed to incorporate risk reduction into development.¹²

China: The SARS epidemic of 2003 triggered an emergency management system in China. After that, the Government of China established the Emergency Management Office and prepared a "Master State Plan for Rapid Response to Public Emergencies" too.²² Other ministries such as the Ministry of Public Security, the Ministry of Health, and offices such as the National Civil Defence (CD) and the Emergency Management Office, assist the Ministry of Civil Affairs with disaster relief in China (EMO). EMO is also established at the local level as per the Government's directives. The management of disasters is done through a single concerned department in the country concerning the type of disaster. Cities and provinces all have formulated their emergency plans. In the recent past, the People's Republic of China issued the National Natural Disaster Reduction Plan (1998-2010) and the National Comprehensive Disaster Prevention and Mitigation Twelfth Five-Year Plan (2011-2015) for disaster reduction and management.²⁷

Australia: The Emergency Management Australia (EMA) section of Australia's Department of Home Affairs delivers programmes, policies, and services to strengthen the country's national security and emergency management capabilities. In the case of a disaster, the Australian Government Disaster Response Plan, 2017 (COMDISPLAN) provides the organisational provisions for delivering non-financial support to States whereas the National Catastrophic Disaster Plan (NATCATDISPLAN) serves as a contingency plan for providing coordinated support by the federal, state, and territorial governments to direct disaster response and recovery in a non-jurisdictional area. The other plans dealing with meteorological and aviation disasters are formulated separately. To lessen the danger of natural disasters, the National Disaster Risk Reduction Framework was created. This framework prioritises the international framework's disaster preparedness and recovery efforts, namely Sendai into action for the Australian context.^{2,7}

South Africa: In South Africa, the responsibility of disaster management is on the Department of Cooperative Governance. In each of the country's eight provinces, the National Disaster Management Centre is institutionalised including disaster-management centres and advisory forums. South Africa's national disaster management system includes four key performance areas (KPA) and three

enablers – establishing disaster management institutional frameworks at three levels of government, addressing the need for disaster risk assessment, leading risk reduction action, introducing disaster risk planning and executing and implementing disaster response, recovery and rehabilitation priorities.¹⁸

Indonesia: The National Disaster Management Law 2007 led to Indonesia's national disaster management agency [Badan Nasional Penanggulangan Bencana (BNPB)] and its regional agencies. These agencies have developed appropriate procedures to respond to any scale of the disaster. In 2005, more than 120 local contingency plans were crafted but were not impactful; they lacked the base of local risk analysis and were not at par with the national and provincial plans. In 2014, the process for formulating National Disaster Response Framework (NDRF) was started by BNPB but has not been accomplished to date. This framework will integrate all the existing laws and guidelines around disaster response and further clarify the role and responsibility of all key actors.⁴

Israel: Israel's approach to disaster is more military-centric due to terrorism and other conflicts. In 1999, the inter-ministerial steering committee for disaster reduction was formatted, limited to earthquakes only. However, a significant amount of importance has been given to managing all sorts of disasters in recent years. Emergency management in the country is looked after by the Israel Defence Force's Home Front Command and the National Emergency Agency, known as the RACHEL, established in 2007.²⁰ Responsibilities for emergency management have been allotted to different authorities. So far, no national disaster management plan or structure has been created. The Ministry of Interior, however, has prepared a national outline plan for renovating old buildings for earthquake protection because the country is more prone to earthquakes.²⁴

Singapore: The Ministry of Home Affairs is in charge of civil defence emergency preparedness and disaster management in Singapore. The Ministry oversees the Singapore Civil Defence Force (SCDF) and the Singapore Police Force which coordinate various disaster-related programmes and activities. Other ministries and departments play the role of supporting agencies in the same. The Fire Safety Act 1993, the Civil Defence Act 1986 and the Civil Defence Shelter Act 1997 guide disaster management activities. The SCDF has also developed the Operational Civil Emergency Plan, which is a national response plan code that outlines the duties of all the concerned institutions in the management of the disaster. The country also has a well-developed specific response plan for international disasters.¹

Nigeria: Disaster management in Nigeria is based on the shared responsibility approach wherein an emergency management authority is established at the national, state, and local level of government. Apart from this, relevant

departments like Disaster Response Units, military, paramilitary and police force, community, and volunteers also manage disasters through involvement with Government agencies. National Disaster Management Framework of 2010 directs for effective and efficient disaster management in the country. Various Disaster Response Plans have also been developed at different levels. The country's framework guides the integration and coordinating roles of all levels of Government in managing disasters.¹⁹

Institutionalizing India’s mechanism for disaster management

India is the 7th largest country globally with 32,87,590 sq. km (12,69,346 sq mi) (NIDM, 2014) and according to the Global Climate Risk Index Report 2020, India was in the 5th position among the ten most-affected countries through disasters worldwide in 2018. Floods, cyclones, earthquakes, cloud bursts, droughts, landslides, and heat/cold waves are among natural calamities that India is particularly exposed to due to its unique geographic characteristics. Nearly all of the 28 states and nine union territories are classified as disaster-prone.¹⁴⁻¹⁷ Earthquakes affect 58.6% of the country's landmass while floods and river erosion affect 12%, and droughts, landslides and avalanches affect 68 percent of the cultivatable area. On roughly 5,700 miles of the 7,516 km long coastline, cyclones and tsunamis are also common occurrences.¹⁴⁻¹⁷ Thus, such topographic features are one of the factors responsible for natural calamities.

Looking at the multi-hazard profile of India, there must be a robust mechanism for disaster management both in planning and implementation. The authors attempted to examine the institutional mechanism as well as the national catastrophe management strategy. Recognizing the importance of

disaster management at the local level, the Sendai Framework encourages localization and implementation at the smallest possible scale. By laying the administrative mechanism, both the National Disaster Management Plan, 2019 and National Disaster Management Act, 2005 recognise its implementation at the lowest administration level.

Integration among local, state, and central governments:

In India, the Ministry of Home Affairs is the nodal agency for disaster relief. In 2005, the Disaster Management Act was enacted to ensure that disasters are effectively managed. As indicated in figure 3, this act supervised the establishment of disaster management authorities at the national, state, and district levels. The National Disaster Management Authority (NDMA) was established as the highest authority in charge of formulating national policies, plans, and strategies to enable timely disaster response throughout the country. The National Institute of Disaster Management was formed under the Disaster Management Act of 2005 (NIDM). NIDM was established with the goal of enhancing disaster resilience in India by increasing disaster preventive and preparedness capabilities at all levels of Government. Moreover, the National Disaster Response Force (NDRF) has also been established to respond to disasters.¹⁴⁻¹⁷

State Governments implement disaster management policies and plans through State Disaster Management Authorities (SDMA), and disaster management then cascades down to District Disaster Management Authorities (DDMA), which are also expected to have district disaster management plans. Through their state and district disaster management authorities, state governments are encouraging panchayats to systematically integrate disaster risk management components into their village development plans or Gram Panchayat Development Plan (GPDP).

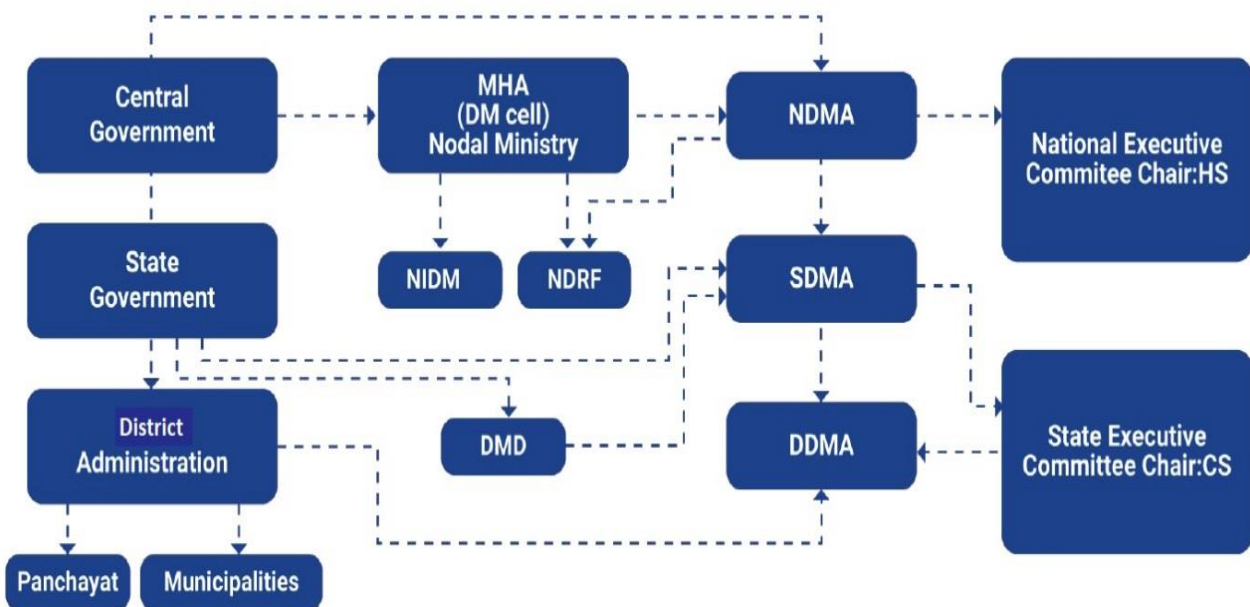


Figure 2: Institutionalized Disaster Management Framework of India
(Source: Invest India)¹¹

State disaster management institutes such as the Gujarat Institute of Disaster Management (GIDM), an apex institute for disaster risk management training and capacity building for Gujarat, are training local level stakeholders to prepare and implement risk-informed GPD. Relatedly, to establish an effective coordination mechanism and deliver the required services to the urban populace, the Government of Andhra Pradesh has established Ward Secretariate at the very local level in urban local bodies.

Although the Ministry of Home Affairs is the overall nodal ministry in charge of disaster management activities on a national level in India, other nodal ministries are also responsible for mitigation and specialised response. Drought relief is handled by the Ministry of Agriculture, while air accidents are handled by the Ministry of Civil Aviation, rail accidents are handled by the Ministry of Railways, chemical disasters are handled by the Ministry of Environment and Forests, biological disasters are handled by the Ministry of Health, and nuclear disasters are handled by the Department of Atomic Energy. Other technical organisations such as the Indian Meteorological Department are crucial in providing alerts regarding heavy rains, cyclones, and heatwaves.

India's National Disaster Management Plan (NDMP):

Only in accordance with the SFDRR's priorities was the National Disaster Management Plan prepared in 2016 and revised in 2019. For each hazard, this method emphasises five primary areas for action: Understanding Risk, Inter-Agency Coordination, Disaster Risk Reduction – Structural Measures, Disaster Risk Reduction – Non-Structural Measures, and Capacity Development are all topics covered in this report. The plan advocates for an integrated approach, and that is why it has specified the role and responsibilities of every department engaged in the management of disasters.¹⁴

Because disaster management is the duty of States, Government departments and districts are also directed to develop disaster plans that include mitigation, preparedness, and response elements. The National Disaster Response Force (NDRF), State Disaster Response Force (SDRF), and District Emergency Operations Centre (DEOC) have their responsibilities clearly outlined by the Incident Response System (IRS).¹⁴ Local governments are also directed to manage the disasters immediately at the local level with district and state government assistance.

Missing out adequate preparedness for emerging challenges posed by multi-disaster scenario

Countries worldwide, including India, have faced several natural disasters such as cyclones and floods along with the COVID-19 pandemic. Other challenges confronted responses to such disasters during the pandemic. For example, in India, Cyclone Nisarga in Maharashtra, Cyclone Amphan in West Bengal and Odisha, Cyclone Yaas in West Bengal and adjoining Odisha, Cyclone Tauktae in Maharashtra, Karnataka and Gujarat, and Cyclone Gulaab in

Andhra Pradesh and adjoining Odisha posed another level of challenges for government authorities and response agencies. These demanded large scale evacuation of people in low line areas to safe shelter points. Communities and responding agencies needed to follow COVID 19 measures such social separation, wearing masks, and hand sanitization. The government authorities also faced challenges in identifying and increasing the number of shelters as the affective capacities of the cyclone and flood shelters were reduced to almost 50 per cent. Response agencies also faced reluctance from the community to evacuate to safer places due to fear of getting affected by COVID 19.¹⁴

After reviewing literature related to disaster management frameworks, plans and policies of 10 countries including India, authors conclude that the current institutional mechanism does not adequately discuss preparing for a multi-disaster response. It broadly discusses the sequential steps of disaster management. Preparing for the situations arising from multiple disasters at a time or dual-disaster scenarios that emerged during the COVID 19 pandemic are not discussed. When the COVID 19 pandemic hit, the standard practise of responding to calamities was put to the test. The disaster management plans and Standard Operating Procedures (SOP) thus should be reviewed and integrated in a methodical manner. Not only for COVID-19, but other hazard potential double-disaster scenarios should also be considered.

There is lack of framework for disaster management mechanisms at a very local level. Most frameworks define a three-tier mechanism in India – national level, state level, and district level. Other nations have also defined a similar mechanism at national and sub-national levels considering the level of administrative units in their respective countries such as national, prefectural and municipal governments in Japan. The local level is the administrative level, even below the district administration. In India, an administrative level below the district is known as a block in most states. At the same time, it is also called a tehsil in some states such as Gujarat, Madhya Pradesh, Uttarakhand, Uttar Pradesh etc.

While working in the field and interacting with block-level officials in Andhra Pradesh, Bihar, Chhattisgarh, Gujarat and Odisha, the authors have experienced local-level initiatives and coordination mechanisms approaches and realised the scope of documenting in the form of a framework.

Recommendations

This study discussed the key two factors, institutional mechanisms for disaster management in different countries and the emerging challenges in disaster risk management. A response to dual or multi-disaster scenarios needs an integrated model guided by the three international frameworks – SDGs, SFDRR, and the Paris Agreement. In India, the coordinated efforts of communities, state

governments and the central Government, and timely preparedness, early warning and evacuation have worked well.¹⁴ The integrated model presented in this paper emphasises the current need and urgency that the existing institutional mechanisms must adapt and align their efforts to prepare to respond the future disasters effectively.

Disaster Risk Management and its Integrated Model: Mitigation, readiness, response, and recovery are the four stages of the disaster management cycle. As discussed, this needs a systematic integration of various aspects, especially those addressing the challenges posed by the recent multi-disaster sceneries and recent developments in disaster risk management.

The preparedness phase is one of the most critical phases and plays a crucial role in minimising the overall impact of the disaster. It covers several activities that ultimately prepare for a better-coordinated response. It is now imperative to revisit the disaster risk management plans and SOPs in the preparedness phase to guide a better-coordinated response at the time of disaster. Similarly, if other phases can also be integrated with multi disasters, community-centric approaches would help respond to the new/emerging situations and achieve sustainable social development. Figure 3 highlights some of the essential aspects for integration into each phase.

It is now imperative to analyse and foresee potential double/multi disaster scenarios and plan the subsequent actions accordingly. As discussed in the case of COVID-19, the major challenge it poses to the resources, be it human resources or the services. Two sets of resources are required when the nature of combining disasters is different.

Effective coordination for the “zero casualty” approach at the local level: A coordinated response is critical for effective disaster management. It requires greater cohesion

and responsibility among different departments responding to the same disaster. For example, in Odisha, coordination remained a key in achieving the “zero casualty” target in recent disasters that the state has faced. The key frontline departments such as revenue and disaster management, health, police, fire brigade, agriculture, horticulture, veterinary, irrigation, education, food supply, and panchayat established a robust coordination mechanism that helped effective disaster responses.

The standard operating procedure for coordination among agencies for disaster response mostly remains the same across all the states in India. Under the supervision of SDMA, the State Emergency Operation Centre (SEOC) serves as a point of coordination at the state level. The District Emergency Operation Centre (DEOC), chaired by the district collector/magistrate, coordinates at the district level under the supervision of the DDMA. The coordination point for disaster response at the local level is block or tehsil. For example, in the State of Odisha, a block development officer (BDO) is the focal point at the block level. The block-level coordination mechanism has been explained in figure 4.

It was shared by the BDO, Astaranga, Puri district of Odisha that they coordinate with the block level representatives of each line department, response agencies and communities with a zero-casualty approach. The response agencies such as the fire brigade, police, and public health deploy their Rapid Response Teams (RRT) for the primary field operations. Other line departments play other specific roles. Department of Education ensures the provisioning of schools as shelter points with Water, Sanitation and Hygiene (WASH) services. The community supports evacuation and shelter management services that assist the most vulnerable individuals including pregnant women, the elderly, those with disabilities and children.

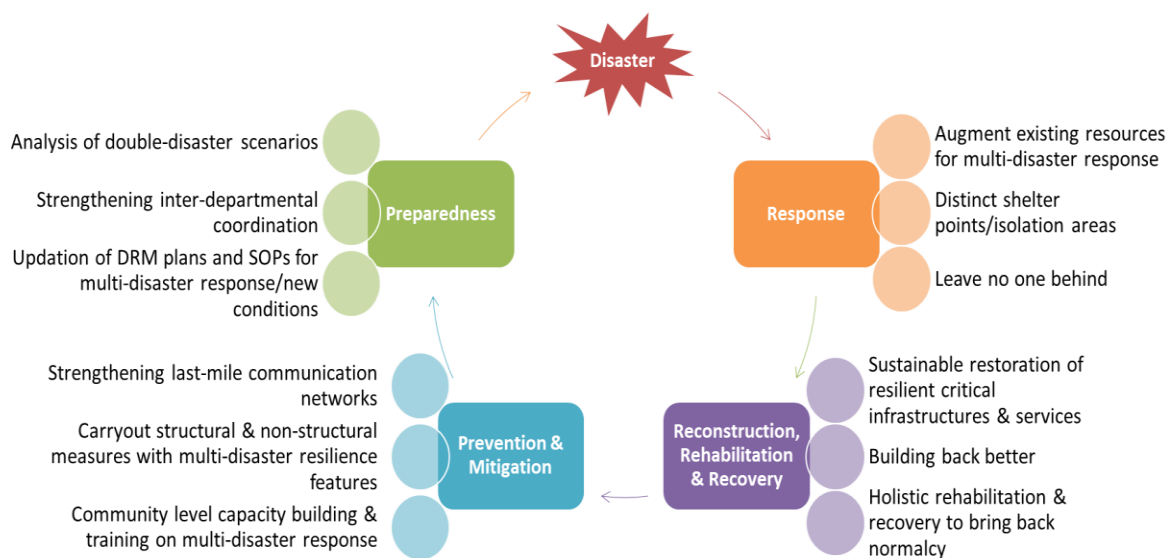


Figure 3: An Integrated Model for Disaster Risk Management
(Source: Self-generated by researchers)

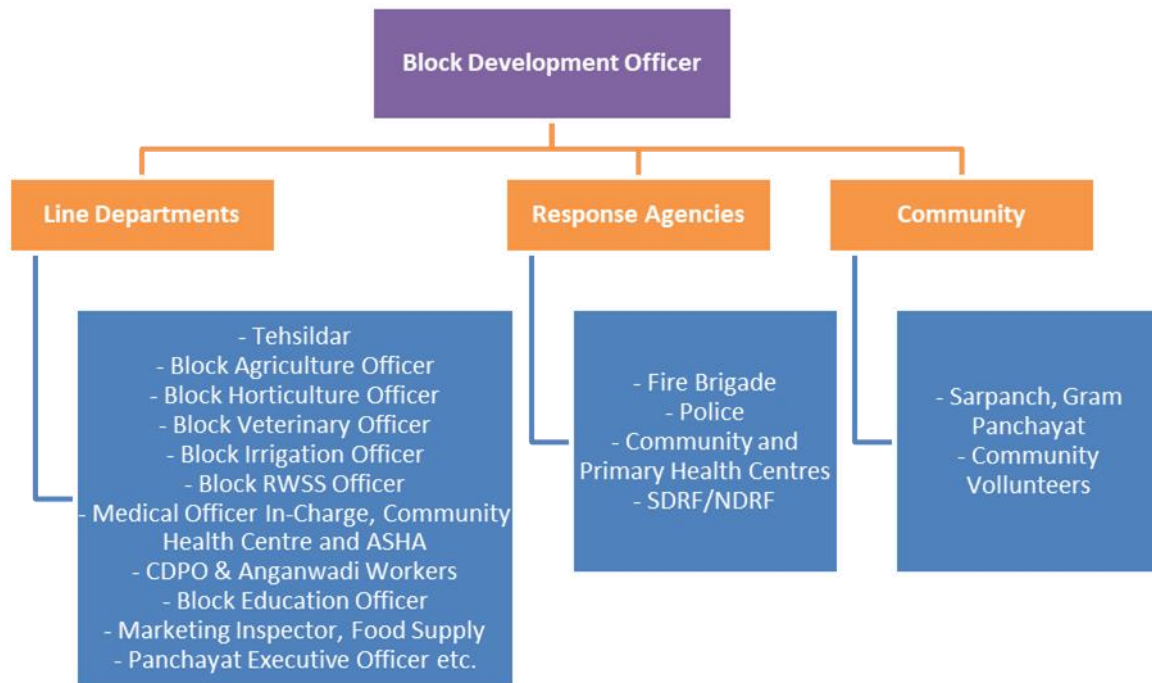


Figure 4: Coordination Mechanism at Block Level

(Source: Self-generated by researchers)

Strengthening of disaster response forces: Large scale disasters in India often responded through specialised response teams such as the NDRF and SDRF. There are 12 NDRF battalions fully functional in India, and four new battalions have also been raised. These are strategically deployed across the nation to respond to natural and man-made catastrophes. Similarly, the SDRF has also been constituted by the State Governments for rapid response to disasters.

However, the current trend of increasing frequency and severity of disasters in India has amplified the need for such trained disaster response forces. The line departments and response agencies located at the local level such as the fire brigade, police, health, and other departments dealing with volunteers such as civil defence, home guards, National Cadet Corps (NCC), National Service Scheme (NSS) and Nehru Yuva Kendra, can help to bridge this gap. For example, it was shared by the fire station officers in the State of Odisha that fire brigade personnel are well trained and capacitated to respond to cyclones and floods, other than firefighting. It was shared by the District Fire Officer, Balasore, that it was difficult for teams to conduct the field operations with personal protective equipment (PPE). Despite adhering to all protocols and safety measures, more than 100 NDRF personnel tested positive for COVID-19 after cyclone Amphan.¹⁴

Therefore, the teams of different response agencies should need adequate training in responding to dual-disaster scenarios especially responding with PPEs, to minimise their risk of contamination without losing the efficiency of the response. Communities, the first respondents to a disaster

situation, should volunteer locally, especially youth and those vulnerable people who spend most of their time at home. Females and elders should also be trained in basic disaster response tactics. The approach of leaving no one behind and reaching out to the last mile can be achieved by strengthening the community at the local level.

Incorporating DRR and CCA principles into the development plans: Integration of programmes, collaboration with agencies, capacity building, and innovation in DRM approaches can help reach the final goal of attaining better cooperation in executing the SDGs, SFDRR and CCA. These can improve national and local level planning and can help prevent any losses and damage occurring from disasters and climate change.

The Indian Government believes that "Centrally Sponsored Programmes" or "national flagship schemes" can be utilised to successfully mainstream or integrate DRR and CCA measures and principles into policy frameworks. With the advancements in policy-making, planning, and efficient implementation of the mainstreaming of DRR and CCA measures in India, the method to incorporating DRR and CCA concepts and measures into development plans is changing.

Conclusion

It is also a fact that for proper implementation of local action based upon local knowledge and awareness, there needs to be the promotion and encouragement of decision-making at the local level. An adequate mechanism, both institutionally and financially, is required to ensure proper mainstreaming and to maintain the drive towards better DRR and CCA

concerns in the flagship programmes, given the need for overall socio-economic development.

References

- Asia Disaster Reduction Centre, 'Country Report on Disaster Reduction Measures', Republic of Singapore, Available at: <https://www.adrc.asia/countryreport/SGP/SGPeng98/index.pdf> (1999)
- Australian Government, 'COMDISPLAN 2017', Australian Government Disaster Response Plan, Available at: <https://www.homeaffairs.gov.au/emergency/files/plan-disaster-response.pdf> (2017)
- Banerjee R., Orissa cyclone leaves a trail of devastation, epidemic, hunger and despair, India Today, Available at: <https://www.indiatoday.in/magazine/cover-story/story/19991115-orissa-cyclone-leaves-a-trail-of-devastation-epidemic-hunger-and-despair-781575-1999-11-15> [Accessed 28 Dec. 2021] (2013)
- Bisri M., Inter-organisational network in Indonesia during disasters: Examples and research agenda on disaster management, IOP Conf. Ser.: Earth Environ. Sci., Available at: <https://iopscience.iop.org/article/10.1088/1755-1315/56/1/012023.pdf> (2017)
- Commonwealth of Australia, National Disaster Risk Reduction Framework, Department of Home Affairs, Available at: <https://www.homeaffairs.gov.au/emergency/files/national-disaster-risk-reduction-framework.pdf>. (2018)
- Eckstein D., Künzel V., Schäfer L. and Winges M., Global climate risk index 2020, Germanwatch, Available at: https://germanwatch.org/sites/germanwatch.org/files/20-2-01e%20Global%20Climate%20Risk%20Index%202020_14.pdf (2018)
- Elphick K., National emergency and disaster response arrangements in Australia: a quick guide, Parliament of Australia, Available at: https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1920/Quick_Guides/NationalEmergencyDisasterManagement (2020)
- FEMA, National Disaster Recovery Framework - Strengthening Disaster Recovery for the Nation, Available at: <https://www.fema.gov/pdf/recoveryframework/ndrf.pdf> (2011)
- Government of India, The Disaster Management Act, Available at: <https://cdn.s3waas.gov.in/s365658fde58ab3c2b6e5132a39fae7cb9/uploads/2018/04/2018041720.pdf> (2005)
- Hodgkin D., Emergency Response Preparedness in Indonesia A Consultation Report prepared exclusively for the Indonesia Humanitarian Country Team, Humanitarian Benchmark Consulting, Available at: https://www.who.int/docs/default-source/searo/indonesia/non-who-publications/2016-emergency-response-preparedness-report-in-indonesia-eng.pdf?sfvrsn=1905f2b4_2 (2016)
- Invest India, Emerging Technology Trends in Disaster Management, National Investment Promotion and Facilitation Agency (2021)
- Liyanarachchi C., A Study on the Disaster Management Framework of Japan, DMC Srilanka, Available at: https://www.adrc.asia/aboutus/vrdata/finalreport/2015B_LKA_fr.pdf (2016)
- National Disaster Management Authority, National Disaster Management Guidelines Incident Response System, Available at: https://nidm.gov.in/PDF/guidelines/Incident_Response_System.pdf (2010)
- National Disaster Management Authority, COVID-19 Impacts and Responses: The Indian Experience, New Delhi, National Disaster Management Authority, Available at: <https://ndma.gov.in/sites/default/files/PDF/covid/COVID-19-Indian-Experience.pdf>. (2020)
- National Institute of Disaster Management, Country Profile of Australia, Available at: https://nidm.gov.in/easindia2014/err/pdf/country_profile/Australia.pdf [Accessed 28 Feb. 2022] (2014)
- National Institute of Disaster Management, Country Profile of Japan, Available at: https://nidm.gov.in/easindia2014/err/pdf/country_profile/Japan.pdf, [Accessed 28 Feb. 2022] (2014)
- National Institute of Disaster Management, Country Profile of The People's Republic of China, Available at: https://nidm.gov.in/easindia2014/err/pdf/country_profile/China.pdf, [Accessed 28 Feb. 2022] (2014)
- Prevention Web, South Africa: National disaster management framework, Available at: <https://www.preventionweb.net/english/professional/policies/v.php?id=60361> (2005)
- Prevention Web, National Disaster Framework', Nigerian Government, Available at: https://www.preventionweb.net/files/21708_nigherianationaldisastermanagementf.pdf (2010)
- Rozdilsky J., Emergency Management in Israel: Context and Characteristics, Western Illinois University, Available at: <https://training.fema.gov/hiedu/downloads/compemgmtbookproject/comparative%20em%20book%20-%20em%20in%20israel-%20context%20and%20characteristics.pdf>. (2009)
- Shaw R., Prabhakar S. and Chiba Y., SDGs, DRR and CCA: Potential for Strengthening Inter-linkages, Institute for Global Environmental Strategies, Available online: <http://www.jstor.org/stable/resrep02906> (2016)
- Shi P., Liu J., Yao Q., Tang D. and Yang X., Integrated Disaster Risk Management of China, National Natural Science Foundation of China, Available at: <https://www.oecd.org/pensions/insurance/38120232.pdf>, [Accessed 23 Mar. 2022] (2007)
- South African Government, Disaster management, South African Government, Available at: <https://www.gov.za/about-government/government-programmes/disaster-management> (2022)
- State of Israel, Steering Committee for Disaster Reduction, The Geophysical Institute of Israel, Available at: <https://www.unisdr.org/2005/mdgs-drr/national-reports/Israel-report.pdf> (2005)
- United Nations Office for Disaster Risk Reduction, Sendai Framework for Disaster Risk Reduction 2015–2030, Available at: https://www.preventionweb.net/files/43291_sendaiframeworkfordren.pdf (2015)

26. World Meteorological Organization, Climate change indicators and impacts worsened in 2020, Available at: <https://public.wmo.int/en/media/press-release/climate-change-indicators-and-impacts-worsened-2020> (2021)

<https://www.gfdr.org/en/feature-story/evolution-national-disaster-risk-reduction-plans-china> (2008).

(Received 17th April 2022, accepted 17th June 2022)

27. Xu W., Qiao Y. and Wu J., The Evolution of National Disaster Risk Reduction Plans in China, GFDRR, Available at:
