NATIONAL DISASTER RESPONSE FORCE

STRENGTH & WEAKNESSES AND IT'S SYNERGY WITH THE ARMED FORCES

A Dissertation submitted to the Panjab University, Chandigarh for the award of Master of Philosophy in Social Sciences, in Partial Fulfillment of the requirement for the Advanced Professional Programme in Public Administration (APPPA)

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CERTIFICATE

I have the pleasure to certify that Brigadier Rajesh Srivastava, SM has pursued his research work and prepared the present dissertation titled "National Disaster Response Force: Strength & Weaknesses And its Synergy with the Armed Forces" under my guidance and supervision. The dissertation is the result of his own research and to the best of my knowledge, no part of it has earlier comprised any other monograph, dissertation or book. This is being submitted to the Panjab University, Chandigarh, for the purpose of Master of Philosophy in Social Sciences in partial fulfillment of the requirement for the Advanced Professional Programme in Public Administration of the Indian Institute of Public Administration (IIPA), New Delhi.

I recommend that the dissertation of Brigadier Rajesh Srivastava, SM is worthy of the award of M.Phil degree of Panjab University, Chandigarh.

(Prof VK Sharma)

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ACRONYMS AND ABBREVIATIONS

ACAS	Assistant Chief of Air Staff
ACNS	Assistant Chief of Naval Staff
ADGMO	Additional Director General of Military Operations
ACIDS	Assistant Chief of Integrated Defence Staff
CAG	Comptroller and Auditor General
CBRN	Chemical, Biological, Radiological and Nuclear
CCS	Cabinet Committee on Security
CD	Civil Defence
CISC	Chief of Integrated Staff of the Chairman Chiefs of Staff Committee
CMG	Crisis Management Group
COP	Conference of Parties
CPMF	Central Para Military Forces
CPWD	Central Public Works Department
CRED	Centre for Research on the Epidemiology of Disasters
CSSR	Collapsed Structure Search and Rescue
CWC	Central Water Commission
DCBA	Disaster Countermeasures Basic Act
DCMG	Defence Crisis Management Group
DCNS	Deputy Chief of Naval Staff
DDMA	District Disaster Management Authority
DEOC	District Emergency Operations Centre
DGMO	Director General of Military Operations
DMAT	Disaster Medical Assistance Team
DNO	Director of Naval Operations
DRDO	Defence Research and Development Organization
DRR	Disaster Risk Reduction
DTC	Decontamination and Treatment Centre
EM-DAT	Emergency Events Database

EOC	Emergency Operations Centre (Control Room)
ETF	Engineers Task force
FEMA	Federal Emergency Management Agency
GDP	Gross Domestic Production
GOI	Government of India
HADR	Humanitarian Assistance and Relief
HPC	High Powered Committee
IAF	Indian Air Force
ICT	Information and Communication Technology
IDRN	India Disaster Resource Network
IDS	Integrated Defence Staff
IEC	International SAR Advisory Group External Certification
IIT	Indian Institute of Technology
IMD	Indian Metrological Department
INSARAG	International Search and Rescue Advisory Group
IRT	Incident Response Team
JMAT	Japan Medical Associations Team
KSEB	Kerala State Electricity Board
KWA	Kerala Water Authority
MEA	Ministry of External Affairs
MFR	Medical First Response
MHA	Ministry of Home Affairs
MSDF	Maritime Self Defence Forces
NCMC	National Crisis Management Committee
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Force
NDMP	National Disaster Management Programme
NDRF	National Disaster Response Force
NEC	National Executive Committee
NEOC	National Emergency Operations Centre
NSG	National Security Guard

PIB	Press Information Bureau
QRT	Quick Reaction Team
RAMT	Rapid Action Medical Team
SAR	Search and Rescue
SDMA	State Disaster Management Authority
SDG	Sustainable Development Goal
SDRF	State Disaster Response Force
SEOC	State Emergency Operation Centre
SNC	Southern Naval Command
TA	Territorial Army
UN / DAC	UN Disaster Assessment and Coordination
UN / ISDR	United Nations / International Strategy for Disaster Reduction
UN-OCHA	United Nations Office for the Coordination of Humanitarian Affairs
USAR	Urban Search and Rescue
UT	Union Territory
VCAS	Vice Chief of Army Staff
VSAT	Very Small Aperture Terminal
WCDRR	World Conference on Disaster Risk Reduction
WSSD	World Summit on Sustainable Development

NATIONAL DISASTER RESPONSE FORCE

STRENGTH & WEAKNESSES

AND IT'S SYNERGY WITH THE ARMED FORCES

Chapter 1: Introduction

General

India which is also known as 'land of disasters' has come a long way from its relief oriented approach to disasters based on the British legacy to the National Disaster Response Plan (NDRP) based on the National Disaster Management Act (NDMA) of 2005 which focuses on prevention & mitigation as the basic tools for reducing human suffering. While the new system has crossed the evolutionary stage, it was able to respond effectively & efficiently during the Dec 2004 Tsunami & the Uttrakhand floods of 2013.

Till recently, India had a crisis & relief oriented system of disaster management based on the supremacy of the states to mount the relief effort with the district collector as the focal point of governmental intervention. This archaic approach to the issue, which requires specialist response, led to many a debacle including the Orissa super cyclone of 1999 & the Gujarat earthquake of 2000. On 23 December 2005, the Government of India (GoI) took a defining step by enacting the Disaster Management Act, 2005, which envisaged the creation of the National Disaster Management Authority (NDMA), headed by the Prime Minister, State Disaster Management Authorities (SDMAs) headed by the Chief Ministers, and District Disaster Management Authorities (DDMAs) headed by the District Collector or District Magistrate or Deputy Commissioner as the case may be, to spearhead and adopt a holistic and integrated approach to DM.

The National Policy on Disaster Management has been issued by the NDMA in 2009 (NDMA, National Disaster Management Plan, 2016). The extract of para 3.4.1 concerning the employment of Armed Forces is reproduced below.

> "*Conceptually, the Armed Forces are called upon to assist the civil administration only when the situation is beyond their coping capability. In*

practice, however, the Armed Forces form an important part of the Government's response capacity and are immediate responders in all serious disaster situations. On account of their vast potential to meet any adverse challenge, speed of operational response and the resources and capabilities at their disposal, the Armed Forces have historically played a major role in emergency support functions. These include communication, search and rescue operations, health and medical facilities, and transportation, especially in the immediate aftermath of a disaster. Airlift, heli-lift and movement of assistance to neighbouring countries primarily fall within the expertise and domain of the Armed Forces. The Armed Forces will participate in imparting training to trainers and DM managers, especially in CBRN aspects, heli-insertion, high-altitude rescue, watermanship and training of paramedics. At the National level, the Chief of the Integrated Defence Staff to the Chairman Chiefs of Staff Committee has already been included in the NEC. Similarly, at the State and District levels, the local representatives of the Armed Forces may be included in their executive committees to ensure closer coordination and cohesion."

The Disaster Management Act has mandated the constitution of a National Disaster Response Force (NDRF) to a threatening disaster situation or a disaster. This force functions under the National Disaster Management Authority which has been vested with its control, direction & general superintendence. This is a multi-disciplinary, multi-skilled, high-tech force for all types of disasters capable of insertion by air, sea & land. All the eight battalions are equipped and trained for all natural disasters including four battalions in combating nuclear, biological & chemical disasters.

The disaster management cycle goes through a number of stages and response/ emergency operations including relief is the first stage of the cycle. India's emergency response capability revolves around the NDRF which sooner or later falls back on the Indian Armed forces as they are usually unequipped to handle the disaster. Maximum relief to the impact of the disaster also depends upon an effective response which rolls out in an institutionalised manner and not like a knee jerk response. Recent handling of disaster has shown that there are inadequacies in the NDRF organisation and resources

which have been addressed by the armed forces after the disaster has struck and crucial lives have been lost. The capabilities of the armed forces are usually unknown to the managers of the NDRF and there is a need to match capabilities of the organisations at the national/ state/ district level so that the emergency response is synergised and optimum.

Statement of the Problem

There has been increase in the risk to disasters and the losses to life and property has also been on the rise. International disaster database of University of Belgium has studied the 'Global Trends of Natural Disasters (1900-2016)' and inferred that there has been an increase in disaster due to factors like – population, concentration of assets, climate change, urbanization, etc. Since these factors will continue to rise, the chances of occurrence of disasters will also continue to rise. Though disaster mitigation efforts will continue, the emergency response to any disaster will be most vital and an effective response will set the path for an effective relief and recovery.

NDRF along with the State Disaster Response Force is responsible for the emergency response to a disaster and it has been seen in the past the capabilities of both the forces is woefully inadequate. NDRF was seen in action in Kerala during the floods in 2018, in Sikkim during the earthquake in 2011 and in Uttarakhand in 2013. During these disasters NDRF has been criticised for lacking infrastructure and preparedness. In Sikkim, the force landed without any arrangement for food and tents for its personnel, creating confusion. Eventually the Armed Forces had to move in and supplement the efforts of NDRF.

Since there always will be a requirement to call in the Armed Forces in assisting the NDRF Battalions in their response, it is mandatory that the strength and weaknesses of NDRF be identified and how this inadequacy can be addressed by the resources of the Armed Forces be laid down for a synergised response.

Aim and Objectives of the Research

Aim. To analyse own disaster emergency response system in light of recent disasters, capabilities of developed countries and suggest methods to improve response capability by supplementing from national resources to include the Armed Forces.

Objectives. The objectives of the research work are:-

(a) Find out and analyse inadequacies in our disaster emergency response system through case studies and comparison with the capabilities existing with the developed countries.

(b) Identify the existing national resources with special reference to the Armed Forces which will address our inadequacies and improve our response.

(c) Analyse and recommend changes to our existing response mechanism with special reference to NDRF Battalions.

Rationale and Justification

Research work on disaster management has been focused more on the management of disaster as a whole and to some extent on its mitigation. Very little work has been done on the inadequacies of the NDRF and the role of Armed Forces in supplementing the resources of NDRF. Very little literature is available on a synergised response by the NDRF and the Armed Forces in major disaster. At the same time the developed nations have a structured response mechanism while our response is still reactive in nature. This same was evident in the recent floods of Uttrakhand in 2013 and Kerala in 2018. Therefore, there is a need for research to identify weakness in our capabilities to fight disasters and suggest measures to improve with assistance from the Armed Forces.

Research Questions

The research questions are as follows:-

(a) What are the shortcomings in our disaster emergency response system and how do we compare ourselves with the disaster management system of the developed countries?

(b) What are the strengths and weaknesses of NDRF?

(c) What are the existing national resources with special reference to the Armed Forces which will address our inadequacies and improve our response?

(d) What are the changes recommended to our existing response mechanism with special reference to NDRF Battalions?

Limitations, Delimitations and Assumptions

The envisaged research would be carried out under a defined framework of well-defined boundary conditions and assumptions and therefore the limitations, delimitations and assumptions are brought out as under:-

(a) **Assumption.** The capabilities of National Disaster Response Force is as existing on ground today. Future acquisitions or accretions, if revealed during the research will be taken into account.

(b) **Limitation**: The capabilities of Armed Forces are as per the information available in open domain. Any classified information will not be discussed.

(c) **Advantage/Delimitation**: The research is aimed to recommend changes to our existing response system.

Methodology

A detailed study of the subject with special reference to one case study has been carried out to analyse the response of NDRF and the assistance provide by the Armed Forces. A response mechanism of a developed country has also been studied to identify their strengths which will assist in improving our response. Interaction and visit were to be carried out with the NDRF Battalion located in Ghaziabad to get a feel of the ground situation, however the same could not materialize due to inadequate response from HQ NDRF. In addition information has been gathered from service officers of the Army Navy and Airforce especially those who had been involved in relief and rescue operations. Own experiences in management of disaster relief was used to bring out relevant lessons. View of the civil servants was also solicited to build a wholesome picture. After a thorough study the analysis will be carried out and recommendations made.

Literature Review

There is no dearth of literature on the subject of disaster management. There are also many journals and reports on the subject by NDMA, Ministries, Education Institutes

and various think tanks. The disaster response plan has been given out by the NDMA and SDMA in some states which lays down the action by nodal ministries/ departments and deliberates on various contingency plans. In addition to these the following important reference points have been identified:-

(a) Ashu Pasricha and Kiyanoush Ghalavand in their book Disaster Management and Strategies (2014) have given strategies to deal with disasters and have discussed the role of the Armed Forces in brief.

(b) Disaster and Tsunami Management by Shri AK Singh, IPS (2016) has discussed the role of employment of the Armed Forces but has stopped short of linking it with the response of NDRF.

(c) Disaster Management: Humanitarian Logistics in Relief Operations by HK Dangi (2014) discusses a systematic approach to relief logistics, global best practices and discusses briefly the role of military and NGOs in relief operations.

(d) Disaster Management and the Role of Armed Forces had been taken up as research project by Maj Gen NC Badhani as part of his doctoral research project under Lucknow University. His research has focussed on the role of Armed Forces and how to improve its effectiveness. However it has still not analysed the capabilities of NDRF and its synergised response with the Armed Forces.

(e) In IIPA a dissertation was done by Shri VK Mishra in 1998-99 on ‘Role of Armed Forces in Natural Disaster Management’ (Lib Ref APPPA 98-99 MIS/15) in which with the help of a case study inadequacies in response of civil administration and the role of armed forces was brought out. However, NDRF in particular was not discussed.

(f) Shodhganga has a research paper on Select Case Studies of Disaster Management in India and the Role of Armed Forces by Deshbir Singh (http://hdl.handle.net/10603/134398). He again analyses the response of the Armed Forces in some cases and recommends measures for a better response.

(g) Disaster Management: Future Challenges and Opportunities by Jagbir Singh in 2007 discusses the technological means to manage disasters with specific reference to remote sensing, GPS and GIS. Armed Forces satellite and space capabilities can be used to supplement the national resources.

(g) Broad review indicates focus of research on relief and recovery measures and current status of our response system in general and NDRF in particular needs more deliberation.

Research Design

The research design will be descriptive and exploratory as the intention is to assess our emergency response system with specific reference to NDRF and utilization of Armed Forces in supplementing the efforts of National and State Disaster response system. It will involve fact-finding followed by interpretation.

Research Methods and Data Sources

The research will be based on both Primary and Secondary sources as follows:-

(a) Primary Research. Primary sources will be explored as under:-

(i) Interaction and visit will be carried out with the NDRF Battalion located in Ghaziabad to get a feel of the ground situation. In addition information will be gathered from service officers of the Army Navy and Airforce especially those who have been involved in relief and rescue operations.

(ii) Interviews with some members of NDMA.

(iii) First-hand account of efforts of NDRF during Kerala Floods of Aug 2018.

(b) Secondary Research. Secondary sources will be explored as follows:-

(i) Study of disaster management system of one developed country.

(ii) Books; academic papers; reports; newspaper and magazine articles available on the subject.

Chapterisation Scheme

The broad chapterisation scheme for this research report is in the following manner:-

(a) **Chapter 2: Disaster Risk Profile of India.** The introductory chapter will discuss the disaster risk profile of India and the effect of disasters on Indian economy. It will also briefly explore India's preparedness in the field of disaster risk mitigation.

(b) **Chapter 3: India's Disaster Management System and Role of National Disaster Response Force.** The chapter will analyse the National Disaster Management Act and its effectiveness in dealing with various situations. In particular the capabilities and tasks of NDRF will be critically analysed.

(c) **Chapter 4: Case Study: Disaster Response during Kerala Floods/ Aug 18 or Uttrakhand Floods /2013.** This chapter will study the disaster response to a recently occurred case in which maximum devastation occurred. If adequate data is available of the Kerala floods of 2018 then the role played by NDRF will be critically examined to bring out the positives and the negatives, otherwise Uttrakhand floods of 2013 will be analysed.

(d) **Chapter 5: Disaster Response System of Developed Country : Japan/ USA.** The disaster response system of an advanced country would be analysed to see its strength which can be effectively incorporated in our disaster response system. Disaster response system of either USA or Japan will be studied in this chapter.

(e) **Chapter 6: Capabilities of Armed Forces to Supplement NDRF.** The role that is played by the Armed Forces in the case study analysed in Chapter 3 will be deliberated in detail and capabilities of the Armed Forces which will be useful to supplement the capabilities of NDRF Battalions will be identified.

(f) **Chapter 7: Synergy in Response and Recommendations.** This chapter will give out the modalities of achieving synergy in response between the armed

forces and NDRF/ SDRF. Recommendations to improve the existing structure of response will also be given.

India has a very high risk profile of disasters and with the pace of modernisation the risk will aggravate and losses to life and property will be high. Even though efforts are on to mitigate the chances of occurrences of disasters, effective response and recovery is the key to managing disasters. Disaster response forces play a major role in relief and rescue and our capabilities in this regard is woefully inadequate. Being a developing nation we can't afford to direct dedicated resources in addressing these inadequacies, however the potential of the armed forces can be optimally utilised to provide a synergised and immediate response. The research proposes to identify the inadequacies in our response mechanism and suggest remedial measures.

CHAPTER 2: DISASTERS AND THE RISK PROFILE OF INDIA

"To build a safer and disaster resilient India by a holistic, pro-active, technology driven and sustainable development strategy that involves all stakeholders and fosters a culture of prevention, preparedness and mitigation."

-*Vision of NDMA* (NDMA, 2009)

"I am compelled to utter a truism-in asserting that physical catastrophes have their inevitable and exclusive origin in certain combination of physical facts".

-Rabindranath Tagore

General

The devastating floods in Kerala brought into sharp focus the strength and inadequacies of our disaster preparedness and management apparatus of the country. It has once again exposed our lack of disaster mitigation steps and inability to effectively respond to disaster. In the past also we were found wanting when calamities like the Gujrat earthquake, Bhopal gas tragedy, Latur earthquake, Orissa cyclones and Malpa floods occurred. In recorded history danger has been an integral part of human existence and societies have attempted to anticipate the unexpected and devised measures to reduce the losses. At present we in India deal with emergencies from the 'crisis-reactive mode' i.e. we wait till the disaster strikes and tackle the losses as they occur. Only a 'crisis proactive attitude will help in reducing the losses of lives and property. However during the last five years, disaster management system of India has undergone a paradigm shift from humanitarian relief and rehabilitation of the victims to holistic management of disasters that include pre-disaster prevention, mitigation and preparedness as well as post-disaster response, recovery and reconstruction.

In order to understand the disaster risk profile of India it would be in order to lay down the bare essentials of disaster in subsequent paragraphs.

What are Disasters?

The term 'disaster' owes its origin to French desastre, Italian disastro & Latin Astrum (star). The term des means bad & aster means star. Thus, disaster would mean

bad or evil star. The Oxford Dictionary defines disaster as ‘an event that causes much suffering or loss’ & as a ‘sudden or great loss or misfortune’. However, this definition does not convey the full implications of the term for those who have to deal with disasters, as a sudden or great misfortune affecting an individual or a family does not normally concern the authorities.

A very interesting definition, which virtually defines the Indian system of Disaster Management till very recently, has been offered by Halloway, an American physician who has written a No of books on disaster Management. He defines disaster as, ‘*many people trying to do quickly, what they do not ordinarily do, in an environment with which they are not familiar*.

United States’ Federal Emergency Management Agency (FEMA) defines disaster as ‘*an occurrence of a severity & magnitude that normally results in deaths, injuries & property damage & that cannot be managed through the routine procedures & resources of government. It usually develops suddenly & unexpectedly & requires immediate, coordination & effective response by multiple government & private sector organizations to meet human needs & speedy recovery*.

The Disaster Management Act, 2005 defines disaster as “a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, 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” **(MHA, 2005)**.

The revised UNISDR terminology, defines ‘disaster’ as: “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.” **(UNIDSR, 2016)**

The above definitions imply that, for an event to be categorised as a disaster, it must have most of the following attributes: -

(a) It has to be an unusual event of sufficient magnitude & severity.

(b) It should develop suddenly, & perhaps unexpectedly.

(c) It should result in widespread damage to property & disrupt normal life & routine functioning of the affected community.

(d) It should gen be accompanied by high casualty figures in the affected population.

(e) It would require immediate, coordinated & effective response by multiple government & private sector orgs.

(f) The response mechanism must address immediate human needs & facilitate speedy recovery.

Hazards & Disasters. The dictionary meaning of hazard is '*a chance of loss or harm; risk, danger, peril'*. Thus, the term hazard implies an element of chance or risk or potential for disaster but may not actually turn into one. For eg, driving in the chaotic traffic conditions of most of our cities is a daily hazard for most commuters but does not turn into a disaster for everyone (that is up till now; one cannot be sure about the future though). Hence, Disaster Management as a subject also needs to take cognisance of existing hazards in the environment & recommend measures to ensure that they do not turn into disasters.

Types of Disasters

The High Powered Committee (HPC) on Disaster Management has identified 31 odd disasters & categorised them into the following five types from the point of view of their Management:-

(a) Water & Climate related disasters, such as cyclones, floods, tsunamis, droughts, etc.

(b) Geologically related disasters, such as earthquakes, landslides, snow avalanches, etc.

(c) Chemical, Industrial & Nuclear related disasters, such as the Bhopal

Gas Tragedy, the Chernobyl Nuclear Disaster, etc.

(d) Accident related disasters, such as the Purushottam Express accident near Ferozabad in 1996, the Delhi *Uphaar* Cinema tragedy of 1997 & the Patna Boeing crash of July, 2000.

(e) Biologically related disasters such as the Surat Plague scare of Sep, 1994.

Vulnerability of India to Disasters

In India during the last thirty years' time span the country has been hit by 431 major disasters resulting into enormous loss to life and property. According to the Prevention Web statistics, 143039 people were killed and about 150 crore were affected by various disasters in the country during these three decades. The disasters caused huge loss to property and other infrastructures costing more than US $ 4800 crore **(MHA, Disaster Management in India, 2011)**. As per a World Bank study in 2003, natural disasters pose a major impediment on the path of economic development in India. In the year 2018, Earthquakes and tsunamis accounted for the majority of the 10,373 lives lost in disasters last year while extreme weather events accounted for most of 61.7 million people affected by natural hazards, according to analysis of 281 events recorded by the Centre for Research on the Epidemiology of Disasters (CRED) in its EM-DAT (International Disaster Database). **(Disasters, 2018)**. Also in the last year India ranked No 1 in the ranking of countries affected by disasters in terms of number of people affected. The same is evident from the following data:-

	Country	Total Number of People Affected
1.	India	23,900,348
2.	Philippines	6,490,216
3.	China	6,415,024
4.	Nigeria	3,938,204
5.	Guatemala	3,291,359
6.	Kenya	3,211,188
7.	Afghanistan	2,206,750
8.	USA	1,762,103
9.	Japan	1,599,497
10.	Madagascar	1,472,190

Source: EM-DAT (International Disaster Database)

Figure 1: Top 10 Countries by Number of People Affected (2018)

Overall Hazard Profile. India, due to its, physio-graphic and climatic conditions is one of the most disaster prone areas of the world. It is vulnerable to windstorms from both the Arabian Sea and Bay of Bengal. There are active crustal movements in the Himalaya leading to earthquakes. About 58.7 % of the total land mass is prone to earthquake of moderate to very high intensity. The region was hit by Uttarkashi Earthquake (1991), Killari Earthquake (1993), Koyana Earthquake (1997), Chamoli Earthquake (1999), and Bhuj earthquake (2001), Jammu & Kashmir Earthquake (2005). The Himalayas being a fairly young mountain range is undergoing constant geological changes resulting in landslides. Floods brought about by heavy rain and drought in arid and semi-arid areas. About 12 % of the o f the total land mass is flood prone and 68 % of the arable land is vulnerable to drought. The Western region of the country is represented by the Thar Desert and the central India by the Deccan Plateau face recurring droughts due to acute shortage of rainfall. India has increasingly become vulnerable to Tsunamis since the 2004 Indian Ocean Tsunami. India has a coastline running 7600 km long; as a result is repeatedly threatened by cyclones. (Kapur, 2010)

India, characterized by unique geo-climatic conditions, has perennially been vulnerable to natural disasters. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought. Further, a mix of poor socio-economic conditions and disasters has created a vicious cycle of poverty and vulnerability. It is ironical to find that of around 260 million poor living in the country, majority of them are found in the disaster-prone regions, especially in the arid, semi-arid and floodplains. The changing topography due to environmental degradation has also increased the vulnerability of the country. During the last thirty years' time span the country has been hit by 431 major disasters resulting into enormous loss to life and property. According to the Prevention Web statistics, 143039 people were killed and about 150 crore were affected by various disasters in the country during these three decades. The disasters caused huge loss to property and other infrastructures costing more than US $ 4800 crore. The most severe disasters in the country and their impact in

term of people affected, lives lost and economic damage is given in the figure below **(MHA, 2011)**.

Year	Type of Disasters	People affected	Life lost	Economic damage (USD x 1,000)
1980	Flood	30,000,023		
1982	Drought	100,000,000		
	Flood	33,500,000		
1984	Epidemic		3290	
1987	Drought	300,000,000		
1988	Epidemic		3000	
1990	Storm			2,200,000
1993	Flood	128,000,000		7,000,000
	Earthquake*		9,748	
1994	Flood		2001	
1995	Flood	32,704,000		
1996	Storm			1,500,300
1998	Storm		2871	
	Extreme Temp.		2541	
	Flood		1811	
1999	Storm		9,843	2,500,000
2000	Drought	50,000,000		
2001	Earthquake*		20,005	2,623,000
2002	Drought	300,000,000		
	Flood	42,000,000		
2004	Flood	33,000,000		2,500,000
	Earthquake*		16,389	
2005	Flood			3,330,000
	Flood			2,300,000
2006	Flood			3,390,000
2009	Flood			2,150,000

Figure 2 : People affected, lives lost and economic damage due to Disasters in India between 1980 to 2010

India's Disaster Risk Profile

The natural geological setting of the country is the primary basic reason for its increased vulnerability. The geo-tectonic features of the Himalayan region and adjacent alluvial plains make the region susceptible to earthquakes, landslides, water erosion, etc. Though peninsular India is considered to be the most stable portions, but occasional earthquakes in the region shows that geo- tectonic movements are still going on within its depth. (Kapur, 2010)

The tectonic features, characteristics of the Himalayas are prevalent in the alluvial plains of Indus, Ganga and Brahmaputra too, as the rocks lying below the alluvial pains

are just extension of the Himalayan ranges only. Thus this region is also quite prone to seismic activities. As a result of various major river systems flowing from Himalaya and huge quantity of sediment brought by them, the area is also suffering from river channel siltation, resulting into frequent floods, especially in the plains of Uttar Pradesh and Bihar.

The western part of the country, including Rajasthan, Gujarat and some parts of Maharashtra are hit very frequently by drought situation. If Monsoon worsens the situation spreads in other parts of the country too. The disturbance in the pressure conditions over oceans, results into cyclones in coastal regions. The Geo-tectonic movements going on in the ocean floor make the coastal region prone to tsunami disaster too.

The extreme weather conditions, huge quantity of ice and snow stored in the glaciers, etc. are other natural factors which make the country prone to various forms of disasters.

Along with the natural factors discussed in the preceding paras, various human induced activities like increasing demographic pressure, deteriorating environmental conditions, deforestation, unscientific development, faulty agricultural practices and grazing, unplanned urbanisation, construction of large dams on river channels etc. are also responsible for accelerated impact and increase in frequency of disasters in the country. Some of the major disasters concerning are given in detail in the subsequent paras.

Earthquakes. The Indian subcontinent is one of the most earthquake prone areas of the world. The main seismic zones are associated with the collision plate boundary between the Indian and Eurasian plates and are marked by the Kirthar Sulaiman, Himalaya and Arakan-Yoma mountain ranges. Of the earthquake-prone areas, 12% is prone to very severe earthquakes, 18% to severe earthquakes and 25% to damageable earthquakes. The biggest quakes occur in the Andaman and Nicobar Islands, Kutch, Himachal and the North-East. The Himalayan regions are particularly prone to earthquakes. The last two major earthquakes shook Gujarat in January 2001 and Jammu

and Kashmir in October 2005. Many smaller-scale quakes occurred in other parts of India in 2006. Some major earthquakes in the region are given out in the following table.

Date	Epicenter		Location	Magnitude
	Lat. (Deg. N)	Long. (Deg. E)		
10-Jun-2008	29.8	90.2	Tibet	6.4
27-Jun-08	11.0	91.6	Andaman Islands	6.7
28-Jun-08	10.8	91.7	Andaman Islands	6.1
25-Aug-08	30.9	83.6	Tibet	6.4
08-Oct-08	11.1	91.6	Andaman Islands	6
10- Nov.-2009	08.1	92.0	Nicobar Islands	6.1
30/03/2010	13.8°	92.8	North off Coast of Andaman Islands	6.8
12/06/2010	7.9	91.9	Off West Coast of Nicobar Islands	7.8
18/06/2010	13.4	93.0	Andaman Islands	6
10/11/2010	45.5	96.5	Southeast Indian Ridge	6.3
18/9/2011	27.7	88.2	Indo-Nepal border in Sikkim	6.9

Source: IMD & SADR

Figure 3: Some Significant Earthquakes in India

All 7 North East states of India – Assam, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura and Meghalaya; Andaman & Nicobar Islands; and parts of 6 other states in the North/North-West (Jammu and Kashmir, Uttaranchal, and Bihar) and West (Gujarat) are in Seismic Zone V. The seismic zone profile of India is as given in the following figure.

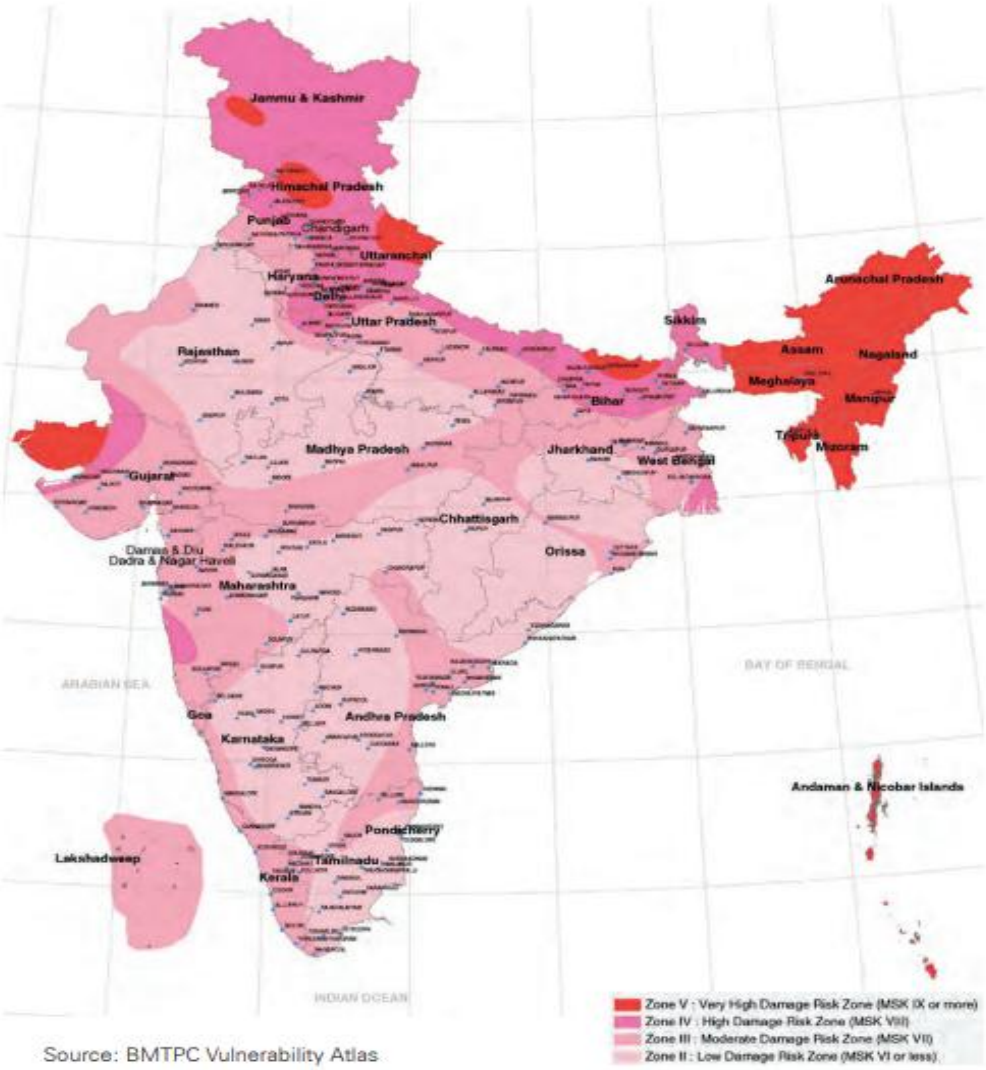
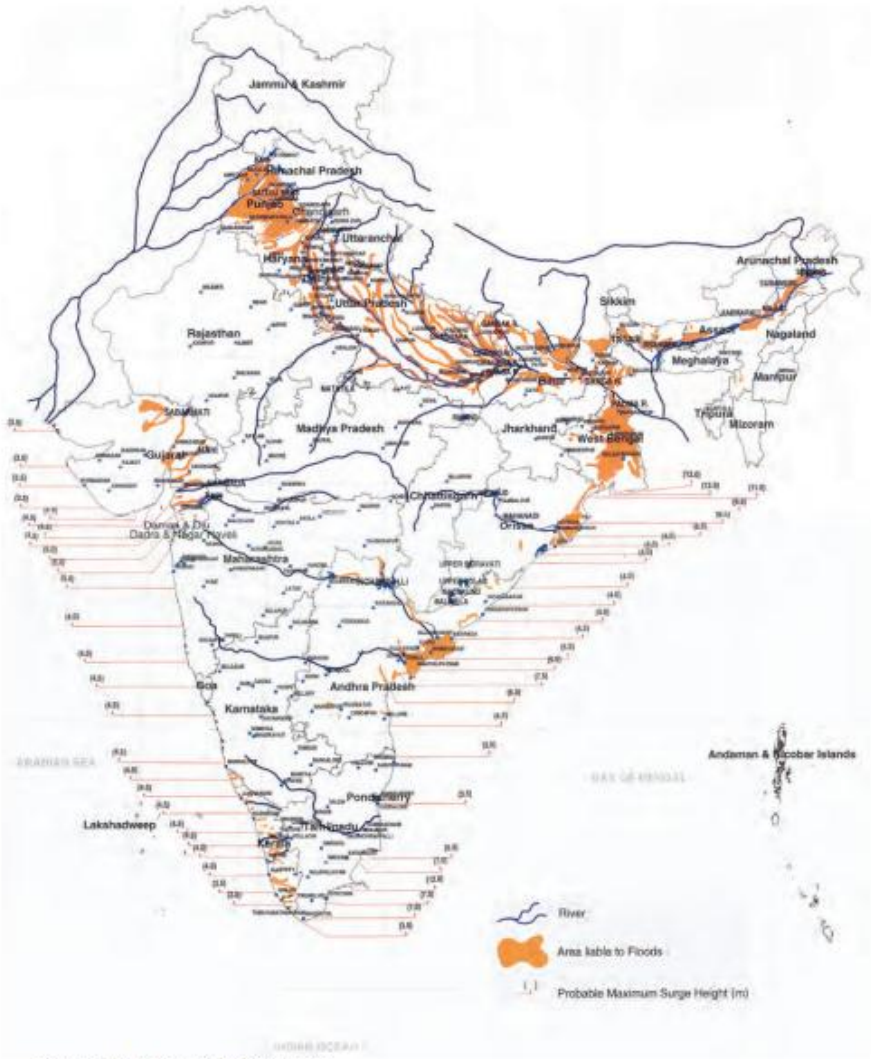


Figure 4 : Seismic Zones of India

Floods. About 30 million people are affected annually. Floods in the Indo–Gangetic–Brahmaputra plains are an annual feature. On an average, a few hundred lives are lost, millions are rendered homeless and several hectares of crops are damaged every year. Nearly 75% of the total rainfall occurs over a short monsoon season (June – September). 40 million hectares, or 12% of Indian land, is considered prone to floods. Floods are a perennial phenomenon in at least 5 states – Assam, Bihar, Orissa, Uttar Pradesh and West Bengal. On account of climate change, floods have also occurred in

recent years in areas that are normally not flood prone. In 2006, drought prone parts of Rajasthan experienced floods. The flood zones of India are depicted in the following figure.



Source: BMTPC Vulnerability Atlas

Figure 5 : Flood Zones of India

Twenty-three of the thirty five states and Union Territories in the country are subject to floods and 40 million hectares of land, roughly one-eighth of the country's geographical area, is prone to floods. The National Flood Control Program was launched in the country in 1954. Since then sizeable progress has been made in the flood protection measures. By 1976, nearly one third of the flood prone area had been afforded reasonable

protection; considerable experience has been gained in planning, implementation and performance of flood warning, protection and control measures. An analysis of data of different states for the period of 1953-2012 reveals that average annual damage to crops, houses and public utilities in the country was around Rs. 3695.299 crore and maximum reported 32551.758 crore was in the year of 2009. On an average, an area of about 7.140 million hectares (17.50 mha maximum in 1978) was flooded, of which, on average crop area affected was of the order of 3.759 million hectares (12.299 mha in 2005). (CWC, 2007).

Droughts. About 50 million people are affected annually by drought. Of approximately 90 million hectares of rain-fed areas, about 40 million hectares are prone to scanty or no rain. Rainfall is poor in nine meteorological subdivisions out of 36 subdivision (each meteorological sub division covers a geographic area of more than ten revenue districts in India). In India annually 33% area receive rainfall less than 750 mm (low rainfall area) and 35 % area receive between 750 to 1125 mm rainfall Medium rainfall) and only 32percent falls in the high rainfall (>1126 mm) zone.

Winds and Cyclones. About 8% of the land is vulnerable to cyclones of which coastal areas experience two or three tropical cyclones of varying intensity each year. Cyclonic activities on the east coast are more severe than on the west coast. The Indian continent is considered to be the worst cyclone-affected part of the world, as a result of low-depth ocean bed topography and coastal configuration. The principal threats from a cyclone are in the form of gales and strong winds; torrential rain and high tidal waves/storm surges. Most casualties are caused due to coastal inundation by tidal waves and storm surges. Cyclones typically strike the East Coast of India, along the Bay of Bengal, ie. the states of West Bengal, Orissa, Andhra Pradesh and Tamil Nadu, but also parts of Maharashtra and Gujarat at the Arabian Sea West Coast.

The yearly distribution of tropical cyclones in the north Indian Ocean indicates large year to year variations in the frequency of cyclonic disturbances and tropical cyclones, but no distinct periodicity. However, the trend indicates a slight decrease with time. The annual average of cyclonic disturbances in the North Indian Ocean is about 15.7 with a standard deviation of 3.1. The annual number of cyclonic disturbances range

from seven in 1984 to twenty three in 1927. The annual average of tropical cyclones has varied from one in 1949 to ten in 1893, 1926, 1930 and 1976. The Cyclone Hazard map of India is as shown below:-

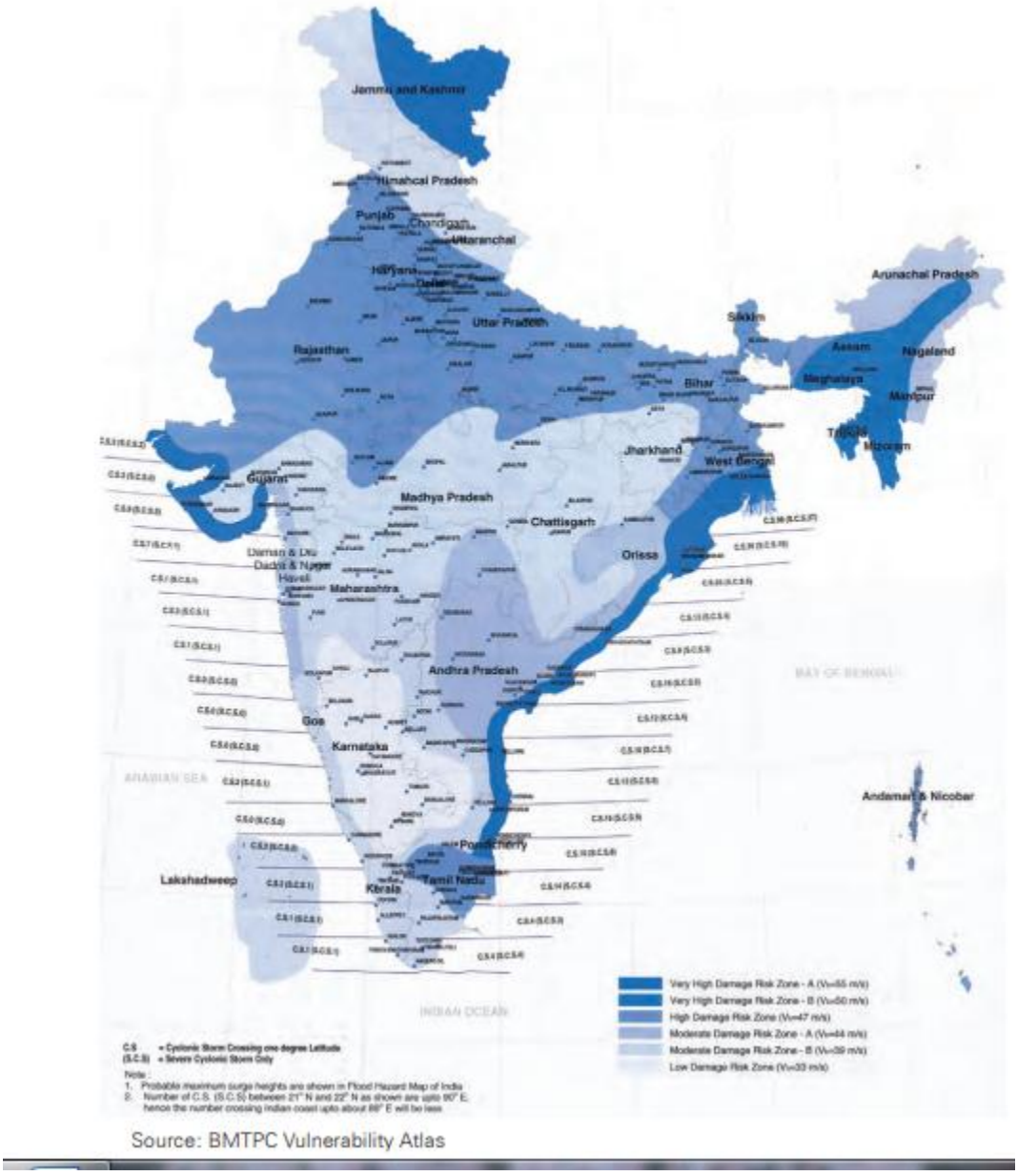


Figure 6 : Wind and Cyclone Zones

Landslides. Landslides occur in the hilly regions such as the Himalayas, North-East India, the Nilgiris, and Eastern and Western Ghats. Landslides in India are another recurrent phenomenon. Landslide-prone areas largely correspond to earthquake-prone areas, i.e. North-west and North-East, where the incidence of landslides is the highest.

Figure 7 : Landslide Affected Areas

Droughts. Drought is another recurrent phenomenon which results in widespread adverse impact on vulnerable people's livelihoods and young children's nutrition status. It typically strikes arid areas of Rajasthan (chronically) and Gujarat states. Drought is not uncommon in certain districts of Uttar Pradesh, Madhya Pradesh, Orissa, Andhra Pradesh, etc. Although a slow onset emergency, and to an extent

predictable emergency, drought has caused severe suffering in the affected areas in recent years, including effects on poverty, hunger, and unemployment.

Heat and Cold Waves.Heat and Cold waves are recurrent phenomenon in North India. Hundreds if not thousands of people die of heat and cold and related diseases every year, most of them from poor urban areas in northern parts of the country. Some data on Heat and Cold waves is given in the following two tables:-

Year	No of Deaths	Year	No of Deaths	Year	No of Deaths
1979	361	1989	44	1999	126
1980	156	1990	2	2000	57
1981	72	1991	252	2001	70
1982	16	1992	114	2002	806
1983	185	1993	42	2003	1539
1984	58	1994	434	2004	117
1985	142	1995	412	2005	587
1986	156	1996	20	2006	135
1987	91	1997	20	2007	476
1988	637	1998	1662	2008	294
2011	793	2010	1274	2009	1071
Source: NCRB 2009. 2010 and 2011 reports					

Figure 8 : Deaths due to Heat Waves in India

	Epochs					
	1901-10	**1911-67**	**1968-77**	**1978-99**	**2000-2009**	**1901-2009**
West Bengal	2	14	3	28	7	54
Bihar	7	27	8	67	12	121
Uttar Pradesh	21	51	8	47	13	140
Rajasthan	11	124	7	53	12	207
Gujarat, Saurashtra	2	85	6	6		99
Punjab	3	34	4	19	10	70
Himachal Pradesh		-	6	18	4	26
Jammu &	1	189	4	15	2	213
Maharashtra		60	7	18	1	83
Madhya Pradesh	9	88	-	12	1	117
Orissa	4	5	-	-	3	15
Andhra Pradesh	2		-	-		2
Assam	1	1	-	-	2	4
Haryana, Delhi & Chandigarh			4	15	15	34
Tamil Nadu		-	-	-		-
Karnataka		10	-	-		10
Jharkhand		-	-	-	1	1

Source: IMD Disastrous weather Event annual reports; EMDAT
Note: Epoch is defined as number of events

Figure 9 : Number of Cold Waves in India (1901-2009)

Man Made Disasters

Industrial and Chemical Disasters. Industrial disasters are disasters caused by chemical, mechanical, civil, electrical or other process failures due to accident, negligence or incompetence, in an industrial plant which may spill over to the areas outside the plant or with in causing damage to life, property and environment. New industries are also coming up at a rapid rate. While chemical disasters are occurrence of emission, fire or explosion involving one or more hazardous chemicals in the course of industrial activity (handling), storage or transportation or due to natural events leading to serious effects inside or outside the installation likely to cause loss of life and property including adverse effects on the environment. Chemical and industrial emergencies may arise in ways, such as:-

(a) Explosion in a plant.

(b) Accidents in storage facilities of chemicals.

(c) Accidents during the transportation of chemicals, misuse of chemicals.

(d) Improper waste management.

(e) Accidents in treatment plants.

(f) Technological system failures.

(g) Failures of plant safety design.

(h) Arson and sabotage.

(i) Human error.

Sl. No.	Year	No. of incidents	No. of Deaths	No. of injured	States where the incidents were recorded
1.	2002	06	05	31	Gujarat, Kerala, Maharashtra
2.	2003	06	11	112	Andhra Pradesh, Assam, Kerala, Madhya Pradesh, Punjab
3.	2004	18	47	91	Andhra Pradesh, Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, Uttarakhand, West Bengal, Delhi
4.	2005	11	15	14	Andhra Pradesh, Assam, Gujarat, Kerala, Tamilnadu, Uttar Pradesh
5.	2006	16	32	24	Andhra Pradesh, Gujarat, Kerala, Maharashtra, Rajasthan, Uttarakhand, Uttar Pradesh, West Bengal
6.	2007	18	37	14	Assam, Gujarat, Kerala, Madhya Pradesh, Maharashtra, Punjab, Uttarakhand, West Bengal
7.	2008	23	50	148	Andhra Pradesh, Gujarat, Jharkhand, Kerala, Maharashtra, Uttar Pradesh
8.	2009	24	50	128	Andhra Pradesh, Assam, Haryana, Kerala, Madhya Pradesh, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand, West Bengal
9.	2010	08	12	01	Andhra Pradesh, Assam, Maharashtra, Punjab, Uttar Pradesh
10.	Total	130	259	563	

Source: Ministry of Environment and Forests

Figure 10: Year wise Chemical disasters in India during the last decade

Stampede. Incidents of stampedes can occur in numerous socio-cultural situations. These stampede incidents can be categorized into the following types, where the causes and the impact are described in the incident. Though the list is not exhaustive, it provides a fair idea about various types of situations where stampedes can occur.

Month & Year	Event	No. of Deaths	Injured
January 2005:	Hindu pilgrims stampede near a remote temple in Maharashtra, India.	265	
December 2005:	Flood relief supplies were handed out to homeless refugees in southern India	42	
October 3, 2007	Train station in northern India	14	
March 27, 2008	Indian temple crush during a pilgrimage	8	10
August 3, 2008	At the Naina Devi temple in Himachal Pradesh	138	47
September 30, 2008	At the Chamunda Devi temple in Jodhpur, India.	147	
March 4, 2010	At Ram Janki Temple, in Kunda, India	71	200
January 14, 2011	At Sabarimala, Kerala	104	50

Source: NIDM

Figure 11: Major Stampedes in India - 2005-2010

Nuclear Emergencies. Nuclear emergency/Disaster is caused due to an extraordinary release of radioactive material or radiation either in the operation of nuclear reactors or other nuclear events like explosion of a Radiological Dispersal Device (RDD) or Improvised Nuclear Device (IND) or explosion of a nuclear weapon. It is accompanied with sudden release of harmful radiations or radioactive materials or both together in to the environment.

Date & Month	Place	Event
4 May 1987	Kalpakkam, India	In an incident during refueling of FBTR, structural deformation happened in some of the fuel assemblies. There was no release of radioactivity. The reactor remained shut down for about two years for restoration which involved development of special tools, inspection and removal of affected fuel assemblies.
13 May 1992	Tarapur, Maharashtra, India	There was a minor tube leak in one heat exchanger which was subsequently replaced. Radioactivity released was within the regulated limits
31 Mar 1993	Bulandshahr, Uttar Pradesh, India	A fire occurred in Turbine building which is not a part of reactor system. This resulted in damage of the steam turbine blades. The reactor was brought to safe shutdown state. The unit was restarted after Regulatory approval
22 Oct 2002	Kalpakkam, India	About 75 kg of sodium from primary sodium purification line at Fast Breeder Test Reactor leaked inside the purification cabin. There was no fire or any release of radioactivity.
April 2010	Mayapuri, Delhi India	In a radiological accident, an irradiator was sold to metal scrap dealer. The dealer dismantled the irradiator which caused release of radioactive source resulting the exposure to a worker in the shop leads to one fatality

Source: Babha Automic Research Centre, Mumbai

Figure 12: Incidents in Nuclear Facilities in India

Conclusion

India is vulnerable in varying degrees to a large number of natural as well as man-made hazards. Over 40 million hectares (12 per cent of land) is prone to floods and river erosion. 58.6 per cent of the landmass is prone to earthquakes of moderate to very high intensity. Of the 7,516 km long coastline, close to 5,700 km (nearly 76 per cent of coastline) is prone to cyclones and tsunamis. 68 per cent of the cultivable area is vulnerable to drought and hilly areas are at risk from landslides and avalanches (nearly 15 per cent of landmass). Further, the vulnerability to Nuclear, Biological and Chemical (NBC) disasters and terrorism has also increased. (Sinha, 2006)

It is difficult to predict precisely where and when a man-made disaster will occur, therefore, it is more difficult to prepare for one. It is possible however, with varying degrees of accuracy to predict the occurrence of a natural disaster. The long-term perspective will reveal to us that disaster is an interaction of combination of political, social, economic and environment forces which work to "undermine the ability of a system to cope with new stresses".

CHAPTER 3: INDIA'S DISASTER MANAGEMENT SYSTEM AND ROLE OF NATIONAL DISASTER RESPONSE FORCE

General

Following the two major disasters, the Orissa cyclone in 1999 and the Gujarat earthquake in 2001, which together caused the death of more than 27,000 people and left more than 8 million homeless, India renewed its focus on disaster management to protect lives and property. It joined with USAID to strengthen its response capacities at the local, state and national levels but the strengthening was always short of the capability required to address the next disaster.

Prior to the year 2005 the essential responsibility of disaster management lay with the State Government where the disaster had occurred, however in event of disasters which were spread over several states and with uncontrollable proportions, the central government was required to supplement taking appropriate measures in rescue, relief and preparedness. At the central level the National Crisis Management Committee oversaw all disaster-related efforts. There were nodal ministries depending on the type of disaster. The National Crisis Management Committee comprised the nodal ministry and other support ministries. For natural disasters, the nodal ministry was the Ministry of Agriculture (Agriculture, 2001). This system was not found to be successful and the same proved ineffective especially during the Tsunami disaster which occurred in December 2004. The need for better early warning systems and preparedness was again underscored with the tremendous loss of life caused by the tsunami in December 2004.

Disaster Management Act, 2005 and National Disaster Management Policy 2009

The Disaster Management Act, 2005, was an important milestone in the evolution of a legal framework for disaster management in India. For the first time a comprehensive law on disaster management at the national level was enacted with the passage of the Disaster Management Act in December 2005. The Act covers aspects of disaster mitigation and management both at Central and State Government levels and caters for contingencies and broadly encompasses all necessary actions. As envisaged by the Act, several new organisations/ entities have been created at the national, state, and

district level. Some of them have done well. For example, the National Disaster Management Authority (NDMA) has issued comprehensive guidelines for disaster mitigation and preparedness. The National Disaster Response Force (NDRF) has made an impact in respect of search and rescue operations in disaster situations. Some State Disaster Management Authorities (SDMAs) also have significant achievements to their credit

For policy formulation and coordination of activities with regard to disaster management, the DM Act, 2005, provides for the setting up of institutional structures at the national, state and district levels. At the national level there are four important entities: the National Disaster Management Authority (NDMA), the National Executive Committee (NEC), the National Institute of Disaster Management (NIDM), and the National Disaster Response Force (NDRF). Post the DM Act 2005 the following main bodies have a major role to play in disaster management: -

(a) National Disaster Management Authority (NDMA).

(b) National Executive Committee (NEC).

(c) Empowered Group of Ministers (EGM).

(d) National Crisis Management Committee (NCMC).

(e) Crisis Management Group (CMG).

(f) Technical and other organizations such as Indian Metrological Department, Central Water Commission, Bureau of Indian Standards, DRDOand Civil Defence.

(g) Home Guards, Central Para military and the Armed forces.

Disaster Management Act 2005 and National Disaster Management Policy 2009 are a Paradigm Shift in the way disasters would be managed in our country. From a response and relief-centric approach which was being adopted earlier, the transition is now being made into a holistic approach covering prevention, mitigation and preparedness with an aim to rehabilitation, reconstruction and recovery. The Act provides

for establishment of institutional framework at all three levels i.e. National, State and District. The formulation of policy and plan are now backed by statutory and financial support. The focus now is on mainstreaming of multi-sectoral disaster management concerns into the developmental process and mitigation measures.

National Disaster Management Plan (NDMP) 2016

Flowing out from the DM Act 2005 and National Disaster Management Policy 2009, a National Disaster Management Plan has been issued by NDMA in 2016. The National Disaster Management Plan (NDMP) provides a framework and direction to the government agencies for all phases of disaster management cycle. The NDMP is a "dynamic document" in the sense that it will be periodically improved keeping up with the emerging global best practices and knowledge base in disaster management. It is in accordance with the provisions of the Disaster Management Act, 2005, the guidance given in the National Policy on Disaster Management, 2009 (NPDM), and the established national practices. (NDMA, 2016)

The national disaster management structure has also been put into place (NDMA, National Disaster Management Plan, 2016) and can be depicted with the help of the following chart:-

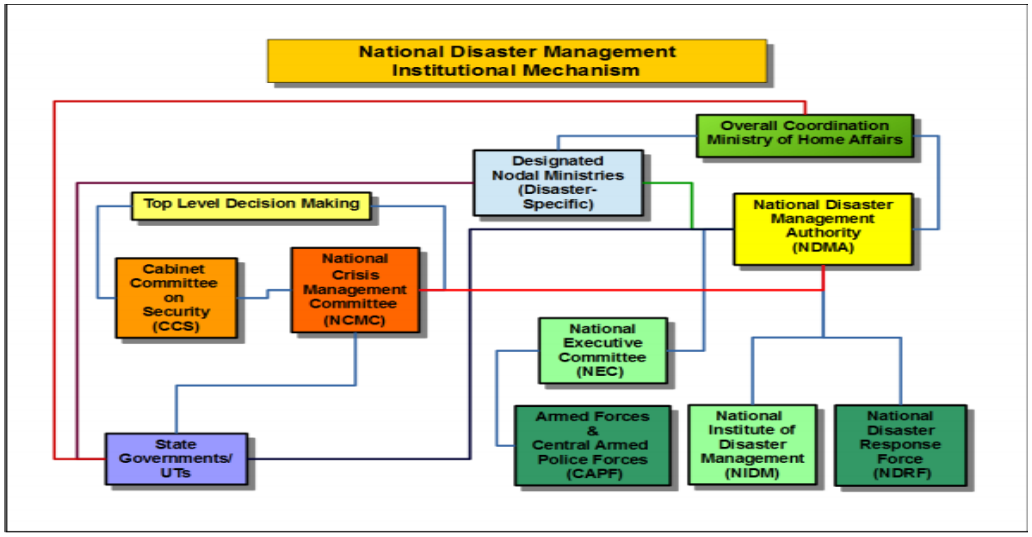


Figure 13 : National Disaster Management Institutional Mechanism

The NDMP, in a sense, can be said to have the five main postulants (NDMA, NDMP-2018-Revised-Draft, 2018) as follows:-

(a) It is conforming to the national legal mandates – the DM Act 2005 and the NPDM 2009.

(b) It endeavors to participate proactively to realize the global goals of Sendai, SDG and COP21 (Paris Agreement) as per agreements to which India is a signatory. The seven global targets are as shown below:-

Figure 14 : Sendai Framework for Disaster Risk Reduction - 7 Global Targets

It aims to be in sync with the international consensus for achieving mutual reinforcement and coherence of these Sustainable Development Goals (Juha I Uitto, 2016) which are depicted in the following figures:-

Figure 15 : Coherence and mutual reinforcement of SDGs and Sendai Framework

(c) It meets the Prime Minister's Ten Point Agenda for Disaster Risk Reduction (DRR) articulating contemporary national priorities.

(d) The underlying principle of Social inclusion as a ubiquitous and cross-cutting principle has been maintained.

(e) The emphasis has also been on mainstreaming DRR as an integral feature.

Role and Function of NDMA

NDMA has been constituted with the Prime Minister of India as its Chairman, a Vice Chairman with the status of Cabinet Minister & eight members with the status of Ministers of State. Each of the members has a well-defined functional domain covering various states as also disaster specific areas of focus and concern. To carry out the mandated functions, NDMA has evolved a lean and professional organisation which is IT-enabled and knowledge based. Skills and expertise of the specialists are extensively used to address all the disaster related issues. A functional and operational infrastructure has been built which is appropriated for disaster management involving uncertainties coupled with desired plans of action. The concept of the organoisation is based on a

disaster division-cum-secretariat system. Each member of the Authority heads disaster-specific division for specific disaster and functional domains. Each member has also been given the responsibility of specified states and UTs for close interaction & coordination. The organisation of NDMA is depicted in the following figure:-

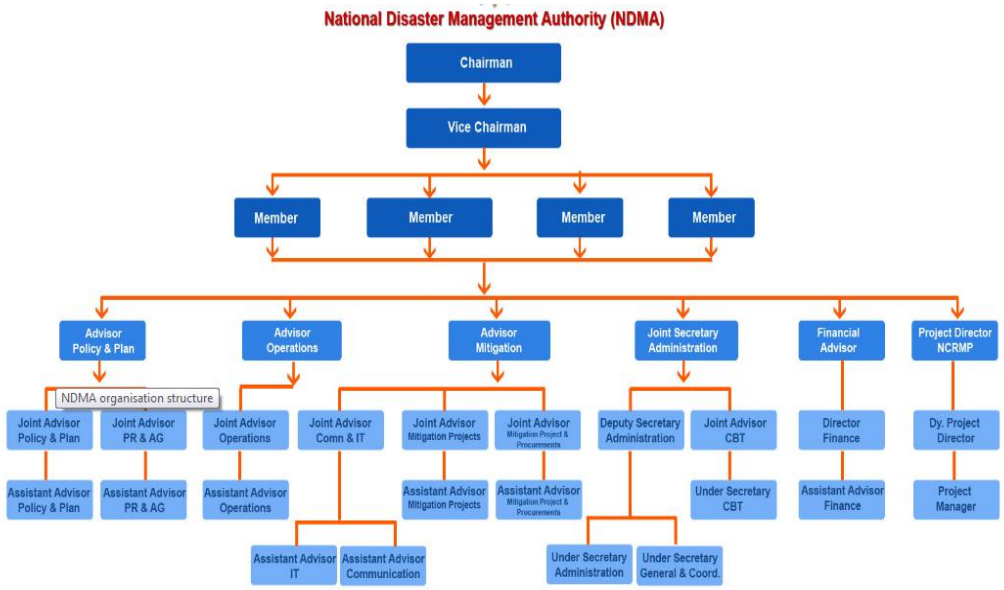


Figure 16 : Organization Structure of NDMA

Role & Responsibility of NDMA. NDMA as the apex body is mandated to lay down the policies, plans and guidelines for disaster management to ensure timely and effective response to disasters. Towards this, it has the following responsibilities (Gandhi, 2007):-

(a) Lay down policies on disaster mgt.

(b) Approve the National Plan.

(c) Approve plans prepared by the Ministries or departments of the Government of India in accordance with the National Plan.

(d) Lay down guidelines to be followed by the State Authorities in drawing up the State Plan.

(e) Lay down guidelines to be followed by the different Ministries or

departments of the Government of India for the Purpose of integrating the measures for prevention of disaster or the mitigation of its effects in their development plans & projects.

(f) Coordinate the enforcement and implementation of the policy and plan for disaster mgt.

(g) Recommend provision of funds for the purpose of mitigation.

(h) Provide such support to other countries affected by major disasters as may be determined by the Central Govt.

(j) Take such other measures for the prevention of disaster, or the mitigation, or preparedness and capability building for dealing with the threatening disaster sit or disaster as it may consider necessary.

Responsibility of National Emergency Council (NEC)

In pursuance of Section 8 of the Disaster Management Act, 2005 NEC has been formed to act as the coordinating and monitoring body for disaster management. It is chaired by the Union Home Secretary and comprises of Secretary level officers from the Ministries and departments having control of agriculture, atomic energy, defence, drinking water supply, environment and forests, finance (expenditure), health, power, rural development, science and technology, space, telecommunications, urban development and water resources. The Chief of Integrated Defence Staff of the Chiefs of Staff Committee, ex-officio, is also its member. (MHA, Disaster Management Divison MHA, 2017) It has the responsibility for implementing the policies and plans of the National Authority and ensures the compliance of directions issued by the Central government for the purpose of disaster management in the country.

Response Mechanism during Disasters

The response process begins as soon as it becomes apparent that a disastrous event occurs or is imminent and lasts until the disaster is declared to be over. Response includes not only those activities that directly address the immediate needs, such as search and rescue, first aid and temporary shelters, but also rapid mobilization of various systems necessary to coordinate and support the efforts. In most cases, first

responders such as members of Incident Response Teams (IRT) of district, block, or other agencies (medical fire, police, civil supplies, municipalities) manage emergencies immediately at the local level. If an emergency escalates beyond their capabilities, the local administration seeks assistance from the district administration or the State Government. If State Government considers it necessary, it seeks central assistance. (NDMA, National Disaster Management Plan, 2016)

The NEC will coordinate response in the event of any threatening disaster situation or disaster where central assistance is needed. The NEC may give directions to the relevant Ministries/Departments of the GoI, the State Governments, and the State Authorities regarding measures to be taken by them in response to any specific threatening disaster situation or disaster as per needs of the State. The NDMA is mandated to deal with all types of disasters. The general superintendence, direction and control of the National Disaster Response Force (NDRF) is vested in and will be exercised by the NDMA.

The central government supplements the efforts of state government by providing logistic and financial support, deploying NDRF, Armed Forces, CAPF, and other specialized agencies mandated to respond to particular types of disasters. It will depute experts to assist the state government in planning and its implementation as per request from the state government. The institutional arrangements for the response system consist of the following elements:-

(a) Nodal central ministries with disaster-specific responsibilities for national-level coordination of the response and mobilization of all the necessary resources. The disaster wise distribution of ministries is as follows:-

Figure 17 ; Institutional Mechanism: Nodal Ministries/ Departments

Sl. No.	Disaster	Disaster being handled by	Nodal Ministry
1.	Earthquake	Ministry of Home Affairs	Ministry of Earth Sciences

2.	Flood	Ministry of Home Affairs	Ministry of Water Resources
3.	Cyclone	Ministry of Home Affairs	India Meteorological Department under Ministry of Earth Sciences
4.	Tsunami	Ministry of Home Affairs	Ministry of Earth Sciences
5.	Landslide	Ministry of Home Affairs	Ministry of Mines
6.	Avalanches	Ministry of Home Affairs	Ministry of Defence
7.	Drought, Hailstorm & Pest Attack	Ministry of Agriculture & Cooperation	Department of Agriculture & Cooperation, Ministry of Agriculture
8.	Forest Fire	Ministry of Environment, Forests & Climate Change	Ministry of Environment, Forests & Climate Change
9.	Nuclear Disaster	Ministry of Home Affairs/ Department of Atomic Energy	Department of Atomic Energy
10.	Industrial and Chemical Disasters	Ministry of Environment, Forests & Climate Change	Ministry of Environment, Forests & Climate Change
11.	Biological Disasters	Ministry of Health & Family Welfare	Ministry of Health & Family Welfare
12.	Rail Accidents	Ministry of Railways	Ministry of Railways
13.	Road Accidents	Ministry of Road Transport & Highways	Ministry of Road Transport & Highways
14.	Aviation Accidents	Ministry of Civil Aviation	Ministry of Civil Aviation

(b) Central agencies with disaster-specific responsibilities for Early Warning Systems and alerts.

(c) National Disaster Response Force (NDRF).

(d) State Disaster Response Force (SDRF).

A control center is set up which is called as the Emergency Operation Centre (Fagel, 2015) is the heart of any disaster and needs to be systematic and organized. An integrated National Emergency Operations Centre (NEOC) will be formed by unifying the NEOC-1 under the NRDF and NEOC-2 under the NDMA. Until the Integrated NEOC becomes operational, the functioning of NEOC-1 and NEOC-2 will unified with the NDRF-EOC acting as the primary NEOC. It will be connected to the following control rooms:-

(a) All agencies designated to provide early warnings information about hazard events.

(b) State Emergency Operations Centre (SEOC).

(c) District Emergency Operations Centre (DEOC).

(d) NDRF.

(e) Integrated Defence Staff (IDS).

(f) MEA.

(g) Armed Forces and CAPFs.

NDRF: Role and Organisation

The NDRF has been constituted as per the Chapter-VIII of the DM Act 2005 as a specialist response force that can be deployed in a threatening disaster situation or disaster. As per the DM Act, the general superintendence, direction and control of the NDRF shall be vested and exercised by the NDMA. The command and supervision of the NDRF shall vest with the Director General appointed by the Government of India. The NDRF will position its battalions at different locations as required for effective response.

NDRF units will maintain close liaison with the designated State Governments and will be available to them in the event of any serious threatening disaster situation. The NDRF is equipped and trained to respond to situations arising out of natural disasters and CBRN emergencies. The NDRF units will also impart basic training to all the stakeholders identified by the State Governments in their respective locations. Further, a National Academy is proposed to be set up to provide training for trainers in disaster management and to meet related National and International commitments. Experience in major disasters has clearly shown the need for pre-positioning of some response forces to augment the resources at the State level at crucial locations including some in high altitude regions. (NDMA, NDMP-2018-Revised-Draft, 2018)

Vision of NDRF is to emerge as the most visible and vibrant multi-disciplinary, multi-skilled, high-tech force capable to deal with all types of natural as well as man-made disasters and to mitigate the effects of disasters. At present, National Disaster Response Force consists of 12 battalions, three each from the BSF and CRPF and two each from CISF, ITBP and SSB. Each battalion have 18 self-contained specialist search and rescue teams of 45 personnel each including engineers, technicians, electricians, dog squads and medical/paramedics. The total strength of each battalion is 1,149. All the 12 battalions have been equipped and trained to respond natural as well as man-made disasters. Battalions are also trained and equipped for response during chemical, biological, radiological and nuclear (CBRN) emergencies. (NDRF, 2019)

These NDRF battalions are located at 12 different locations in the country based on the vulnerability profile of country and to cut down the response time for their deployment at disaster site.

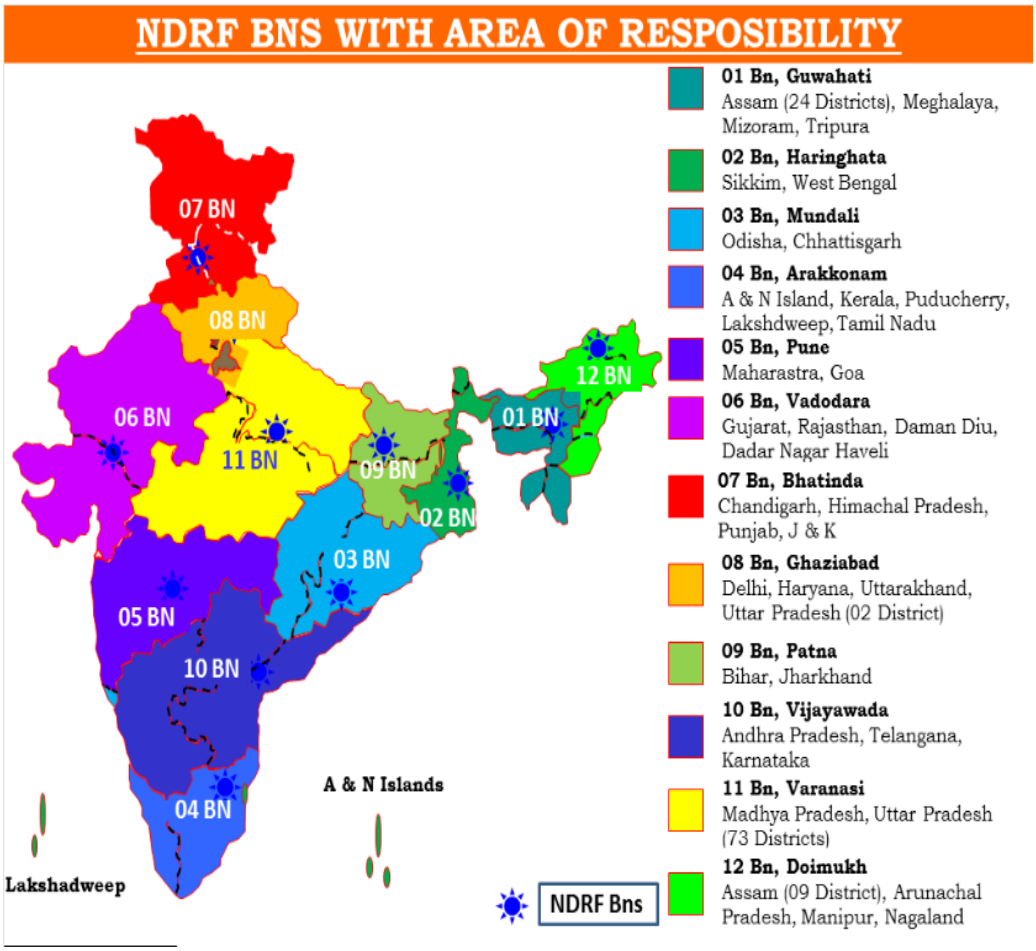


Figure 18 : NDRF Bns locations and their respective area of responsibility

Role of NDRF

NDRF is a 'Specialist Force' which has been designed to respond to disasters/ threatening disaster. Its functional role during disasters is to execute a specialized response and in case of an impending disaster is to carry out a proactive deployment of teams to assist in disaster management. During the non-disaster period it has multiple roles to include:-

(a) Skills upgradation of its own forces or in other words train itself for various contingencies.

(b) Training other stake holders to include SDRF, Civil Defence personnel, Home Guards and other similar resources available at the state level.

(c) Creating resilient community by engaging the community in capacity building and public awareness programme. The target groups are villagers, local people, school children, National Cadets Corps & Local Government.

(d) Familiarization exercises and mock drills at likely disaster sites and also at schools and colleges. Mock Exercises have also been carried out in association with the various stakeholders on various disasters like Industrial Disasters, Urban Flooding, Cyclones, Earthquake simulation, Train accidents etc.

NDRF is a multi-disciplinary, multi-skilled, high-tech, specialist force, capable of responding to any natural disaster or CBRN emergency. It is the largest Stand-alone Dedicated Disaster Response Force trained & equipped as per international standards. By virtue of its design and capability the response time during disasters is reduced to the barest minimum with the concepts of 'Proactive availability' to States' and 'Pre-positioning' in threatening disaster scenario. The force is also capable of carrying out disaster response operations within the country, in the region & internationally.

The composition of each NDRF battalion is laid down and each battalion has a strength of 1149 personnel which are organized themselves into 18 self-contained specialist teams of 45 members each. Each of these teams comprises of specialist manpower viz. Medical Officers, Engineers, Paramedics, Technician, Electrician and dog squads. All Battalions are trained and equipped for all natural disasters and for CBRN emergencies. Each NDRF battalion is equipped with 310 state of the art equipment to include the following:-

(a) Collapsed Structure Search and Rescue CSSR (Earthquake) – 124 equipment.

(b) Water Rescue/ Diving – 12 equipment.

(c) Mountaineering/ High-Altitude Rescue – 16 equipment.

(d) Medical First Response – 112 equipment.

(e) CBRN Emergencies – 46 equipment.

Over a period of time NDRF has become a professional and well trained force and its strength and capabilities are as follows:-

(a) NDRF personnel are fully trained & capable in CSSR (Collapsed Structure Search & Rescue) operations.

(b) Adequately trained for MFR (Medical First Response).

(c) Trained & equipped to deal with CBRN emergency.

(d) Flood and Mountain Rescue Operations.

(e) Deep Diving Search & Rescue operations.

(f) Canine and Technical Search.

(g) Animal disaster response.

The strength of the NDRF Battalion lies in its teams which are manned and equipped as under:-

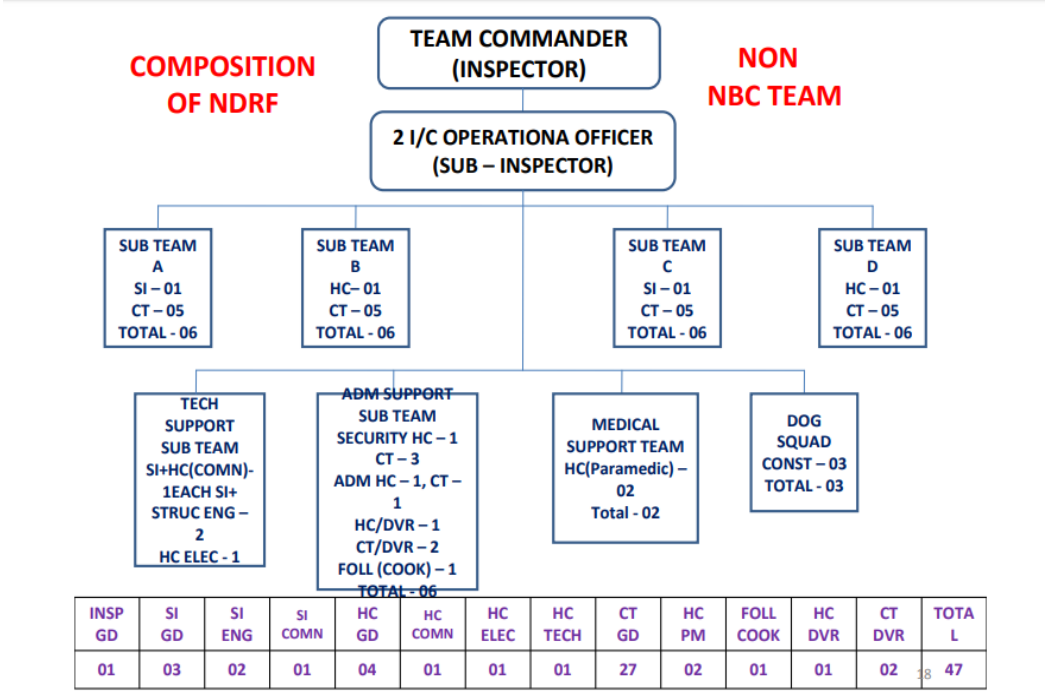


Figure 19 : Composition of NDRF Team Non NBC

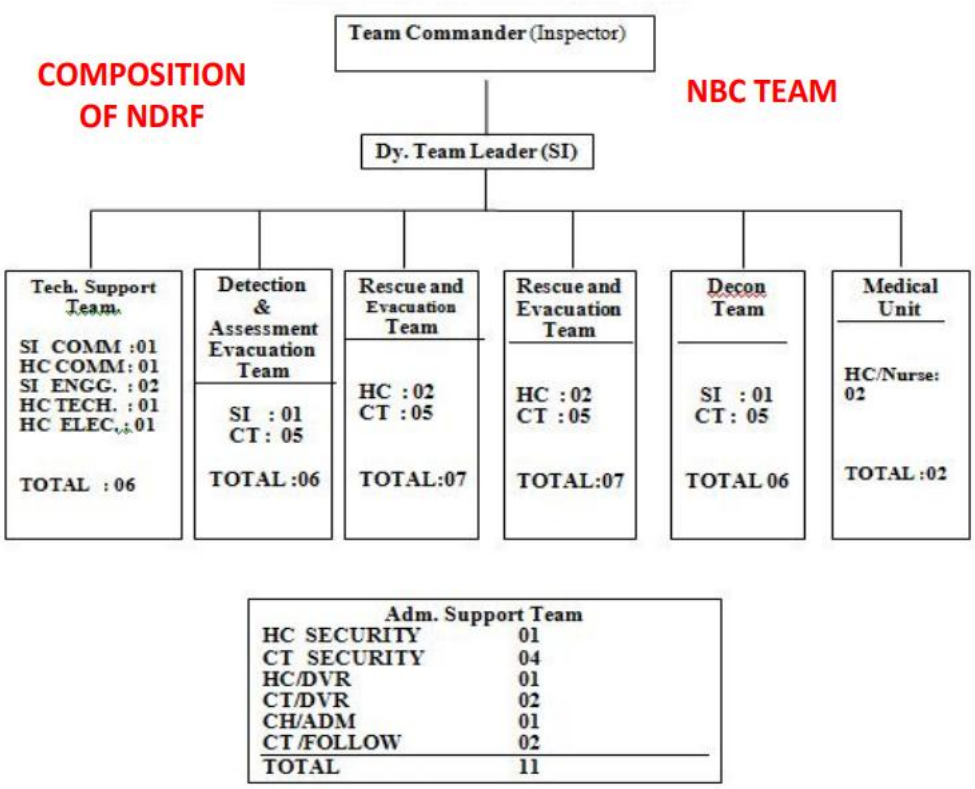


Figure 20 : Composition of NDRF Team NBC

Sometime in mid-August 2018 the Union Cabinet gave approval to increasing the size of the NDRF and it will soon raise four more battalions, adding to existing 12. The four new battalions would be stationed in Jammu and Kashmir, Himachal Pradesh, Uttarakhand and NCR Delhi. These battalions will be modernised to meet international standards and NDRF also has proposed to have exclusive women contingents within battalions to take care of women during times of distress. The objective of raising four additional battalions is to reduce response time keeping in view vast geographic area of the country. These four battalions will initially be raised as two battalions in Indo-Tibetan Border Police (ITBP) and one battalion each in Assam Rifles (ARs) and Border Security Force (BSF). Later these four battalions will be converted into NDRF battalions.

Critical Appraisal of NDRF

The efficacy of NDRF was tested recently during the Kerala floods where NDRF deployed 55 teams with 38 boats and played a crucial role in providing relief to many affected people. The DG NDRF in its quarterly magazine stated that NDRF Battalions

proved as “Angels in Disasters” by saving 535 precious lives, 119 livestock and evacuated 24,690 marooned persons. Besides this the NDRF had set up 1207 medical camps in various districts and provided medical assistance to over 6800 sick and needy persons. (NDRF, Message from DG NDRF, 2018) However the vast magnitude of disaster dwarfed there contribution and brought out their inadequacy to the fore. In an article in the Pioneer on 11 Dec 2018 Ramesh Davesar stated “At present, the NDRF has strength of 12 battalions drawn from various Central Police Organisations; each battalion designed to provide 18 rescue teams of 45 people each. In all, 216 teams are available. Prima facie, keeping in mind the vastness, doubt arises on its pan-Indian capability to fight disasters. Next, the DM, besides initiating immediate relief, is the explicit manifestation of restoring public services, communication, and provision of medical and other administrative support. Sadly, the present organisation, bereft of captive resources such as air effort, specialised equipment and lack of wherewithal to administrative support, among others makes for a truncated outfit.” (Davesar, 2018)

Gen NC Vij who was the founder chairman of NDMA opined that over the last ten years NDRF has acquired a niche for itself for its professionalism in handling different types of disasters. However, it has been increasingly felt that having one professional response mechanism at national level alone is not enough. What is required is a multi- level response mechanism: the NDRF and the Armed forces at national level; State Disaster Response Forces (SDRF) at state level; Fire & Emergency Services, Civil Defence, Police, Home Guards, NSS and NYKS etc at district level and well aware community at grass root level. (VifIndia, 2016)

There was a One Day Round Table Conference on "Revisiting India's Disaster Response Mechanism: Challenges and Way Forward" in 06 May 2016 at Vivekanand International Foundation (VifIndia, 2016) and some of the issues highlighted the role of NDRF as follows:-

(a) Referring to the operational capability of NDRF, Gen Vij highlighted the need of appropriate training infrastructure, well trained personnel and state of art technical equipment. He stressed that the focus should be on matching the capacities of SDRF with NDRF at all levels with requisite trained personnel and

equipment.

(b) Shri Kiren Rijiju, MoS, Ministry of Home Affairs mentioned that there is a need to bring about high end technology to increase our capacity in the domain of response and for that we need to integrate all our key institutions such as Indian Institute of Technology, Indian Institute of Management and Indian Space Research Organization in the area of research & development.

(c) The general opinion was that though NDRF is performing very well, but there are some new issues emerging such as non-availability of critical equipment, especially in the area of management of fire and suggested that we need to come out of the 'jugad' culture and build our capability. An example of fire incident in Uttrakhand was cited, which caused massive loss and NDRF and Home Guards had to struggle to diffuse the fire not because of lack of their commitment, but because of lack of critical equipment required to diffuse the fire.

(d) NDRF has become more visible as compared to earlier times when the armed forces were used for leading response & rescue operations.

(e) Shri OP Singh, DG NDRF at that time, mentioned that currently National Disaster Response Force is facing organizational deficiencies such as lack of technical equipment, trained personnel and strategies and hence there is a need to revisit the organizational needs in order to serve the main objective of the organization. He suggested that management of the force, use of technology and developing systems are three aspects that need to keep pace in the current scenario and match up to emerging risks and make sure that appropriate institutions equipped with technology and expertise can be used as a catalyst. He impressed upon the need of setting up of a modern Emergency Operations Centre, on site coordination and resource categorisation for quick response.

(f) There is a need to invent mechanisms, tools, equipment with the targeted training and technological advancement for a better response in all sorts of disaster situations and towards this end micro zoning is a must. Primitive ways to conduct operations need to be replaced with the new technological tools and

equipment.

(g) Some of the shortcomings of NDRF, according to him, were the existing personnel policies unsuitable for its role, rotation of police personnel as a 5 year rule; lack of modern training facilities meeting the international technical and equipment standards for urban search and rescue; lack of specialist leadership and continuity; lack of exposure to international training and functioning with the Armed Forces.

(h) There was a need felt for INSARAG certification for NDRF and a systematic study of manpower and equipment requirement of NDRF and SDRF in the country.

(i) There is a requirement of implementation of 'brick system' for equipment in NDRF on the lines of Army. The importance of coordination between Army and NDRF during normal period was also found lacking.

(j) There is a need to strengthen our response capacities to handle CBRN emergencies. NDRF needs to be better equipped with technical equipment and personnel training and emphasis should be laid on deploying young men in the response force.

(k) For a specialist force like NDRF, which has the unique distinction of being the single largest dedicated disaster response force in the world, a dedicated training institution of international standard is a must. MHA had given, in principle, approval of setting up a national level training institution (National Disaster Response Academy) which needs to be implemented on ground.

(l) NDRF has earned a niche for its professionalism, but is still not qualified for any international deployment under the umbrella of the UN OCHA. To qualify for any such deployment, a specially selected team (80/ 90 personnel] have to go through the rigorous process of IEC (International Search & Rescue Advisory group External Classification), which is a long drawn process. In principle decision of Govt to have an IEC certified team of NDRF is needed.

(m) The inventories of tools, equipment and accessories as also transport of NDRF for launching specialised effective response need up-gradations from time to time. Government needs to look into this aspect on priority.

It was also observed by the Task Force Report of MHA in 2013 that the arrangements that existed prior to the Act continue to remain in force. For instance, the National Crisis Management Committee (NCMC) headed by the Cabinet Secretary coordinates and guides the work of GoI's Departments at a time of crisis. A Crisis Management Group (CMG) headed by a senior officer of the nodal Ministry meets from time to time in the event of disasters to coordinate at the central level and liaise with state governments and other agencies for response and relief activities. There is also a Central Crisis Group (CCG) under the chairpersonship of the Secretary, Ministry of Environment and Forests, for the management of chemical accidents. The High Level Committee (HLC) headed by the Union Agriculture Minister/Home Minister takes decisions regarding financial assistance to States in the context of natural disasters (MHA, 2013). The NDMA has no role in in many other matters. At the time of crisis, the NCMC takes over; the NEC hardly has any role to perform.

As regards the NDRF, the Task Force was of the view that it has performed quite well. There is no need to amend the existing provisions relating to the NDRF in the DM Act, 2005. However, the Task Force had suggested two administrative measures with regard to the NDRF:

(a) At present, NDRF personnel come from different Forces and return to their parent organisation after a specified period. This means that the skill, experience and expertise they develop while working with the NDRF might not be available for disaster response after they leave the Force. Either some of them may be allowed to continue, or the NDRF may recruit some of its personnel so that there is continuity and institutional memory in respect of some types of expertise.

(b) The present arrangement of the Director General (DG) NDRF, also performing the duties of Civil Defence, Home Guards and Fire Services can help

the integrate disaster management activities of these organisations. However, the DG, NDRF and Civil Defence, should not be given any other additional duties of any central armed police force. The DG should also have an administrative reporting line to the NDMA and ideally should be under the administrative control of the NDMA as an officer on deputation.

Conclusion

It is evident from the above that a robust disaster management system has been put into place and has evolved over a period of 13 years in a satisfactory manner. The NDMA has performed its task admirably and the contribution of NDRF has been exemplary. The nation's response during the recent Kerala floods is a case in point. The Armed Forces also played an invaluable supporting role and supplemented the efforts of the state administration. The NDRF is a growing force and has many capabilities. However, it is lacking state of the art equipment and is still not capable of taking on bigger disasters. It can also contribute towards international disasters; however their exposure in this area is very limited. Apart from the technological disadvantage the personnel manning the force are regularly rotated to their parent organization. This results in loss of experience to the force. Overall the system to fight disasters is in place, now only what we have to do is to put our act together in a more synergized and efficient manner.

CHAPTER 4: CASE STUDY: DISASTER RESPONSE DURING KERALA FLOODS IN AUG 2018

General

The Chennai flood in 2017 or Mumbai floods in 2015 affected a single city, the heavy downpour drove red alert to the entire state. Kerala had never imagined that this kind of situation could develop in any of their city or in their state. Since May 2018, unusually high levels of rain took over the state of Kerala. The devastation that ensued resembled that of the Great Flood of 1999. The unmatched precipitation unfurled catastrophe across the flood plains of the state to such an extent which is not recorded in the history of Kerala. The heavy downpour in the catchment areas of all the 41 west flowing rivers made the rivers swelled up and overflowing flood waters shifted the course of the rivers, submerged the settlements, bridges washed away and ransacked roads. During the peak time of the emergency situation, two district Pathanamthitta and Thrissur were about 80% submerged. More than one million people got affected. 35 out of the 44 dams within the state were opened for the first time in history. Monsoon poured 41% extra rain which resulted in a death of over 483 people. People perceived the situation as wrath of the nature and felt the scenario of a potential doomsday.

How the Situation Unfolded

The summer monsoon rainfall in Kerala from May to August the year 2018 was 2,290 mm, which was 53% above normal. The average rainfall during the summer monsoon period (June-September) is about 1,619 mm. This made 2018 Kerala's third wettest year in the last 118 years (1901-2018); 1924 and 1961 were the wettest years with about 3,600 mm of annual rainfall. Till August 21, Kerala witnessed few extreme rainfall events covering almost the entire State. Kerala received 1634.5 mm rainfall during the period May 1 to August 7, which is more than the average rainfall (1619.37 mm) during the summer monsoon period (June-September). As a result, six of the seven major reservoirs in the State had over 90% storage before August 8, well before Kerala received the unprecedented extreme rainfall events. Another interesting fact is that during the period May 1-August 21, the catchments upstream of the Idukki, Kakki, and Periyar reservoirs received unprecedented rainfall of 279%, 700%, and 420% respectively from

their long-term means. Hence, it is worthwhile analysing as to how the events unfolded after August 7 so as to analyse the impact on the state. (Saleem, 2018)

On 08th August 2018 Kerala received rainfall of 310mm over 24 hours. The shutters of Neyyar dam rose to 5 inches from 4 inches. Chalakuddy river started overflowing.

Figure 21 : Map Showing Chalakuddy River Basin

Central government team visited flood-hit regions of Kuttanad, Upper Kuttanad. Meanwhile over 20 landslides were reported in Kannur district and hundreds of families were isolated.

On 09th August, 24 dams across the state opened. On the same day Idukki dam's first gate were opened which had never been opened in the last 26 years. Shutters of Idamalayar dam were also opened for the first time in 5 years. Landslides were reported in Malappuram, Idukki, Wayanad, Kannur, Kozhikode and Palakkad districts. Red Alert was issued in Wayanad. The nation's disaster response system was activated and 15 NDRF men with a chopper reached Wayanad. A further 5 choppers (3 from Air force, 1 from Coast Guard, and 1 from Navy) were also pressed into action. Parts of Nilambur were evacuated, and situation worsened in Kuttanad.

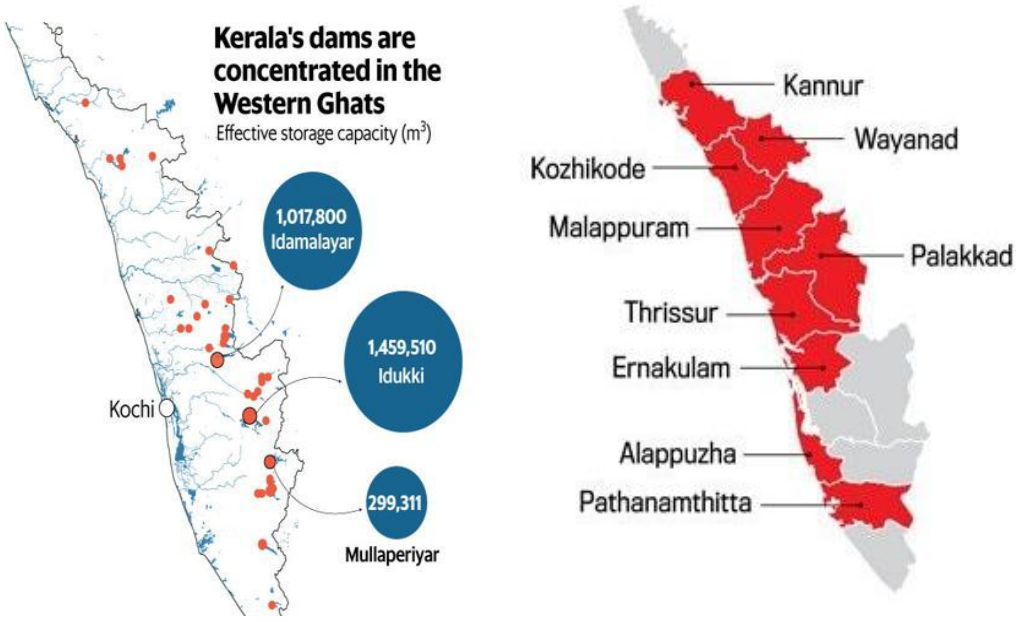


Figure 22 : Map Showing Locations of Dams and Areas Affected

By the next day half of Kerala was declared flood-hit. State emergency response mechanism was already in action and almost 10,000 people were evacuated. Due to incessant rainfall all the five gates of Idukki-Cheruthoni dam had to be opened. Kochupampa dam was also opened. Armed Forces were requisitioned by the civil administration and 80 Army personnel from Madras Regiment were deployed for rescue and relief missions for tourists in Pallivasal, Idukki. Navy and NDRF teams reached Ernakulam. Basic services were disrupted and there was a drinking water crisis in Kochi, as the supply from Aluva was down by 20%. Air services were also affected and Thiruvananthapuram airport was geared up, as Cochin International airport was shut down.

On 11th August Idukki dam level reached 2400.18 feet and Banasura Sagar dam had to be opened. Upper Kuttanad experienced heavy downpour and IMD issued Red Alerts across 8 districts. Chief Minister Pinarayi Vijayan undertook aerial survey of affected regions and appealed to all to donate generously to Chief Minister's Distress Relief Fund since preliminary assessments indicated that total loss due to flooding would be worth more than Rs 8,000 crores. The next day Union Home Minister, Rajnath Singh, took an aerial survey of Ernakulam and Idukki districts of Kerala and asserted that the

situation was “very serious” and announced immediate release of Rs 100 crore. Meanwhile, a powerful low-pressure formation developed over Odisha coast, and rain was forecasted for 2 more days. By this time 302 relief camps had been set up and the Red Alert in flood affected districts continued.

By 14th August all gates of Idukki dam had been opened and Walayar and Mattuppetti dams were also opened. Water level stood at 2,397 feet at Idukki-Cheruthoni dam and reached 138 feet at Mullapperiyar dam. Munnar town was isolated and till now 52 units of the defense forces had been deployed. On 15th August there were additional rains and following these heavy rains, gates of 35 dams in the state were opened. It was the first time in history where all five gates of Idukki dam had been opened. Government issued an alert before opening gates of Mullaperiyar dam when water levels reached 140-foot mark. Kochi Airport was shut down for the next few days, thereby hampering the air relief works. Southern Railways and Kochi Metro also suspended operations due to floods.

The state on 16th August was that Idukki had to endure 84% extra rain. State disputes came on the forefront and Tamil Nadu government declined Kerala's request to reduce water level at Mullapperiyar dam to 139 feet. Water levels at Idukki and Mullapperiyar dams reached 2402.2 feet and 141.95 feet respectively. Neyyar dam had to be opened for the first time in decades. Due to uncontrolled flow of water, landslides in 87 places across the state were reported leaving hundreds isolated. Situation worsened further in Idukki, Upper Kuttanad was flooded and Wayanad Churam was blocked.

The disaster response system of the entire nation was working overtime and 40 more units of NDRF were appointed. On 16th August NDRF evacuated 926 people to safer places at Pathanamthitta, Kozhikode, Ernakulam, Thrissur and Alappuzha. Navy's Marine Commandos were also deployed and two ships of the Coast Guard moved to Cochin. Cauvery River surpassed the danger mark. And Army constructed a 35-feet-long bridge to rescue around 100 people from Valiyakadu village in Malampuzha. Approx 1000 fishing boats from Thiruvananthapuram and adjoining areas had joined rescue ops and the total number of disaster management teams reached to 220.

By 17th August 82,442 individuals had been rescued and around 142,000 people were in 416 relief camps in Ernakulam district. 80,757 people placed in 500 relief camps in Alappuzha district. On 18th August itself, 58,506 people rescued, however, 388 individuals were also reported missing.

Donations to the CM's relief fund surpassed Rs 112 crore and PM declared an urgent relief of Rs 500 crore for rescue ops. Meanwhile, Situation in Chalakkudy, Paravur, Mala, Aluva, Kalady remained critical and Ernakulam-Ankamaly road remained blocked, and district borders between Ernakulam and Thrissur was washed off. A cumulative view of rainfall data from June 1 to Aug 30 actual v/s normal is as follows (Saleem, 2018):-

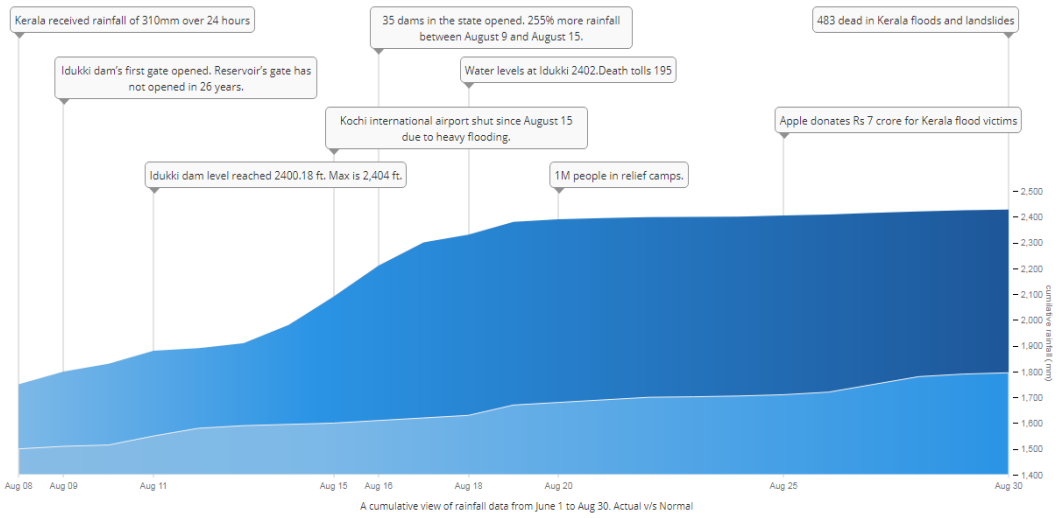


Figure 23 : Cumulative view of rainfall data from June 1 to Aug 30. Actual v/s Normal

On 19th August there was a respite in the rainfall and the red alerts were withdrawn from all districts. However, IMD predicted strong winds by the coasts, and rough seas over the south, central and northwest Arabian Sea. Fishermen were advised not to go out to sea in these areas. Water receded in Ranni, Konni, Kozhancherry and parts of Pathanamthitta district. Road and rail transportation services resumed and the CM directed that focus of effort should now shift from rescue to rehabilitation.

Kerala received a cumulative rainfall of 771mm from August 1 – 20. There are

images released from earth observatory NASA, which shows the satellite view of Kerala before and after the flood. (Saleem, 2018)

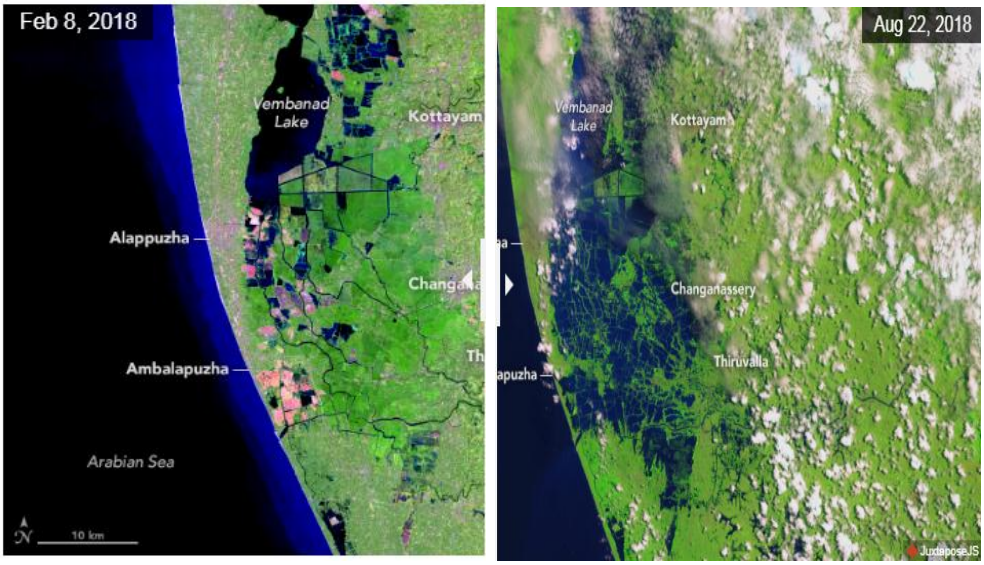


Figure 24 : Satellite Image of Kerala Floods

12 of 14 districts were worst affected by Kerala floods with 483+ lives were lost and 15 were reported missing. Damage assessments were having varying estimates however, according to Kerala's preliminary reports estimate of 50,000 Crores rupees worth was lost. More than 3 lakh farmers affected and some incidences of suicide were reported. 221 bridges were damaged and more than 10,000 Kms of roads were damaged. More than 20,774 houses were also damaged heavily. Another estimate of losses as shown in media reports is shown in the following figure (Keelery, 2018):-

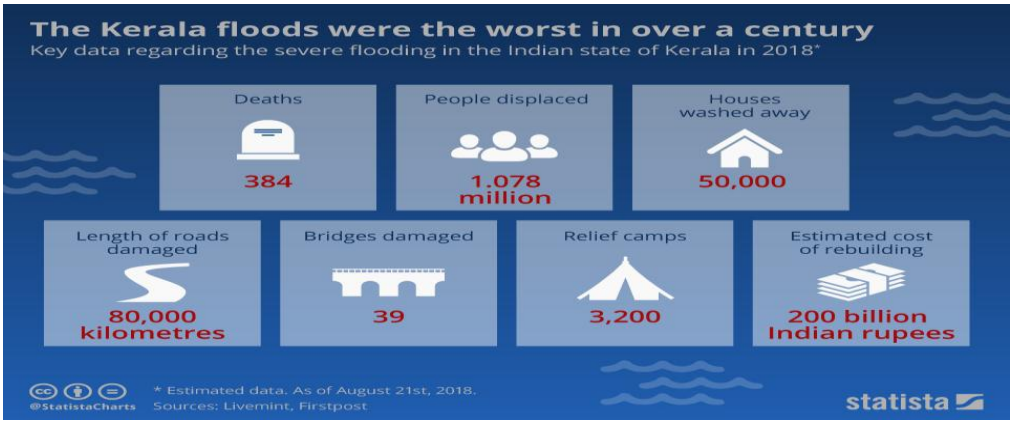


Figure 25 : Losses in Kerala Floods

Causes of the Disaster

Extreme Rainfall. An IIT study team stated that a combination of four factors led to extreme flooding across Kerala this year. The factors are above normal seasonal (May-August) rainfall, extreme rainfall events occurring almost across the State during the season, over 90% reservoir storage even before the onset of extreme rainfall events, and finally, the unprecedented extreme rainfall in the catchment areas of major reservoirs in the State led to the disaster. (Mishra, 2018)

The summer monsoon rainfall in Kerala from May to August this year was 2,290 mm, which was 53% above normal. The average rainfall during the summer monsoon period (June-September) is about 1,619 mm. This makes 2018 Kerala's third wettest year in the last 118 years (1901-2018); 1924 and 1961 were the wettest years with about 3,600 mm of annual rainfall. As a result, six of the seven major reservoirs in the State had over 90% storage before August 8, well before Kerala received the unprecedented extreme rainfall events. Thereafter till August 21, the State witnessed few extreme rainfall events covering almost the entire State. Consequently, the catchment areas of major reservoirs in the State received extreme rainfall never before witnessed in the State which resulted into this disaster. The role of other factors such as changes in infrastructure which have grown at the expense of vegetation and drainage added to the damages incurred.

Central Water Commission Hydrological Studies Organisation Hydrology (S) Directorate in its Study report (CWC, 2018) concluded that August 2018 flood in Kerala was due to severe storm occurrences during 8-9, August 2018 and 15-17, August 2018. The storm of 15- 17, August 2018 resulted in heavy flooding in Periyar, Pamba, Chalakudi and Bharatpuzha sub-basins of Kerala. The rainfall during 15-17, August 2018 was almost comparable to the historical 16-18, July 1924 rainfall of Kerala, particularly in Periyar, Pamba, Chalakudi and Bharatpuzha sub-basins

Role of Dams. According to some reports mismanagement of dams was the primary reason for the Kerala floods. One of the major functions of dams is flood protection by attenuating the flow of water and its impact downstream. One of the main rules followed in dam management is to maintain a flood cushion (buffer) in case of unexpectedly high rainfall. Kerala has 39 major dams whose maintenance is shared

between the Kerala State Electricity Board (KSEB) and the Water Resources Department. The Periyar is the longest river in Kerala and has the highest discharge potential. Some of the main dams across this river that are maintained by the KSEB are Idukki, Lower Periyar, and Madupetty. The water from Lower Periyar, Madupetty and Mullaperiyar drains into the Idukki reservoir consisting of the Idukki dam and the Cheruthoni dam. The water from the Idukki reservoir and Idamalayar drains directly into the Bhoothathankettu dam, which is the lowermost in the Periyar system, just 15 km from Kothamangalam town.

According to India Meteorological Department's study, the rainfall in August was only the sixth highest in the past 143 years (1875-2017) in Kerala. All dams in Kerala reached their full reservoir level by July-end, and were thus incapable of containing the water flow from torrential rainfall in August. This forced the State government to open the gates of 34 major dams, thereby submerging all the major towns downstream. According to the data released by the State Disaster Management Authority, 85,300 litres of water was released every second from Kakki-Anathode dam, and 47,000 litres from Pampa dam at 4 p.m. on August 14. The shutters of both dams were raised at night. By 10 p.m., 4.68 lakh litres of water started gushing out of both dams. Data posted by the KSEB reveals that the water released into the Periyar river basin from the Idukki and Idamalayar dams surged from 46.26 mcm/day on August 14 to 200 mcm/day the next day. This caused the towns downstream to be totally submerged. An analysis of spill from these dams reaffirms the gross mismanagement in the operation of dams. The State government and the KSEB opened 34 of the 39 major dams simultaneously, controlled release from these dams would have reduced the gravity of the calamity

However according to Central Water Commission Hydrological Studies Organisation Hydrology (S) Directorate Study report (CWC, 2018) the release from reservoirs had only minor role in flood augmentation as released volume from the reservoirs were almost similar to inflow volumes. In fact Idukki reservoir absorbed a flood volume of about 60 MCM during 15-17, August 2018. Even, with the 75 percent-filled reservoir conditions, the current flood could have not been mitigated as 1-day rainfall in majority of the area was more than 200 mm and severe rainfall continued for 3

to 4 days.

Indiscriminate Urbanization Admittedly, the change in topography due to human interventions and climate change have contributed to the sporadic and excess rainfall. The proliferation in illegal stone-quarrying activity has been a major reason for widespread landslides. The decision of the incumbent government to reduce the boundary of a quarry from residential buildings to 50 metres has facilitated the mushrooming of the stone quarrying mafia.

Lack of Inter Government Coordination The State government also failed miserably in coordinating with the Tamil Nadu government on the release of water from Upper Sholayar despite the State heading the joint water regulatory board. The Government of Kerala argued in the Supreme Court that the sudden release of water from the Mullaperiyar Dam by the Tamil Nadu government was one of the reasons for the devastating flood in Kerala. The Tamil Nadu government rejected the argument, saying that Kerala suffered the deluge due to the discharge of excess water from 80 reservoirs across Kerala, spurred by heavy rains from within the state; It also argued that the flood surplus from the Idukki dam is mainly due to the flows generated from its own independent catchment due to unprecedented heavy rainfall, while the discharge from Mullaperiyar dam was significantly less.

Though it is difficult to attribute any single event to climate change, its possible role in causing the heavy rainfall event over Kerala cannot be ruled out.

Removing Vulnerability to Disaster

As is evident from the above analysis that apart from the heavy rainfall, one of the main reason for the extensive losses in this disaster was the poor management of dam waters. In case we are able to improve our flood forecasting, we would be able to control the flow of waters from the dam. There have been improvements in the methods of flood forecasting in the world, however India lacks the required monitoring network, which allow real time flood prediction. New techniques have been developed in which with the help of satellites floods can be forecasted based on the quantum of water flow in the river. Radar altimetry, for example, can accurately estimate water levels and can predict

the flow downstream. This technique though requires low revisit time of satellite; otherwise it may lead to delay in flood prediction. To overcome this problem, the scientists have used the artificial neural networks to merge data from multiple satellite sources and optical sensors. This technique has resulted in a reliable tool for estimating river discharge. India needs to work towards this technology since many more states are vulnerable to flood prone disasters.

Environmental reasons also played a major role in the massive economic losses suffered by the state. Over a period of time the floodplains of the river were indiscriminately encroached and also the water bodies had slowly vanished. The natural water drainage system of the terrain had been destroyed and numerous water obstacles were created which hindered the flow of rivers. Even if accurate flood forecasting was possible, it would have been of no use since the terrain profile had already been altered. In this kind of problem the Government needs to step in and delineate the floodplains where all economic activity is restricted even if there is the slightest probability of floods.

The State Government's Ministry of Environmental Affairs needs to play a proactive role in screening the various development projects for the risk they pose to the land and water ecosystem. Innovative means would be required to regulate high risk projects and should take into account climatic changes taking place due to global warming. Even the agricultural activities need to be regulated in the vulnerable stretches, since indiscriminate farming in the flood plains pose a hazard to the humanity as a whole.

Human settlements in the floodplains should be shifted out and the ecosystem of the area should be restored. After removing all encroachments there should be an effective action plan to restore the river basin ecosystem. The plan should have strict control over illegal activities like sand mining and other activities which affect the flow of river water. Planned flooding of downstream rivers should be catered for. Encroachments of roads, houses and other structures onto the flood plains may limit the scope of controlled flooding.

Optimal planning of the dam locations which assist in regulating the flow of river water is a must. A centrally located dam which stores the water for socio-economic use

and also assists in mitigation of disasters. The location of dam should not only be based on maximum economic potential, but also regulating the flow of river water.

Holistic approach to management of water needs to be adopted which takes into account the urban water system as well. Embankments to divert the flow of water helps in developing settlements but at the same time develop into vulnerability during flooding. Sponge city is a concept which should be put into effect. A Sponge City is a city that has the capacity to mainstream urban water management into the urban planning policies and designs. It should have the appropriate planning and legal frameworks and tools in place to implement, maintain and adapt the infrastructure systems to collect, store and treat (excess) rainwater.

Analysis of Emergency Response

To assist the state of Kerala, the Centre launched massive rescue and relief operations. In one of the largest rescue operations, **40** helicopters, **31** aircraft, **182** teams for rescue, **18** Medical Teams of Defence forces, **58** teams of NDRF, **7** companies of CAPFs were pressed into service along with over **500** boats and necessary rescue equipments. They successfully saved over **60,000** human lives by rescuing them from marooned areas and shifting them to relief camps. Defence aircrafts and helicopters have made 1,084 sorties of duration **1,168** flying hours and airlifted **1,286** tonne of load and carried **3,332** rescuers. In addition, a number of Navy and Coast Guard ships were pressed into service to carry relief material to Kerala. (PIB, 2018)

NDRF did a commendable job and till the last day of calamity that is 21 Aug 18 41 teams of NDRF were still deployed in Kerala to assist the state administration in rescue, relief and rehabilitation work. A Press release issued by NDRF stated that "during the rescue and relief operations, NDRF teams demonstrated their prowess and professionalism and left no stone unturned to provide immediate relief to the victims. In on-going operation, National Disaster Response Force (NDRF) has rescued 535 lives and evacuated 24,616 marooned people to safer places as well as teams have rescued 119 livestock and provided pre hospital treatment to the 4908 people, so far" (NDRF, 2018)

The Armed Forces were equally committed in managing the disaster and the

Army was deeply involved in the Rescue & Relief operations since the request for provision of Army assistance was received on 09 August 2018. Accordingly, Indian Army carried out execution of Disaster Relief tasks on a war footing which was greatly appreciated by civilian populace and the State administration. As on 17 August 18 a total of 10 flood relief columns, each having an approximate strength of 65 personnel carried out rescue operations in ten districts of Kerala. In addition to these 10 flood relief columns, 10 Engineer Task Forces (ETF) each having an approximate strength of 40 personnel from Jodhpur, Bhopal, Pune, Bangalore and Secunderabad were pressed into action. Army also utilised 53 military boats to evacuate civilians from flood affected areas. In spite of continuous and heavy rains, Indian Army columns worked round the clock to restore connectivity to remote villages by constructing temporary foot bridges, bunds and preparing alternate routes. 13 temporary bridges were constructed to reconnect 38 remote areas and total of 3627 personnel had been rescued till 17 Aug 2018, which included 22 foreign nationals. Relief materials were also sent to 19 villages with medical aid being provided to approximately 500 civilians. (PIB, Press Information Bureau, 2018)

Indian Air Force too responded immediately to the crisis in extending all possible assistance to the residents of Kerala through Humanitarian Assistance Disaster Relief (HADR) missions. Concerted efforts were made by IAF in rescuing stranded people from the flooded areas. Ladies, children, elderly people and residents were winched from the rooftops of submerged houses to safety by IAF helicopters. To summarise the effort of Indian Air Force, it carried out 517 sorties of Fixed Wing aircraft, airlifting 3787 persons and 1350 Ton of load and 634 sorties of Helicopters, winching 584 persons and airlifting 247 Ton of load. (PIB, Press Bureau of India, 2019) IAF helicopters had also dropped food and water packets to the stranded people in the affected areas. Transport aircraft from all corners of the country have been flying day and night to ensure relief material is available in the relief camps and till 21 Aug 2018, 974 Tons of relief material has been airlifted to Kerala state. No 1 Rapid Action Medical Team (RAMT) Of the Indian Air Force had been airlifted from Command Hospital Air Force Bengaluru to Thiruvananthapuram to assist in the medical relief efforts to the residents of Kerala. Additionally, 119 civil Doctors with 63 Tons of medicine and equipment had been airlifted to Kochi and Thiruvananthapuram for further positioning at various medical

camps. (PIB, Press Information Bureau, 2018)

The Southern Naval Command started its Operation Madad and by 24 Aug 18 had successful completed the rescue and relief operations. This was the largest ever HADR operation undertaken by the SNC that lasted close to sixteen days, with a total of 16,843 persons having been rescued, of which 15670 were by boat, while 1173 had to be airlifted. The efforts reached a peak with 92 rescue teams with Gemini boats deployed in a day. The aircraft were also able to undertake air sorties from daybreak to dusk without stopping. Rescue camps were organised at two places, Naval Armament Depot, Aluva and the T2 Hangar, Naval Base for the displaced persons. Medical camps were set up at Wayanad and Aluva where access by road was not possible. A community kitchen, which was feeding up to 10, 000 people all three meals and tea twice was set up. Emergency repairs of critical public facilities and infrastructure was undertaken at Amritha Hospital, Pazhassi dam and KWA water pumps to restore water supply, and some of the KSEB transformers to restore power supply. (PIB, Press Information Bureau, 2018)

The HADR Operations of Indian Coast Guard also worked parallel to other relief operations. Similar as that of the tri-services, men and machinery of the Coast Guard were mobilized from all across India for the operational easiness. Defence forces worked in close co-ordination with the state machinery. The palpable cohesion between the various Centre and state forces and civilians helped to address the doom at various levels, saved lives and averted the terrible fate.

Conclusion

The floods in Kerala in August 2018 were unprecedented and despite all our efforts towards mitigation of disasters, the state and the country suffered invaluable losses in terms of human life and resources. The response to the disaster was encouraging on all fronts and the relief was provided to the best of the ability. The question now arises is whether our capability to fight disasters of this magnitude adequate or still it’s a long way to go. One of the major inadequacies which was noticed was the adoption of latest technological means in preventing and fighting this disaster. Despite the meteorological department predicting incessant rains, means were not available to predict the severity of the outcome and warn all concerned. The dams played a crucial role and it appeared that

there was no contingency planning available to this kind of water deluge. So the steps towards disaster mitigation by the Kerala Government failed.

The response by the Centre was also graduated and reactive as everyday based on the situation on ground more forces were deployed. Synergy in operations between the different forces was visible, but it could have been much better. Once the men were there on ground they did not have the right equipment to provide assistance. The Armed Forces did the best they could and mobilised all possible resources, but there resources are not designed for relief and rescue work. NDRF is designed for this and did an exemplary job, but they also found a need for better equipment to deal with search and rescue operations. The shortfall in numbers of NDRF was made up by the Armed Forces and the civil society, but each of these rescue members were not suitable equipped to provide optimal rescue effort. Overall our response was much below par when compared to response of a developed nation during its disaster.

CHAPTER 5: DISASTER RESPONSE SYSTEM OF DEVELOPED COUNTRY: JAPAN

General

Japan is a country standing on geographical structure which is called as "Ring of Fire" - an arc which covers pacific basin and it is situated on Amurian and Okinawa Plate in South and Okhotsk Plate in the North. The continuous moment of these plates in conjunction with Pacific plate, the Philippine sea plate, the Eurasian plate and the North American plate are the cause of seismic and volcanic activities resulting into various disasters in this country. (Nazarov, 2011)

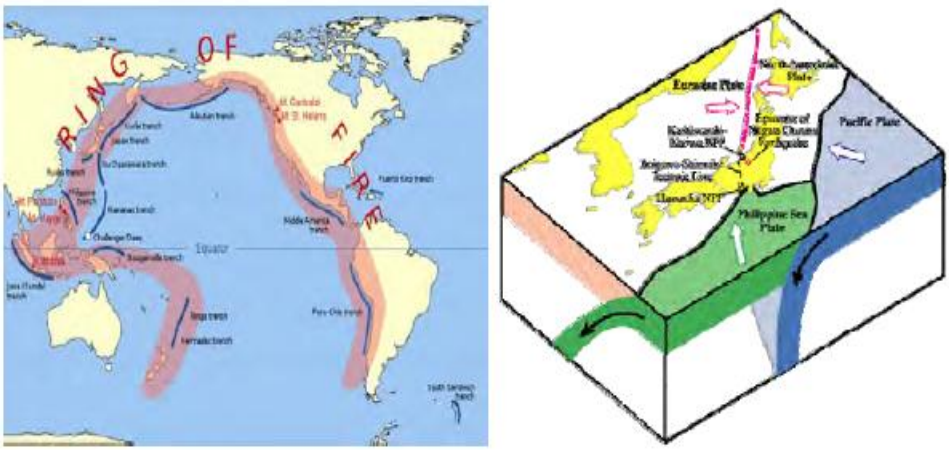


Figure 26 : Japan's Geographical Vulnerability to Disasters

Japan is disaster prone area on all fronts may it be Earthquakes, Tsunamis, Typhoons, Cloudburst, Torrential rains, Flooding, Heavy snow storms, or Volcanic eruptions. In fact among the developed nations Japan has the highest natural disaster risk in the world. Some of the major disaster events which have occurred till date are listed below (In terms of fatalities & damage):-

(a) The Mount Uzen volcano eruption in 1792 which killed 15000 people.

(b) The North Kyushu Typhoon in 1828 which killed 19113 people.

(c) The Sanriku earthquake in 1896 which killed 21959 people.

(d) The Great Kanto earthquake in 1923 which killed over 140,000 people.

(e) The Great Hanashin earthquake 1995

(f) The massive earthquake (known as the Tohoku earthquake) and the subsequent tsunami that struck Japan on March 11, 2011, and the following release of radiation from the Fukushima Dai-ichi nuclear power station, constitute one of the greatest disasters to strike Japan in recent times. (Panda, 2012)

Japan has been at the receiving end of most of the disasters that have occurred in the world and the details of casualties as suffered by them are a grim reminder of that. The same is depicted (Japan, Disaster Management, Disaster Management in Japan) below:-

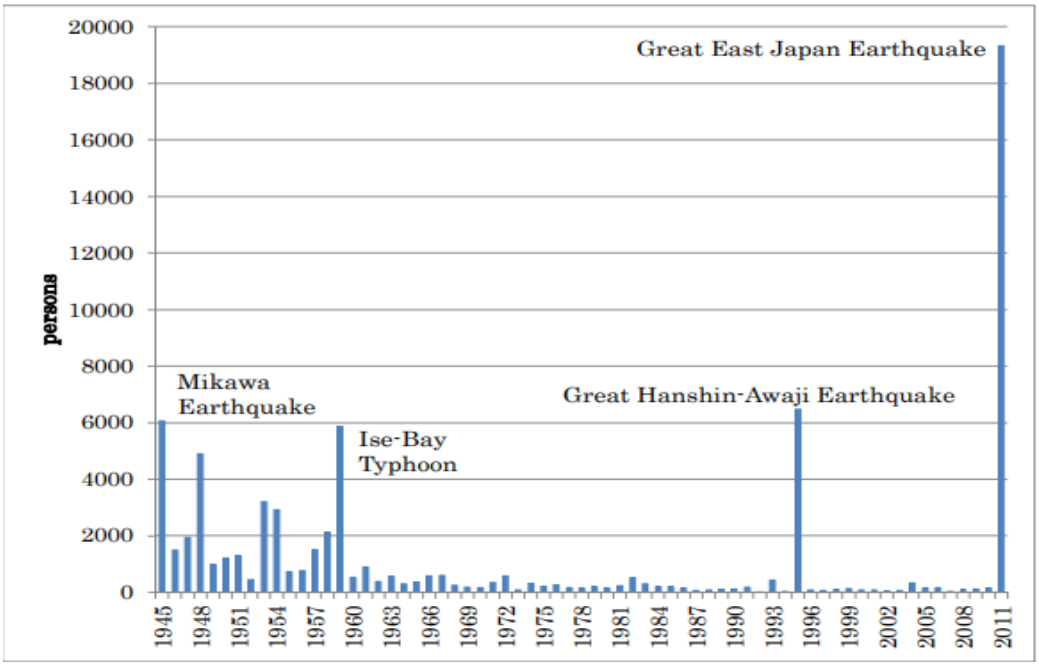


Figure 27 : Casualties in Disasters in Japan

Disaster Management System of Japan

Disaster Management System in Japan has basically three laws which have been enacted to regulate disaster response activities at national level. These are the Disaster Relief Act of 1947, Fire Services Act of 1948 and the Flood Control Act of 1949. The

enactment of the **Disaster Countermeasures Basic Act** (DCBA) is considered to be the turning point in the history of modern disaster management system of Japan. Adopted in 1961, two years after the Ise-wan Typhoon which caused tremendous destructions and loss of more 5000 people, the DCBA defined *protection of national land as well as citizens' lives, livelihoods, and property from natural disasters* as a national priority. (Nazarov, 2011) The basic scheme of DBCA is as given in the following figure:-

Figure 28 : Basic Scheme of DCBA

One of Japan's most recent initiatives in the field of disaster risk reduction and management is the publication of the White Paper on Disaster Management in 2015. This annual report provides comprehensive information including disaster losses and relevant data and statistics; updates on the progress of recovery and reconstructions from specific disasters; policies and measures for disaster management by disaster type; and insights into good practices on disaster risk reduction/ prevention at local/community level, and much more. (Japan, 2015)

The structure of disaster management plan (Japan, Disaster Management, Disaster Management in Japan) is as depicted in the following figure:-

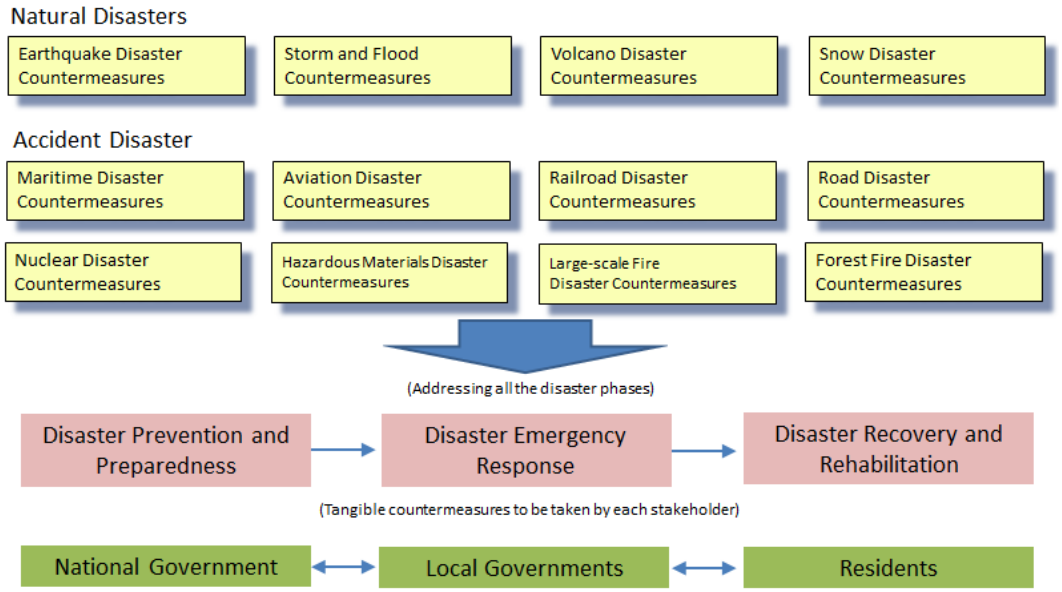


Figure 29 : Structure of Disaster Management Plan of Japan

The Ministry of Disaster Management is the lead ministry on behalf of the Cabinet Office and has eight separate offices manages the disaster in the following manner:-

(a) Disaster Management.

(b) Disaster Response Operations.

(c) Communities/Drills.

(d) Surveys/Policy Planning.

(e) Disaster Victims Administration.

(f) Disaster Preparedness, Public Relations and International Cooperation.

(g) Disaster Management Planning.

(h) Project Promotion.

The main priority of the state authorities is on disaster risk management. Aim is to reduce damage caused by disasters, especially due to sudden on-set of earthquakes and

tsunamis, through wider involvement of all the stakeholders. This has been specifically implemented by taking measures for the likely kind of disasters. The decrease in the number of casualties by earthquakes is ensured by retrofit/rebuild of old existing houses and buildings, affixing furniture and adhere protective films on old windows and encourage companies to make Business Continuity Plans. The decrease in the number of casualties by tsunamis is implemented by distributing tsunami hazard maps, disseminating tsunami warnings effectively and ensuring that people are evacuated to safe places. Similarly further decrease in the number casualties by typhoons and floods is affected by providing early evacuation alerts for the elderly and disabled and distributing flood hazard maps to all affected people.

The Government of Japan advocated the importance of "mainstreaming DRR" at the Third WCDRR. The primary meaning of "DRR mainstreaming" is making prior efforts in initiatives to mitigate damage from disasters in particular; in other words, to ensure that DRR efforts are reflected in all policies on a widespread basis. All sectors are affected once a disaster strikes and DRR cannot be achieved unless advanced preparations are made in all types of policies. Japan has been building a disaster management system with relevant ministries and agencies, public agencies, local governments, and others under the Central Disaster Management Council, comprising all relevant Cabinet ministers. (Saya, 2017)

Disaster Response Mechanism

In the event of an extreme disaster that cannot be handled at the local level, a Major Disaster Management Headquarters is established which is led by the Minister of State for Disaster Management (or in the event of an extraordinary and violent natural disaster, establishment of an Extreme Disaster Management Headquarters is led by the Prime Minister). Based on legal provisions laid down for management of disasters, several ministries coordinate with the principle ministries and agencies to respond to the emergency situation. There is no regional organization like SDMA for disaster risk reduction during ordinary times. They do not have a standing response organization like NDRF or FEMA (Federal Emergency Management Agency) of USA which has a standing strength of more than 10,000 personnel. Following the occurrence of a disaster,

depending on the scale of the disaster, National On-site Disaster Management Headquarters and on-site contact offices will be set up. The Cabinet Office closely collaborates with relevant ministries and agencies to prevent, respond to, and recover from disasters and works to ensure that the nation prepares strongly for such events.

In the event of a natural disaster, national government institutions, local governments, public agencies, and other institutions involved in disaster management work as one, in cooperation with residents, to respond to that disaster. Disaster Management Headquarters will endeavor to grasp a whole picture of the damage and action will be taken immediately without waiting for requests for assistance from the affected areas. Large support units such as the police, firefighter and Self-Defense Forces would be dispatched to the administrative divisions, where great damages are expected. The initial 72-hour is the maximum period earmarked for rescue and JMATs (Japan Medical Association Teams) and DMATs (Disaster Medical Assistance Teams) are dispatched over a broad area for this purpose.

Rajaram Panda a researcher at the IDSA in his article "Japan Coping with a National Calamity", (Panda, 2012) stated that Japan's response to a powerful 9.0-magnitude earthquake which hit Japan on March 11 was massive. The government established an emergency response team headed by the Prime Minister. In the midst of a national calamity, Japan handled the disaster with calm and poise. The stoicism and efficiency with which the Japanese used their human capital and organizational skills for dealing with the situation was remarkable. The way Tokyo sprang back to life and business within hours while coping with the situation says a lot about Japan's national character.

During the March 2011 earthquake, the Japanese government and the Self-Defense Forces swung into action quickly and they were quickly strengthened and supplemented by deployment of forces by its allies. The DD Harusume in Yokosuka Bay was quickly dispatched on a rescue mission, as were other Maritime Self-Defense Force (MSDF) teams and ships. The government also dispatched nearly 28,000 members of the National Police Force and Fire and Disaster Management Agency for the rescue mission. The Japanese Red Cross, which serves as an auxiliary to the government for disaster

relief, also chipped in. The government also allocated almost $50 billion for critical tasks, such as debris removal, temporary housing, and restoration of infrastructure. (Assistance, 2011)

The Japanese response mechanism can also be best understood with the help of its planned response during a major earthquake which is expected to strike sometime along the Nankai Trough, a submarine trench running off the Japanese archipelago from around Shizuoka Prefecture in Honshu to the seas east of Kyushu. It is anticipated that some 60,000 people in 33 municipalities are in danger of being caught in a tsunami due to tremors in the Nankai trough.

In an immediate response, more than one lakh troops from the Self Defence Forces and approximate 30,000 police and firefighter personnel from 37 prefectures have been earmarked for the relief and rescue. These forces will have adequate aircrafts and marine vessels. Medical, food and fuel supplies have been planned for induction. The same is shown in a figuratively manner (OGATA, 2016) as follows:-

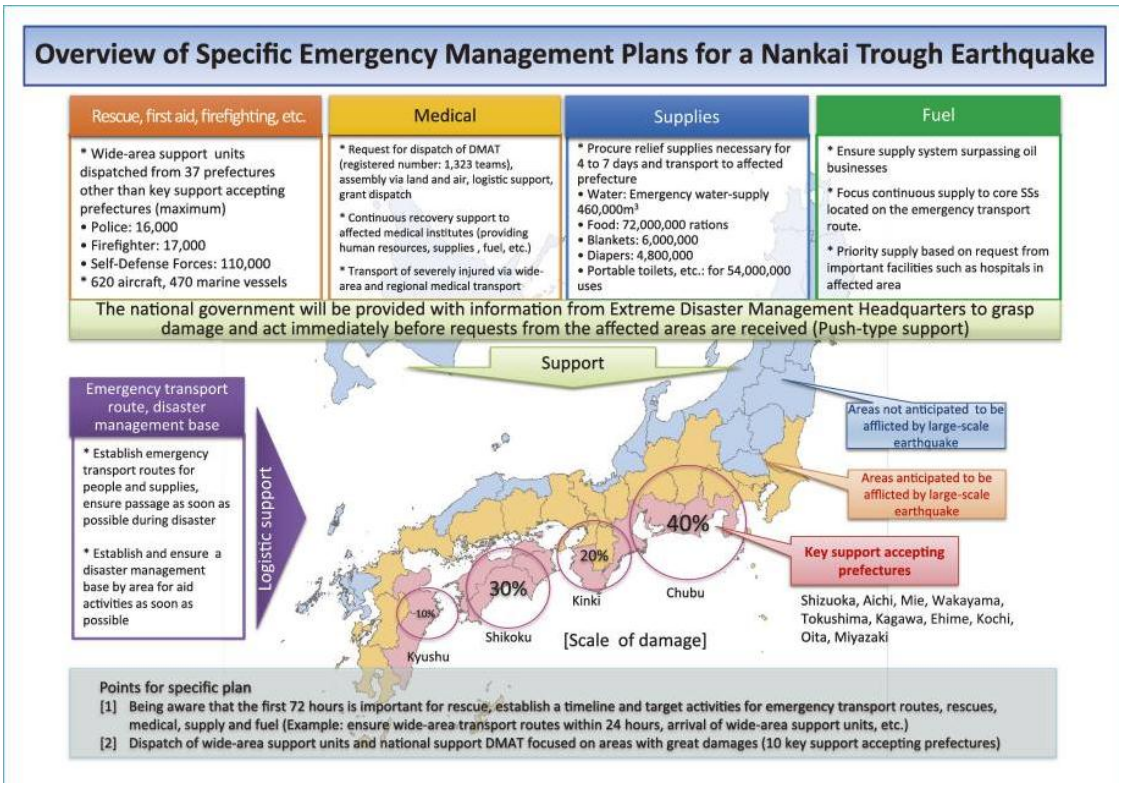


Figure 30 : Response in Nankai Trough Earthquake

Disaster Response Forces

For the emergency response to a disaster, Japan does not have a standing force and relies on its Self Defence Forces which are akin to our Armed Forces and Fire Corps Volunteers. The Volunteer Fire corps is made up of volunteer firefighters who protect a region's safety and sense of security and they play a key role in improving regional fire/disaster preparedness. Volunteer Fire corps members engage in firefighting, lifesaving, and first-aid activities during a disaster and in non-crisis times, they work on the promotion of disaster preparedness awareness to local residents. Generally anyone over 18 years of age can become a member and students and females are encouraged to be a part of this force. The strength of these volunteers (Japan, White Paper on Disaster Management in Japan, 2015) varies as follows:-

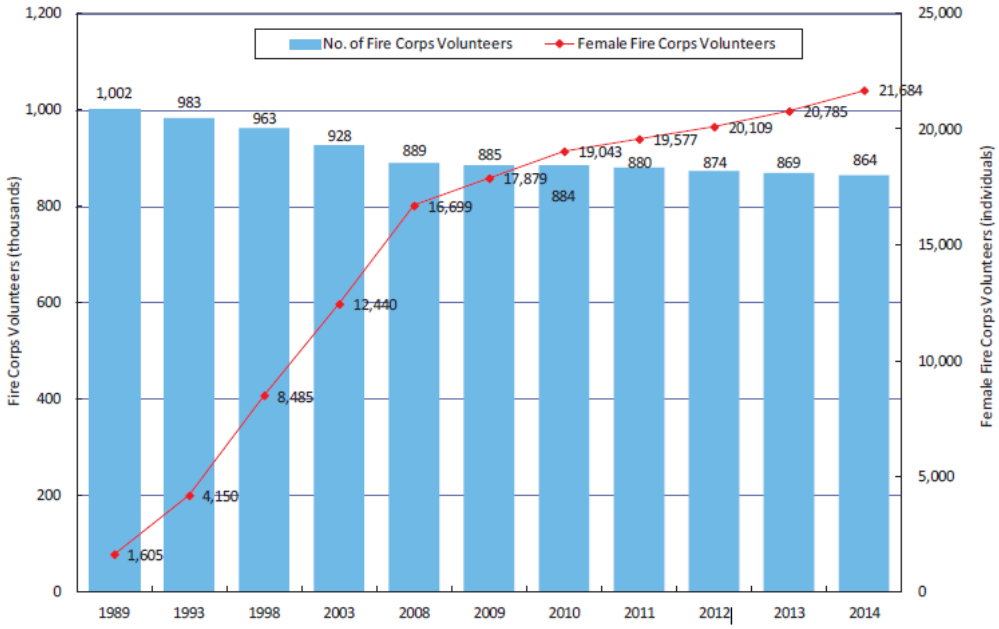


Figure 31 : Trends in Volunteer subscription for Disaster Management

The Japanese Self Defence Forces response is reserved primarily for larger scale disaster operations. The mainstream view is that the military plays a limited and supplementary role. This concept of a “last resort” is consistent with SDF’s approach toward its disaster relief missions. In general, the disaster relief missions of the SDF are based on three principles: contribution to common good, urgency, and no comparable civilian alternatives.

Conclusion

Notwithstanding the excellent response the Japanese Government identified certain shortcomings in their response during the 2100 earthquake (Panda, 2012) which are as under:-

(a) Lack of political leadership.

(b) Delayed response of the central government to the disaster.

(c) Ineffectiveness of non-governmental response.

(d) Constraints on the military.

(e) Inefficient communication system.

(f) Socially vulnerable people.

India has also lessons to learn from the Japanese experience in handling disasters. Our country needs to move beyond policies and guidelines and towards actual implementation. Disaster planning should be integrated into City Development Plans, education curriculum. Besides creating public awareness, it is necessary to have NDRF properly equipped with modern tools to predict and handle emergencies so that effects of disasters like Kerala Floods of 2018 can be mitigated. The government also needs to consider instituting courses on disaster preparedness mandatory in educational institutions to prepare people to respond appropriately in disaster situations.

CHAPTER 6: CAPABILITIES OF ARMED FORCES TO SUPPLEMENT NDRF

General

The Indian Armed Forces are one of the most dedicated and professional organisations in the world. They have a rich tradition of being involved in all the socio-developmental roles of nation building. Their physical presence in the remote, inaccessible and backward areas of the country gives them a unique opportunity to be involved with the problems of the local communities. The soldier coming from different areas of our vast country is a model of national integration and acts as a catalyst for progress of an area by his sheer presence. He is known to be hardy, ingenious, skilled, disciplined and resourceful so as to be relied upon to handle any type of adverse situations. Apart from the main responsibility of defending the border of the country the army renders assistance to civil authorities when called upon to do so, during the natural calamities and maintenance of law and order or essential services.

The constitution and the legal framework provide for the army to render assistance when the situation is beyond the capability of the existing administration to handle. Hence during a disaster it becomes imminent for the army to be involved. During an emergency situation all the resources available with the administration would be inadequate, and the multifarious resources that can be mobilized by the army are called upon to bring prompt succor to the grief stricken population. The depth of assistance which the Armed Forces on its own are capable of providing can be perceived from the volume of effort put in by the forces to mitigate the evil effects of the devastating floods which occurred in the state of Kerala in August 2018.

Resources and Capability of Army

Before looking into the capability and resources at the disposal of the Armed Forces it is important to know what all assistance they can provide to the civil administration at the time of crisis. These are as under:-

(a) **Infrastructure for Command and Control**. Infrastructure for setting up

of command and control organization for providing relief is an important task for the Armed Forces. This would involve provision of communication both telephone, radio and specialist manpower to handle it.

(b) **Medical Aid**. Provision of medical care with the help of medical teams including treatment at the nearest military hospital is another major task performed by the Armed Forces.

(c) **Transportation of Relief Material**. Provision of logistic backup to include aircrafts, ships and vehicles for transportation of relief material to the affected areas is also one of the functions which they may be required to undertake.

(d) **Establishment of Relief Camps**. Setting up and running of relief camps can be effectively carried out by the Armed Forces.

(e) **Construction, Repair of Roads and Bridges**. The army engineers can undertake construction and repair of roads and bridges to enable relief teams/ material to reach affected areas. This also includes provisioning of technical and plant equipment such as cranes, bulldozers and boats etc.

(f) **Maintenance of Essential Services**. Repair, maintenance and running of essential services like transport, railways etc may have to be undertaken in the initial stages of disaster.

(g) **Evacuation of People to Safer Areas**. Assist in evacuation of people to safe places before and after disaster is one of the most important tasks that the Forces may be assigned to do.

(h) **Stage Management of International Relief.** The Armed Forces with their airlift and sealift capability can undertake stage management of handling of international relief.

(j) **Security**. The Armed Forces may also be called to coordinate provisioning of escort for men, material and security of various sensitive

installations.

Principles of Employment of Armed forces The operations of the armed forces whenever called upon to assist the civil authority in rendering relief are governed by certain guiding principles (IDS, 2009) These are enumerated below:-

(a) Judicious Use of Armed Forces. The assistance by armed forces should be requisitioned only when it becomes absolutely necessary and when the situation cannot be handled by civil administration from within its resources.

(b) Immediate Response. When natural and other calamities occur, the speed for rendering aid is of paramount importance. It is clear that under such circumstances prior sanction for assistance may not always be possible. In such cases the army when approached for assistance should provide the same without delay. No separate government sanction for aid rendered in connection with assistance during natural disaster and other calamities is necessary.

(c) Command of Troops. The army units while operating under these circumstances continue to be under command of their own commanders and aid rendered is based on task basis.

(d) No Menial Tasks. While assigning task to the troops it must be remembered that troops are not utilised for menial tasks. Troops should not be utilised for disposal of dead bodies.

(e) Requisition of Aid on Task Basis. The requisition of Armed Forces should not be in terms of number of columns, engineer and medical teams; instead the civil administration should spell out task and leave it to army authorities to decide the force level, equipment and methodology to tackle the situation.

(f) Regular Liaison and Co-ordination. In order to ensure that optimum benefit is derived out of armed forces employment, regular liaison and co-ordination needs to be done at all levels and contingency plans made and disseminated to the lowest level of civil administration and the army.

(g) Advance Planning and Training. The army formation located in areas prone to disaster must have detailed plans worked out to cater for all possible contingencies. The troops should be well briefed and kept ready to meet any such contingency.

(h) Integration of all Available Resources. All available resources, equipment, accommodation and medical resources with civil administration, civil firms, NGOs etc need to be taken into account while evolving a disaster relief plan. All the resources should be integrated to achieve optimum results. Assistance from outside agencies can be super imposed on the available resources.

(i) Early Derequisitioning. Soon after the situation in disaster affected area has been brought under control of the civil administration. Armed forces should be de-requisitioned.

Sequence of Actions and Challenges during Disasters

Once a disaster/national calamity is declared a meeting of the Defence Crisis Management Group (DCMG) is convened by HQ IDS which is attended by representatives of all three services. The instructions are passed for action by each service & the lead service is nominated. There may be occasions when one service is nominated as lead service in one State & other in another affected state based on the situation. The lead service then issues directions to the concerned Command HQs and who in turn issue orders to nearby static/field formations as per the requirement. The field formation then interacts with state agencies to organise relief.

At the national level, the Chief of the Integrated Defence Staff and the Chairman, Chiefs of Staff Committee are already part of the National Executive Committee (NEC) of the NDMA. (NDMA, National Disaster Management Plan, 2016) The Defence Crisis Management Group was institutionalized under the chairmanship of CISC in Jul 05. It has nine members to include CISC-Chairman, DG DIA, DCIDS (Ops) HQ IDS, DGMO Army HQs, ACNS (IW Ops) NHQs, ACAS (Ops) Air HQs, ACIDS (Jt Ops) HQ IDS, JS (G) MoD, ADGAFMS, DACIDS (Op Lgs) Secretary and DRDO representative. The DCMG has a watch, analysis, and overall plan formulation and coordination role.

Detailed planning, execution and management will be carried out by the respective Services. DCMG prepares detailed strategic estimates for each crisis situation. (Chand, 2010) At the Services HQ level the DGMO, ADGMO (A), DIR MO 6 in Army Headquarters; DCNS, ACNS (IW & Ops), DNO in Naval Headquarters and VCAS, ACAS (Ops), D Ops (T&H) in Air Force Headquarters are charged with coordinating the Emergency Response measures for disaster management.

Disasters in the recent years have shown that in the after-math of major calamities, there is no likelihood of any communications, infrastructure and civil set-up remaining intact. Therefore, in the initial stages, suitable key personnel, both civil and military and infrastructure/communications equipment will have to be moved by the fastest means to the affected areas. Transport aircraft/helicopters would have to be earmarked and kept ready to move such elements, at short notice. Some of the challenges that have been experienced recently during relief operations are: -

(a) Local authorities did not possess any inputs regarding the situation & services first had the task of gaining information of the extent of damage and the relief effort required.

(b) Heavy rains & poor weather conditions made relief operations difficult.

(c) There usually was a shortfall of the capability available for evacuation of affected personnel & the requirement.

(d) Problems were experienced of communication & compatibility of equipment between the different relief agencies.

(d) State Departments were not available for coordination where the army columns had already reached, leading to delay in affecting relief.

(e) There also was appreciable reluctance in providing resources of the state to the services.

Armed Forces Response during Kerala Floods

During the flood assistance to the state of Kerala, the Centre launched one of the largest rescue operations which comprised of 40 helicopters, 31 aircrafts, 182 teams for rescue, 18 Medical Teams of Defence forces, 58 teams of NDRF, 7 companies of CAPFs and many NGOs were pressed into service along with over 500 boats and necessary rescue equipment. This massive rescue operation saved over 60,000 human lives by rescuing them from marooned areas and shifting them to relief camps. Defence aircrafts and helicopters had made 1,084 sorties of duration 1,168 flying hours and airlifted 1,286 tonne of load and carried 3,332 rescuers. In addition, a number of Navy and Coast Guard ships were pressed into service to carry relief material to Kerala. (PIB, 2018)

The scope of disaster was beyond the management capabilities of NDRF and rightly so the Armed Forces had a major role in managing the disaster and the Army was deeply involved in the Rescue & Relief operations. Army alone had committed a total of 10 flood relief columns, each having an approximate strength of 65 personnel and carried out rescue operations in ten districts of Kerala. In addition to these 10 flood relief columns, 10 Engineer Task Forces (ETF) each having an approximate strength of 40 personnel were pressed into action. Army also utilised 53 military boats to evacuate civilians from flood affected areas. In spite of continuous and heavy rains, Indian Army columns worked round the clock to restore connectivity to remote villages by constructing temporary foot bridges, bunds and preparing alternate routes. A number of temporary bridges were constructed to reconnect many remote areas. Relief materials were also sent to many villages with medical aid being provided to many of the needy civilians. (PIB, Press Information Bureau, 2018)

Indian Air Force too responded immediately to the crisis in extending all possible assistance to the residents of Kerala and concerted efforts were made by them in rescuing stranded people from the flooded areas. The Indian Air Force carried out 517 sorties of Fixed Wing aircraft, airlifting 3787 persons and 1350 Ton of load and 634 sorties of Helicopters, winching 584 persons and airlifting 247 Ton of load. (PIB, Press Bureau of India, 2019) IAF helicopters had also dropped food and water packets to the stranded people in the affected areas. Transport aircraft from all corners of the country provided

974 Tons of relief material to Kerala state. Rapid Action Medical Team (RAMT) Of the Indian Air Force assisted in the medical relief efforts and additionally, 119 civil Doctors with 63 Tons of medicine and equipment was airlifted for further positioning at various medical camps. (PIB, Press Information Bureau, 2018)

The Indian Navy started its Operation Madad that lasted close to sixteen days, with a total of 16,843 persons having been rescued, of which 15670 were by boat, while 1173 were airlifted. The efforts reached a peak with 92 rescue teams with Gemini boats deployed in a day. Rescue camps were organised, community kitchen, which was feeding up to 10, 000 people all three meals and tea twice was set up and emergency repairs of critical public facilities and infrastructure was also undertaken by the Navy. (PIB, Press Information Bureau, 2018)

While in comparison to above the contribution of NDRF as given on their website is that they successfully rescued 535 persons, evacuated 24690 persons, 119 live-stocks and further shifted them to safer places. Teams also retrieved 10 dead bodies. In addition, teams also provided medical assistance to flood affected victims and assisted the state authorities in distribution of relief materials (NDRF, National Disaster Response Force, 2018) It is also evident from the above contribution, that despite the NDRF having 12 Battalions earmarked specially for Disaster Management, each of which can contribute 18 teams for search and rescue, they could only send 58 teams for their main task. That means that not more than four battalions would have been utilized for the task. It appears that because of the enormity of task at hand and the readily availability of Armed Forces, the utilization of NDRF was not optimal.

While the Armed Forces are not designed for disaster relief, they put in all they had and provided the maximum assistance while the response of NDRF faded to a dismal second spot. It raises an important issue of inertia building into the system of NDRF due to their over commitment on administrative tasks and having less troops available for operational tasks. In an answer to a question on the NDRF teams being pre-positioned at various locations Shri Sanjay Kumar, Director General, NDRF replied that the teams stationed there were the first ones to be deployed in Kerala. Additional teams were called in from different battalions as a standby given the fast deteriorating flood situation. On

the request of the State government, they deployed 58 teams in Kerala to ensure that the entire operation is managed smoothly. (NDMA, Kerala Floods, 2018) However seeing the magnitude of disaster which struck Kerala, more teams could have been mobilized to execute faster relief work.

The equipment profile of NDRF teams was also found inadequate since during the relief operations they felt the need of having latest technology search and rescue devices. The Collapse Structure Search and Rescue equipment which were being utilized by the NDRF teams was of vintage variety and it did not use the latest technology which is prevalent in modern equipment. The Armed Forces do not have any of these kinds of devices and manual means with the help of engineer devices like excavators were used for rescue operations. Therefore there was lack of synergy in application of resources from both the NDRF and the Armed Forces.

However, during the conduct of relief operations there were very minimal coordination issues and there was synergy seen in the response of the different organisations involved. This can be attributed to the efficient systems set in place by NDMA, which ensured that the Emergency Operation Centre was fully functional round the clock. NDMA also organised a meeting to facilitate the coordination between Non-Governmental Organisations (NGOs)/Civil Society Organisations (CSOs) and Kerala government so as to ensure the coordination of relief efforts for the State. (NDMA, Kerala Floods, 2018) The National Crisis Management Committee also held regular meetings beginning August 16, 2018 to take stock of the situation, preparedness, rescue and relief operations and directed that immediate and continued assistance be provided to Kerala to meet this crisis. Resultantly, NDMA's effort resulted in more than 2,80,000 persons being evacuated and more than 14 lakh people being brought to around 5,600 relief camps.

Armed Forces and NDRF in Disaster Management

Role of the armed forces in disaster management has been in debate for quite some time now and has become a regular discussion issue on the subject and the debate being more pronounced within the defence circles. There are two divergent views that are being voiced in various forums; whereas one view recommends dampening the response

of the armed forces and discourages over-enthusiasm, while the other view recommends a larger, proactive and more participative role in disaster management considering the immense and time tested resources and capabilities of the armed forces. Both have reasons and are backed by some rationale. (Commision, 2006)

Some people feel that engagement of the armed forces in disaster management will lead to a shift of focus that may even dilute the effectiveness of the armed forces for war. The other view supports the disaster management is an important role of the armed forces since it falls under the ambit of aid to civil authorities. The unambiguous and primary role of the Defence Forces is related to the defense of the country against external and internal threats. The secondary role of the Defence Forces is to support the civil authorities in the situations of natural calamities and disasters. Notwithstanding the above the situation for calling the Defence Forces for Disaster Management should be well defined by joint effort of Civil and Military Authorities by keeping in view the primary role of Defence Forces. Aid to civil authority in cases of disasters has to be viewed as a special emergency and tackled with full enthusiasm and the synergistic efforts of both the civil administration and the armed forces. Notwithstanding the role of the military, it is beyond any doubt that disaster management is a function of governance. Disaster management comprises not only rescue and relief but a more complex process linked with overall development. The role of the military, therefore, is secondary, as part of aid to civilian authority (Dagur, 2008)

Technically, the armed forces need to be requisitioned by the civil administration only if the situation is clearly beyond the control and capacity of the local administration. It does not necessarily mean that the armed forces will only be pressed into service after exhausting the resources and efforts of the civil administration in case of a disaster. Sequential deployment of rescue and relief resources, or a graduated response by various entities to emergencies is fraught with the dangers of delay, and the situation going beyond control. (Raj, 2008)

It is worthwhile examining reasons for the Armed Forces getting involved in disaster management in spite of the raising of the National Disaster Response Force (NDRF) and State Disaster Response Forces (SDRF). The armed forces will continue to

get embroiled in rescue and relief operations due to the triggering of disasters of unprecedented magnitude as a result of climate change and haphazard development. Another important aspect is the public faith in troops and resultant pressure on the administration to call the armed forces to provide assistance to affected disaster victims. In addition to this the civil administration or political establishment is unwilling to take a chance of being accused of inefficiency; hence, deployment of the armed forces in such scenarios becomes a play-safe option. However after any armed forces assistance it is necessary to check if the deployment of troops was unwarranted especially when other governmental entities could also have undertaken relief operations. (Raj, 2008)

There is a need to evolve from the present status of over reliance on Armed Forces for management of disasters to a more effective civil administration response. Efforts should be made for using the expertise of the armed forces for bolstering the capacity of the civil authorities, including the disaster response forces. It would enable the latter to achieve self-reliance and thus reduce their dependence on the armed forces. Enhancing capability for risk reduction in urban as well as rural areas and having suitable legislative and regulatory mechanisms to promote safe buildings should be encouraged as part of the civil–military relations programme. Specialised workshops and seminars also need to be conducted at the various command levels. (Gautam, 2012)

Conclusion

"First responders – last resort", used to be the basic principle for employment of the armed forces in disaster rescue and relief operations: first responder, meaning response by troops in the close vicinity of the disaster location first, on their own, in grave disaster situations. (Raj, 2008) It is now the NDRF who are the first responders and the Indian armed forces have a secondary role to play. Also there is a need to give the armed forces a charter, an institutionalised role for managing disasters in the country which is supplementary to the charter of NDRF. For state governments the first preference for any disaster management should be NDRF/SDRF and not the Armed Forces. The Armed Forces is self-contained body, well-laid, has its own command structure and should have an institutional place in disaster management with the principle of utilization only when no comparable civil alternative is available. Though CISC is part

of NEC, senior functionaries of armed forces must be part of NDMA and SDMA. The army must not be the first respondent except for major disasters.

CHAPTER 7: SYNERGY IN RESPONSE AND RECOMMENDATIONS

The disastrous word 'Disaster' has its origin in Latin. Aster in Latin means a star. In ancient times, sailors used to detect directions by looking at the position of certain stars. Unfortunately, in some days, the skies went cloudy and the sailors went astray. This resulted in shipwreck and many got drowned in the deep waters. When these incidents became frequent, a starless night was often called a disaster (No star). Hence, a disaster spelled death to many

General

As illustrated by the Indian Ocean tsunami in December 2004, Uttrakhand Floods in 2013 and the Kerala Floods in 2018, India is one of the most hazard prone countries in the world, and poor people are at high risk when disaster strikes. Floods, drought, landslides and cyclones occur regularly. Earthquake risk is extremely high. These hazards threaten millions of lives and can cause large-scale financial, infrastructure, crop, and productivity losses that hinder India's development. The steps taken by India towards managing these kinds of disasters are commendable but a lot of refinement is still needed for a synergised and effective response.

The management of disasters, and of risk reduction, requires, an inter-disciplinary approach, and in practice, an inter-ministerial and inter-agency approach. We in India had a long history of professional management of natural disasters. Even in the colonial era, the discipline of disaster management had got the attention of administrators. India's Famine Code is remembered all over the world in dealing with problems of drought. There were detailed and explicit codes for the management of floods, droughts and other disasters. (Sahani, 2003) However, in the post-independence period, implementations of policies and non-effective administrative response to disasters had left much to be desired. Post the DM Act of 2005, setting up of NDMA and the NDRF a lot of method has come into the madness of disaster management. They have played a crucial role in mitigating the effects of disasters. Small disasters like monsoon floods are now being adequately addressed by the civil administration along with the assistance of NDRF and the Armed Forces are seldom called for assistance. However, in big disasters the situation

turns grim and the Armed Forces play a major role.

Adequacy of Our Disaster Emergency Response System

Our emergency response system has stabilised over the last ten years and a structured response is now available at the national level to deal with any disaster. We have gradually moved away from the immediate response by the armed forces to the NDRF being the first responders in every crisis. At the national level our disaster response capability has grown exponentially and we are taking further steps to meet the sustainable developmental goals laid down by the United Nations. Keeping the economic condition of our country in mind and the fact that we are still a developing country, raising and sustaining a standing Disaster Response Force is a creditable achievement. Even Japan, who is extremely vulnerable to disaster, has not kept such a force and relies on its volunteer force and its armed forces for a strong response to disasters. Similarly in USA, its FEMA's emergency response is based on volunteer force and small decentralized teams trained in such areas as the National Disaster Medical System, Urban Search and Rescue, Disaster Mortuary Operations Response Team, Disaster Medical Assistance Team, and Mobile Emergency Response Support. (FEMA, 2019) Thus our system of having a standing disaster response force is unique but debatable specially when there is requirement on cutting down expenditure and making our resources lean and mean. The raising of additional four battalions is a step which needs a review since modernization of the existing forces will pay more dividends than accretion of forces.

The age profile of NDRF is also a cause of concern, since having older people makes the force lethargic and less motivated. The Japanese emergency response which mainly consists of the Volunteer Fire Corps is young and dynamic and has been able to assist the civil administration in all kinds of contingencies. Similarly in USA their specialist response teams are assisted by FEMA Corps which is a voluntary force, ranging in the age bracket of 18 to 24 years and is a cadre dedicated to disaster response and recovery. The Corps work on teams of 8 to 12 people and follow a model of living together and traveling together. The Corps described as a "dedicated, trained, and reliable disaster workforce" works full-time for 10 months on federal disaster response and recovery efforts. The Corps receives $4.75 a day for food and a living stipend of

approximately $4,000 over 10 months. An education award is distributed to corps members who successfully serve 10 months of service, completing 1,700 total hours. (Security, 2019) Thus it is again clearly evident that a young trained volunteer force is a better response force to have rather than an ageing government funded full time force. Involvement of the local community is a must in disaster management and this should be the underlying principle of our response forces also. SDRF should be stronger than the NDRF and should consist of local volunteers for a faster and dedicated response to any disaster.

While the disaster management system has evolved at the national level, it has not evolved in a similar manner at the State level. The setting up of SDMA and the SDRF is in a very nascent stage in most of the states. Assam, Bihar, Gujarat, Jammu and Kashmir, Kerala, Madhya Pradesh, Nagaland, Tamil Nadu and Uttarakhand were the only states that could give their status report on the functioning of SDRF in a recent conference chaired by the Home Secretary on capacity building of SDRF (Times, 2018). It is clear from this fact that the states do not see disaster management as a governance issue and leaves it either to the local bodies or the Centre to manage it. The states consider expenditure on SDRF as drain on its limited budgetary resources and prefers to rely on its fire services, home guard, civil defence and the local armed forces component for a response in case of a disaster.

Strength and Inadequacies of NDRF

NDRF has over a period of time proved its effectiveness in the last ten years of operations and has evolved into a professional disaster ready force. Since 2007 NDRF has saved 1,33,192 human lives and retrieved 276 dead bodies of disaster victims in 73 response operations in the country. (NDRF, National Disaster Response Force, 2018) In most of the cases the armed forces were not called for and the civil administration was able to handle the situation with the assistance from NDRF. Some of the major strengths of NDRF are highlighted as follows:-

(a) By virtue of its dedicated role for disaster management, NDRF is a proactive force available as the first responders in a crisis. The Centre and states rely on it and have developed confidence in them over a period of time after

seeing their professional response. It's prepositioning also helps in reducing time in reacting to a disaster which has resulted in saving innumerable lives and reducing the economic damage costs to a large extent.

(b) Due to its extensive training and keeping themselves abreast with the latest developments in disaster management, NDRF has evolved into a professional and experienced force which is capable of dealing with any kind of disaster. Not only in India has their performance been applauded, even during the Nepal earthquake in 2015 their contribution was appreciated by the Nepal government and the entire international community.

(c) NDRF has become more visible during the recent times and this is evident from the 73 responses that they have given in a short period of 10 years. This has certainly reduced the load of the Armed Forces and allowed them to concentrate on their primary task of defence of the country.

Notwithstanding the professionalism that NDRF has shown, they have some inadequacies which have come out during its response in various disasters including the recent Kerala floods of 2018. The CAG report of 23 Apr 2013 found that the NDRF was not adequately prepared to deal with disaster since it was lacking in manpower, training and requisite equipment. (CAG, 2013) Some of the inadequacies as identified during the research are as follows:-

(a) The large size of the force is an asset as well as a liability. Abundance of resources increases our capabilities, but if the same comes at a cost then the economics of that resource has to be kept in the mind. Maintaining one battalion costs a large amount and maintaining 12 battalions is a big drain on the exchequer. Our composition of NDRF battalions is troop's intensive and not advance technology equipment oriented. Its response during the Kerala Floods was suboptimal since only 58 teams were deployed for the operations. There was an overreliance seen on the resources of Armed Forces, which raised an important question on the capability of NDRF to produce the troops on ground when asked for. So if we look through the prism of economics, NDRF is not budget friendly,

manpower intensive and still banks on the armed forces to complete its assigned role.

(b) Continuing on the manpower issues, it's an overage force which is not fully ready to meet any contingency with its full capability. The manpower is also mis-utilised on duties other than disaster relief. CAG report of 2013 observed that 73 personnel of NDRF were sent on attachment to various CAPFs which depleted the strength of NDRF. In addition there were 190 low medical category personnel whose presence in the force reduced its efficiency to respond to disasters. (CAG, 2013) Organisational deficiencies have also come to fore wherein the parent CAPFs are not fully subscribing to their vacancies citing deficiencies in their own cadre. This clearly shows reluctance on the part of CAPFs to form part of NDRF. Rotation of personnel to NDRF has also been a cause of concern since experienced manpower of NDRF gets reverted back to the parent organisation resulting in loss of trained manpower. Therefore, seeing the manpower policies of the organisation, the NDRF appears to be evolving at a slower pace than it should actually be growing.

(c) The prepositioning of the NDRF assists the states in quicker response to any crisis. But seeing the vast size of India, the numbers of NDRF battalions that we have, appear less and certainly its Pan-India presence is not satisfactory. There is a view in some quarters that we need more such battalions and hence the raising of four additional battalions is justified. Therefore, even though we have the largest standing disaster response force in the world, it is not enough to cater for the vast size of our country.

(d) Since disaster relief is a specialized task, it involves a lot of training and refresher courses to keep abreast with the latest techniques in managing disaster relief operations. The NDRF is unable to satisfactorily meet this basic requirement since it suffers from inadequate training infrastructure and has to ensure training of its cadre in make shift arrangements either inside their units or some other training institutes. Lack of structured training affects their proficiency levels and is detrimental in handling disasters. There was proposal by MHA to set

up a National Disaster Response Academy, but the same has not seen the light of the day due to inaction at the ministry level probably due to budgetary constraints. Therefore the decision makers have to take a call whether they want additional weakly trained battalions or to have a few well trained disaster response battalions.

(e) The force lacks specialized equipment to deal with different kinds of disasters. The current inventory of resources is outdated and needs a technology boost. It was seen during the recent Kerala Floods that due to limited number of vintage equipment in the inventory of NDRF, the force personnel had to resort to primitive way of conduct of relief and rescue operations. Thus, there is an urgent need to provide high end technology equipment to each of the battalion in the response domain. Specialised equipment is needed for firefighting services since fire is a common occurrence during disasters. Modern Urban Search and Rescue devices/kits are also required in large numbers since the urban areas are the most affected in disasters. The list of advance technology required to fight disasters is endless and this issue needs to be addressed at the earliest.

(f) Post disaster recovery operations, immediate rehabilitation needs to be carried out so as to enable the local administration to restart functioning. The force in its present organisation lacks the ability to restore public services, communication network and provision of enhanced medical aid. In its battalion organisation there is a need to have a team which is trained to restore water and electricity supply, telecom experts and the existing medical teams need to be further augmented and trained for enhanced operations.

(g) The NDRF battalions have limited logistic capabilities. They are able to cater for their own administrative needs and during operations needs additional transport. For airlift or sealift they need the assistance of Air Force and Navy. Though the force cannot afford to have its own air and sea capability, they should have regular coordination and exercises with the various transport agencies for a synergised response during disasters.

(h) One of the basic principles of emergency response of our system is response at state and national level based on the gravity of the disaster. The national capability is in place, but the state disaster response force has not yet developed thereby going against the basic principle of disaster management. Though setting up of SDRF is the responsibility of the State Government, the promoting and nurturing the growth of SDRF is in the interest of NDRF. If the SDRF has a matching capability with the NDRF, then our response would be much better and the need for armed forces response would reduce considerably.

(j) The International Search and Rescue Advisory Group (INSARAG) is a network of disaster-prone and disaster-responding countries and organizations dedicated to urban search and rescue (USAR) and operational field coordination. The INSARAG Guidelines 2015 make the difference between the IEC classification – a process amongst peers, designed by the INSARAG community for the verification of the achievement of the standards for teams with an international deployment mandate. (INSARAG, 2017) The NDRF has now well established its presence in the country and for any oversees assignment needs to get this certification. The guidelines for this certification are very stringent and our NDRF has the capability to achieve this.

(m) The coordination between NDRF and Armed Forces is lacking and there is almost no interaction amongst them during non-operational times. It is only during disasters that the two come together for the national cause and obviously the response is not synergized. Personnel of the Armed Forces and NDRF have a very little idea of the capabilities of each other and hence during operations some of the resources remain underutilized. The blame for the lack of this coordination squarely lies on the leadership since jointmanship in operations has to be ensured by the leaders. Structured training courses on disasters in which representatives of both the organisation participate is a must. Also at the ground level the NDRF Battalion Commanders should closely interact with all the armed forces units in his area of responsibility so as to be better prepared for his task.

(n) Though four battalions have been earmarked for response to CBRN disasters, they are ill-trained and ill-equipped to handle this kind of emergency. Even the equipment required for fighting this kind of disasters is limited and the force needs better equipment to deal with decontamination and personal gear and NBC suits for operating in radioactive hazard areas. The Armed Forces are well versed in operating in these kinds of conditions and the NDRF needs to draw form the armed forces expertise and experience for a better response.

(o) It has been seen in the recent disasters that the civil administration showed a lack of confidence in the capabilities of NDRF. They preferred to approach the local armed forces unit for aid to civil authority duties. They preferred the armed forces for its professional and apolitical response and wanted to take advantage of their rich experience in handling these kinds of situations. The NDRF has to work hard to develop this kind of confidence from the civil administration. The CAG report on Chennai Floods in Dec 2015 in Para 6.4.1 observed that civil authorities requisitioned for NDRF Battalion which was located nearby in Arrakonam, three days late which resulted in an ineffective response from the NDRF. (CAG, Disaster_Management of Report No 4 of 2017 Performance Audit of Flood Management and Response, 2017)

(p) Japan has a disaster management system akin to our system laid down through DM Act 2005. However, it does not bank on a standing disaster response force like NDRF for its emergency response. They have Fire Corps Volunteers which is akin to our Civil Defence/Territorial Army. This force is regularly trained, consists of a large number of women volunteers and is not a burden on the government exchequer. Similarly The US disaster response is through FEMA Corps which is again on daily wages and is a well-trained team of volunteers. This raises a question on the viability of NDRF since we need to seriously see the feasibility on relying more on a civil volunteer force like Civil Defence, Home Guards for emergency disaster response than raising additional battalions.

(q) During the recent Kerala Floods a yeoman service was done by various NGOs in rescue and relief operations. But there assistance was not synergized

with the national effort and optimum effects were not achieved. Coordination of this kind of unstructured assistance should be done by the local NDRF battalion during non-operational times, so that a cohesive non-governmental response can be engineered at the time of disasters.

(r) Communication plays a very important role in managing disasters especially when there is a breakdown of the local communication architecture. The communication sets employed by NDRF are at variance with the ones used by the Armed Forces are there are compatibility issues. This issue needs to be looked into by the NDRF and they should cater for such communication equipment so that at the times of conduct of operations there is synergy amongst all the operators.

Critical Analysis of NDRF and its Synergy with the Armed Forces

Centre for Land Warfare System (CLAWS) conducted a seminar on the Armed Forces involvement in disaster management and found that the NDRF which has only ten battalions are woefully inadequate to provide any meaningful assistance when required as they are dispersed all over the country. It observed that given the size of our nation, a standing separate organisation will not fulfill the desired role nor is it required, given the availability of a number of CAPF units apart from armed forces units readily available at various locations all over the country. Since inception, NDRF has carried out 73 response operations all over the country. In comparison, Indian Army provided 150 teams in 2012-13 in aid of civil authorities as per Ministry of Defence Report of 2012-13. (CLAWS, 2014)

The seminar also recommended establishment of a 'Regional Disaster Management Grid'. Since a number of battalions of army and CAPFs along with their regional headquarters are located all over the country, they must be integrated together to form a regional disaster management grid. Each state could work out its disaster prone areas requiring assistance, like the flood prone areas and allocate and place resources nearby for faster deployment. The highest headquarter, irrespective of the organisation must be the local controlling headquarters. The regional grids could be in direct communication with the NDMA operation Centre and the state response centers. In case

this is implemented then the present separate standing organisation of NDRF will then not be required as its force levels are inadequate to meet the national requirement. (CLAWS, 2014) Therefore, it is evident that we are trying to tackle too much (Disasters) with too little (NDRF). Just because our nation has NDRF, we are leaving everything to them and not trying to capatalise on a variety of resources that are at our disposal. Coordination and integration amongst all the resources is the need of the day and who better than NDRF to do this task.

There are a multitude of agencies like the Army, Air Force, ITBP, NDRF, state agencies, NGOs, private groups etc deployed in the disaster zone. It has been observed during Kerala Floods that all of these agencies are working independently, passing information in their own chain of command and coordinating relief as a standalone group. The synergy between various agencies is lacking. The armed forces being an organized, disciplined and capable force are always the first respondents during any natural calamity due to their expertise, outlook and tendency of the local administration to seek assistance at the first instance of a disaster. Hence, it is imperative that their application be closely integrated with the state resources for a comprehensive response strategy.

Recommendations

A catastrophe of large magnitude brings out the strength and inadequacy of the nation's resources to include NDRF and Armed Forces along with its hardware and eqpt. Inability of the local and State Civil administration to handle incidence of a massive natural or manmade disaster should not come as a surprise since the governance setup itself is disrupted. The successful accomplishment of the disaster management is intimate interaction and coordinated response by the NDRF, Armed Forces and other Civil constituents.

There are a plethora of agencies and resources which can be utilized to manage disasters in our country. The Armed Forces and the CAPFs are the largest pool of such resources whose one of the task is to aid the civil authorities in management of disasters. The NDRF which has the main role of giving emergency response to disasters has unfortunately not been able to meet the national requirement and has just been able to display patches of brilliance. The economic effects of disasters have been very high on

India and it can ill afford to have disasters as potholes in its path to becoming a world superpower. With growth and overburdening of natural resources, disasters will occur and we have to manage the disaster as a nation with all its resources being utilized to the optimum. Therefore the shortcomings of NDRF have to be met by effecting an attitudinal changes in the way the NDRF functions and institutionalizing the role of the Armed Forces in disaster response. More coordination and integration is required at all functional levels for a synergized response to disasters.

There is a need to change the way we are functioning today and some of the recommendations for improving the emergency response to disasters is as under:-

(a) Our disaster response capability has grown exponentially and we are taking further steps to meet the sustainable developmental goals laid down by the United Nations. Keeping the economic condition of our country in mind and the fact that we are still a developing country, we need to rethink our strategy of raising and sustaining a standing Disaster Response Force. We need to learn lesson from the other countries like USA and Japan in having an emergency response force of a volunteer variety and shelve the idea of raising of additional four battalions.

(b) There was a proposal by MHA to set up a National Disaster Response Academy, but the same has not yet seen the light of the day due to inaction at the ministry level, probably due to budgetary constraints. In case we plan to keep NDRF professional in its task then we need to give the force required training infrastructure at the earliest.

(c) There is an urgent need to provide high end technology equipment to each NDRF battalions in the response domain. The list of specialized equipment is endless and specialised equipment is urgently needed for firefighting services and Urban Search and Rescue missions. A modern Emergency Operations Centre also should be permanently set up having all the required infrastructure and satellite links.

(d) The State Disaster Response Force is ineffective and has not developed thereby has not been able to supplement the efforts of NDRF. The promoting and nurturing the growth of SDRF has to be pushed through Centre initiatives and the NDRF has to get proactively involved in this task.

(e) A particular kind of disaster requires a particular set of relief stores which can be prepositioned in the areas identified as vulnerable. We may call this set of relief stores a 'Disaster Brick'. This brick concept is akin to what is existing in the Indian Army wherein stores required for war fighting in a specified terrain are pre-located for ease in logistics. The same concept needs to be evolved and the NDRF/SDRF should be responsible for manning these disaster bricks for speedier mobilization during the disasters.

(f) Our country has a vast pool of talent with matching institutions like ISRO, IMD, IIM and IIT. These national resources have not been tapped for improving response to disasters. NDRF can gain a lot by having close interaction with these institutes. An audit by a team of IIM will improve the efficiency of NDRF and will save the government a lot in its expenditure. Similarly innovations, inventing new mechanisms, tools and equipment to mitigate the effects of disasters can be outsourced to IITs and other such technical institutes. Going further on this our national capabilities in terms of satellite and expertise in weather forecasting can give a forewarning on disasters. The same has been seen during the recent cyclones. The NDRF needs to get more closely integrated with these institutes for a more effective response to disasters other than cyclones also.

(g) Personnel of the Armed Forces and NDRF have a very little idea of the capabilities of each other and hence during operations some of the resources remain underutilized. There is a need for a structured interaction between the two forces to be organised at all functional levels.

(h) SDRF should be stronger than the NDRF and should consist of local volunteers for a faster and dedicated response to any disaster. Personnel of SDRF should be a volunteer force on the lines of Civil Defence/ Home Guards and

should be trained by the NDRF. The developed countries response experience has shown that a young trained volunteer force is a better response force to have rather than an ageing government funded full time force. Involvement of the local community is a must in disaster management and this should be the underlying principle of our response forces also.

Conclusion

In our country whenever a natural disaster occurs, invariably we find that the State government requisitions the NDRF and the Armed Forces and these forces then get involved very deeply in the process of disaster management. Over the experience of previous disasters it has been observed that the response and relief, which the NDRF was capable to extend, would have been more beneficial if there was a better coordinated, synergised and planned response along with the Armed Forces. The same is still to be seen on ground as it is repeatedly seen that there is no well-defined strategy of the NDRF to combat the disaster with the assistance of the Armed Forces. The resources that can be made available to augment the efforts of NDRF are tremendous both of the Army and Civil administration. The much needed benefit at the time of crisis an be achieved if there exists a synergy between the apparatus of NDRF and Armed Forces for which a deliberate thought is required to be given on priority. The various remedial measures as indicated in the research are few of the ways with which the NDRF and the Armed Forces can exploit each other's capabilities and resources to the benefit of the population affected by the disaster.

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